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The Role of Venture Capitalists in Monitoring Portfolio Companies

Khaled Khalil Abdou
University of New Orleans

THE ROLE OF VENTURE CAPITALISTS IN MONITORING PORTFOLIO COMPANIES

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Khaled Khalil Abdou

B.A., Helwan University, 1997
MBA, Eastern Illinois University, 2001
M.S., University of New Orleans, 2005

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Dedication

I dedicate this dissertation to my father Mohamed and my mother Madiha.
They have been always for me.

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Abstract

Does the role played by venture capitalists add value to their portfolio companies? How do they add value? What are the characteristics of those venture capitalists? Does financial leverage matter for VC-backed companies? All of these questions are researched in this dissertation. The manuscript specifically explores two cases. The first is the role of U.S. venture capitalists after the IPO of their troubled portfolio companies, while the second examines the role of venture capitalists in international investments. The findings detailed in the first part of the study show that a higher level of monitoring and involvement is a significant factor in being a successful company, but characteristics such as the age and reputation of VCs are not. Moreover, and as expected, financial leverage is shown to be an insignificant factor for a troubled VC-backed company. However, those characteristics of venture capitalists are useful in extending the life a VC-backed bankrupt portfolio company. The second part of the study reveals that U.S. venture capitalists prefer to cooperate with a foreign counterpart in order to delegate monitoring responsibilities. Also, international investments tend to have many more foreign venture capitalists and fewer non-managing board members than domestic investments. This manuscript is divided into five chapters. Chapter 1 gives an overview of the venture capital industry. Chapter 2 discusses the problems of the VentureXpert database, its limitations and remedies. Chapter 3 investigates the role of venture capitalists in troubled portfolio companies following an IPO. Chapter 4 looks into the role of U.S. venture capitalists in their international portfolio companies. Finally, Chapter 5 summarizes the conclusions of the investigations and research.

Chapter 1: Overview of the Venture Capital Industry

"The question of what venture capitalists do has received surprising little academic scrutiny."
Thomas Hellmann and Manju Puri (2002)

The first modern venture capital firm was established in 1946 by Karl Compton, the president of the Massachusetts Institute of Technology, Merrill Griswold, the chairman of the Massachusetts Investors Trust, Ralph Flanders, the president of the Federal Reserve Bank of Boston and General Georges F. Doriot, a Harvard Business School professor. American Research and Development (ARD), the entity formed by these trend-setting men, financed commercial applications of technologies that were developed during the world-war period (Gompers, 2001; Lambe, 1992). Their investment was very successful and was referred to as a "home run" (Gompers, 2001).

This success motivated the federal government to become involved in the activities of what became known as the venture capital industry. In 1958, the government established the Small Business Administration, which was given the authority to control new small business investment companies (SBICs) that provided financing and industry expertise (Gompers, 2001).

By the 1980s, there was an increasing flow of funds into the venture capital industry from different types of investors, including individuals, pension funds, corporate funds and endowments. The flourishing of the venture capital industry during the 1980s was attributed mainly to the New Prudent Investor Rule that was enacted at the end of 1970s, which allowed institutional investors to invest in venture capital firms (VCFs).

Table 1 shows the growth of the number of venture capital funds for the period from 1970 to 2004. In 1970, the total number of funds was only seven, but it crossed the 100 mark in 1982. It reached its peak in 2000, when 1445 funds formed the venture capital industry. Since the burst of the bubble in April 2000, the number of funds decreased dramatically, with only 320 funds in 2004. The table also shows the amounts raised annually by venture capitalists (VCs) from 1970 to 2004. In 1970, venture capitalists were able to raise $161.3 million dollars in commitments to fund portfolio companies. In 1979, the amount raised reached $1 billion. In the following years, it grew dramatically to reach its 200 peak of just over $158 billion. By 2004, however, the amount raised by VCs dropped to $29 billion.

Table 1

Amount Raised by Venture Capitalists and the Number of Funds (1970 to 2004)

Year	Amount Raised (Millions U.S.$)	Number of Funds
1970	161.3	7
1971	103.8	11
1972	496.9	14
1973	99.0	11
1974	380.4	12
1975	89.2	9
1976	301.7	14
1977	210.4	11
1978	361.4	20
1979	1,031.8	21
1980	2,265.8	61
1981	1,659.8	89
1982	1,948.0	100
1983	4,207.9	161
1984	4,112.4	152
1985	4,738.0	162
1986	4,706.7	134
1987	5,412.8	143
1988	6,278.4	140
1989	6,745.3	158

Table 1 (Continued)

Year	Amount Raised (Millions U.S.$)	Number of Funds
1990	5,304.7	145
1991	3,490.5	78
1992	6,309.8	124
1993	8,667.6	170
1994	12,434.2	208
1995	14,834.6	279
1996	16,808.1	296
1997	27,940.9	457
1998	42,603.2	575
1999	80,033.8	870
2000	158,169.6	1,445
2001	64,183.7	730
2002	17,442.7	411
2003	16,943.5	269
2004	28,770.7	320

Figures 1A and 1B outline commitments by participants in the venture capital industry. The difference between the two figures demonstrates the cyclical nature of this industry. In Figure 1A, the highest amount accounted for 38% of the total of commitments, and was funded by family or individual investors. The second highest percentage, 24%, was committed by corporate non-pension funds. Banks only accounted for 2% of the commitments. In Figure 1B, the highest percentages of commitments, 29% and 28%, represented foreign investors and pension funds respectively. Banks and other intermediaries' commitments increased dramatically in 2004, compared to 1986, as they totaled 27% of the total commitments. An obvious difference between the two figures is the growth in the types of participants in the venture capital industry.

Figure 1A

Commitments by Participants (1986)

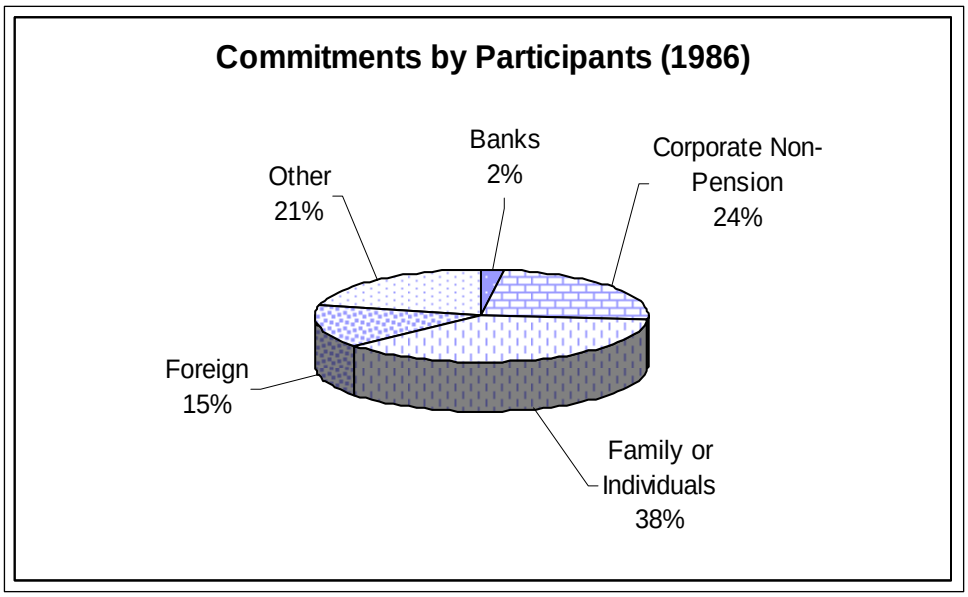
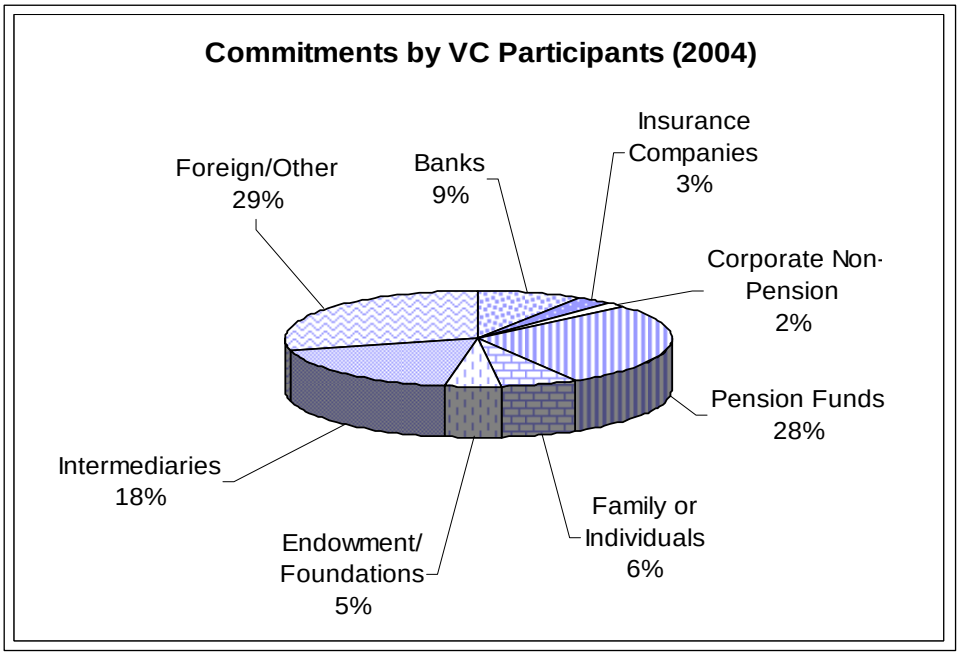


Figure 1B

Commitments by Participants (2004)



Demonstrating that VCs often work globally, the next group of tables highlights international participation. Table 2 shows the trend of investments in international portfolio companies by United States-based VCs. In 1990, 24 U.S. firms were involved in the international VC industry, funding 33 VC funds. In 2000 the number of firms increased to 484 firms funding 702 funds, while in 2004 the number of firms had been 227 firms funding 329 VC funds. This illustrates that the increasing trend of this industry has been not only domestic, but also international.

Table 2

Trend of Investments in International Portfolio Companies by U.S. VCs (1990 to 2004)

Year	Number of Rounds[1]	Number of Companies	Number of Funds	Number of Firms	Sum of Investments U.S.$ Millions
1990	98	81	33	24	242.79
1991	56	51	36	27	440.51
1992	82	67	46	35	423.18
1993	96	79	53	41	780.27
1994	109	97	53	40	376.47
1995	145	126	77	57	501.55
1996	311	282	112	80	1,157.31
1997	320	289	137	100	1,102.29
1998	483	428	207	148	2,802.05
1999	795	704	363	258	7,612.84
2000	2,255	2,003	702	484	16,577.10
2001	1,628	1,478	518	357	12,231.28
2002	1,030	942	310	212	7,094.25
2003	932	848	305	221	5,752.35
2004	696	636	329	227	4,705.66
TOTAL	9,037	8,112	3,282	2,312	61,799.92

[1] Venture capitalists do not pay their commitments in a lump sum; they divide the total amount of commitments into different portions, which are called rounds. These rounds are paid to the portfolio company based on a preset schedule. This is one way in which venture capitalists control and monitor the activities of a portfolio company.

Table 3 shows the countries in which U.S.-based VCs have preferred to place their investments. Not surprisingly, countries with well-established economies, such as Canada, France, Israel, Japan, the United Kingdom and Germany, attract U.S. VCs.

Table 3

International Investments by U.S. Venture Capital Firms (1990 to 2004)

Nation	Number of Companies	Percent of Total Companies	Sum of Investments U.S.$ Millions	Percent of Investments
Algeria	1	.02	4.05	.01
Argentina	38	.76	817.21	1.32
Austria	21	.42	156.77	.25
Australia	235	4.73	1753.07	2.84
Bosnia/Herzegovina	1	.02	.65	.00
Bermuda	24	.48	3114.07	5.04
Belgium	79	1.59	1068.59	1.73
Brazil	46	.93	1510.78	2.44
Bulgaria	1	.02	9.50	.02
British Virgin Islands	3	.06	29.11	.05
Canada	482	9.70	5535.26	8.96
Czech Republic	19	.38	244.99	.40
Chile	12	.24	131.49	.21
China	146	2.94	3171.71	5.13
Cayman Islands	7	.14	525.78	.85
Cameroon	1	.02	.18	.00
Colombia	6	.12	153.23	.25
Costa Rica	2	.04	3.50	.01
Croatia	2	.04	12.90	.02
Cyprus	2	.04	99.80	.16
Denmark	47	.95	678.66	1.10
Estonia	4	.08	54.90	.09
Ecuador	1	.02	27.80	.04
El Salvador	1	.02	1.00	.00
French Guiana	1	.02	7.00	.01
Finland	72	1.45	207.51	.34
France	495	9.96	4367.68	7.07
Germany	283	5.69	2926.59	4.74
Greece	2	.04	.76	.00
Hong Kong	75	1.51	1656.99	2.68

Table 3 (Continued)

Nation	Number of Companies	Percent of Total Companies	Sum of Investments U.S.$ Millions	Percent of Investments
Hungary	14	.28	143.94	.23
Iceland	2	.04	54.74	.09
Indonesia	19	.38	299.84	.49
India	169	3.40	2284.75	3.70
Ireland	104	2.09	1404.76	2.27
Israel	265	5.33	1877.19	3.04
Italy	75	1.51	976.34	1.58
Jamaica	1	.02	7.50	.01
Jordan	1	.02	3.00	.00
Japan	251	5.05	3644.27	5.90
Kenya	1	.02	1.00	.00
Kazakhstan	2	.04	9.23	.01
Lithuania	1	.02	4.60	.01
Luxembourg	13	.26	1215.51	1.97
Malaysia	23	.46	135.65	.22
Moldova	1	.02	2.50	.00
Morocco	3	.06	13.00	.02
Mexico	23	.46	349.45	.57
Netherlands Antilles	1	.02	3.20	.01
Nigeria	2	.04	23.44	.04
Norway	30	.60	239.03	.39
Netherlands	101	2.03	1701.72	2.75
New Zealand	14	.28	33.34	.05
Peru	1	.02	10.30	.02
Philippines	19	.38	171.22	.28
Pakistan	2	.04	.23	.00
Poland	37	.74	243.55	.39
Portugal	5	.10	57.96	.09
Romania	10	.20	120.62	.20
Russia	20	.40	78.86	.13
South Africa	12	.24	51.01	.08
Singapore	86	1.73	715.55	1.16
South Korea	301	6.06	3709.86	6.00
Spain	78	1.57	604.81	.98
Slovakia	3	.06	13.14	.02
Sweden	139	2.80	1090.05	1.76
Switzerland	69	1.39	848.74	1.37
Thailand	25	.50	180.36	.29
Turkey	3	.06	27.12	.04
Tunisia	1	.02	9.80	.02
Taiwan	76	1.53	573.61	.93

Table 3 (Continued)

Nation	Number of Companies	Percent of Total Companies	Sum of Investments U.S.$ Millions	Percent of Investments
United Arab Emirates	1	.02	20.00	.03
Uganda	1	.02	.79	.00
United Kingdom	853	17.16	10426.02	16.87
Venezuela	2	.04	143.60	.23
Vietnam	1	.02	3.00	.00
Zambia	1	.02	.16	.00
TOTAL			61799.92	

The cyclical nature and performance of the venture capital industry have attracted both academics and practitioners to analyze the workings of this industry. Lerner (2002) investigated the recent drop in the venture capital industry and pointed out that this decrease may not be as grim as it appears because of the significant impact of the industry on innovation. On average, the performance of a venture-backed company differs from that of a non-VC-backed company; Brav and Gompers (1997) discovered that venture-backed companies outperform non-VC-backed companies.

Moreover, the industry has many unique characteristics in relation to other financial intermediaries. Although the venture capital industry provides funding, as banks do, it provides equity rather than debt. In addition to funding, venture capitalists also provide industry expertise and networking with other professionals, such as lawyers and accountants. Previous literature has pointed out other characteristics that are unique to this industry, such as staging,[2] grandstanding,[3] the heavy use of convertibles in investments and participation on the board of directors (Sahlman, 1990).

[2] Staging refers to paying commitments to the portfolio companies in stages as milestones are achieved.
[3] An IPO timing decision made by an inexperienced VC is different than one made by a veteran. Companies that are backed by inexperienced VCs experience more under-pricing than companies backed by experienced VCs (Gompers, 1996).

Although academics have been active in exploring the venture capital industry, not all of the questions they raise have been answered. For example, Lerner (1995) suggested several venues of research, one of which is to investigate the impact of venture capitalists' involvement in firms after they go public. Another topic suggested by Lerner (1995) was the study of the importance of geographic proximity. Several researchers have attempted to conduct this study within the U.S.; however, the matter is so broad that several aspects of the topic have been overlooked. A more recent paper by Kaplan and Schoar (2005) highlighted the need for future research, which would aim to better understand the organizational structure of the VC industry. The motivation of this manuscript is to fill the gaps left by previous research.

Chapter 2: Data Problems and Remedies

Finding information about private equity-backed firms and private equity organizations is often difficult. If the firm is privately held, it is likely to attract little outside scrutiny and to disclose scant public information. Even if the firm is publicly traded, its coverage by the press may be infrequent. These problems are even more severe for private equity organizations. Private equity organizations tend to be extremely reluctant to disclose information about their successes, much less their failures."

Josh Lerner (2004)

Several data problems are inherent in venture capital industry research. This chapter discusses these problems, the potential limitations caused by these issues and proposed remedies. The data sources for this dissertation are the VentureXpert (VE) database (part of the Securities Data Corporation [SDC]), CRSP and COMPUSTAT tapes.

One problem with the VE database is that it depends on the voluntary reporting of funds by private equity firms (general partners) and the limited partners in these firms (Kaplan and Schoar, 2005). Also, Kaplan et al. indicated that a possible bias could occur in the form of underreporting worse performing funds.

The proposed remedy to this problem is to cross-check the companies that filed for an IPO in the VE database with SDC's Global New Issues database, which reports all companies that filed for an IPO. The use of this combination of databases delivers a reasonably complete list of firms that filed for an IPO. The second step of the remedy is to ensure that the numbers of defunct companies (according to the VE database) are correct. After acquiring the names and CUSIP numbers of the companies that filed for an IPO via the VE database, the VC-backed companies that filed for an IPO were matched with the CRSP (Center for Research in Security

Prices) database. The name of the company, the PERMNO, and the date of delisting[4] were identified. If the reason for delisting is bankruptcy or liquidation, then that company was included in the chosen sample.

Table 4 was compiled directly from the VE database, without involving the CRSP cross-check. The table shows the total number of companies per year (from 1970 to 2004) that filed for an IPO; these are then divided into the status of these portfolio companies. The analysis shows how many companies are still public, have gone private, have merged with another company as a subsidiary, are defunct or do not fall into these classifications.[5]

The table illustrates that 3,316 VC-backed companies went public during the specified period. Approximately 70% of those companies are still public, while 21% of the companies have merged with other companies as subsidiaries. There were 132 defunct companies for the period from 1970 to 2004, and seemingly only 36 for the period from 1990 to 2004. However, by adopting the above-mentioned steps, the number of defunct companies during the same period in the original sample became 180 portfolio companies.

The delisting bias[6] in the CRSP database described by Shumway (1997) and then by Shumway and Warther (1999) does not affect the results of this study, because the delisting bias concerns missing returns of delisted firms *after* the actual delisting. However, this study concentrates on the time before and up to delisting.

[4] Delisting occurs for many reasons, such as mergers, acquisitions, bankruptcy, liquidation or migration to another exchange (Shumway and Warther, 1999).
[5] The category of "Other" comprises companies that registered for an IPO but did not actually go public.
[6] Shumway and Warther (1999) stated that the delisting bias occurs when "…many returns in CRSP's database are missing for firms that are delisted from NASDAQ for performance reasons…"

Table 4

VC-backed U.S. Portfolio Companies that Filed for an IPO (1970-2004)

Year	Total	Public	Private	Subsidiary	Defunct	Other
1970	19	11	1	7	0	0
1971	27	10	5	10	2	0
1972	70	34	7	28	1	0
1973	17	6	3	7	0	1
1974	4	1	1	1	1	0
1975	2	1	0	1	0	0
1976	14	2	1	11	0	0
1977	6	2	0	3	1	0
1978	17	11	0	6	0	0
1979	34	21	2	11	0	0
1980	56	32	2	21	1	0
1981	93	53	4	34	2	0
1982	37	19	0	16	2	0
1983	186	103	8	73	2	0
1984	79	46	1	28	4	0
1985	68	38	6	23	0	1
1986	348	165	21	88	74	0
1987	124	72	5	44	3	0
1988	53	32	1	19	1	0
1989	62	45	0	15	2	0
1990	65	47	0	16	2	0
1991	141	95	5	39	1	1
1992	176	121	4	46	5	0
1993	185	138	7	39	0	1
1994	132	96	3	29	3	1
1995	178	131	9	36	1	1
1996	241	214	11	12	4	0
1997	128	108	7	8	4	1
1998	78	72	3	2	1	0
1999	264	225	7	23	9	0
2000	242	208	4	23	6	1
2001	37	35	0	2	0	0
2002	23	23	0	0	0	0
2003	27	27	0	0	0	0
2004	83	83	0	0	0	0
TOTAL	3316	2327	128	721	132	8

Chapter 3: The Role of Venture Capitalists in Bankruptcy

This chapter covers a timely topic: the role of venture capitalists in their portfolio companies. More specifically, the paper investigates the effect of monitoring techniques and the characteristics of venture capitalists in bankrupt venture capital-backed public companies. First, this essay fills the gap in existing academic literature that investigates the relationship between venture capitalists and their portfolio companies *after* an IPO. Second, since the venture capital industry is unique, the determinants of bankruptcy are expected to be different from those brought to light in previous literature. Finally, the paper studies the role of venture capitalists' monitoring techniques to determine the success of such companies after an IPO. The results of this study are important for venture capitalists and entrepreneurs because they reveal the interaction between the two parties in a late stage of their relationship.

"By intensively scrutinizing firms before providing capital and then monitoring them afterwards, venture capital organizations can alleviate some of the information gaps and reduce constraints."

Josh Lerner (2002)

Introduction

This chapter investigates the role of venture capitalists when a venture-backed company that has already gone public is failing. The main questions that this study raises are divided into two categories. One section of the research examines the different characteristics of venture capitalists (VCs) in the case of bankruptcy; questions addressed include whether less experienced VCs have the same effect on their portfolio companies as seasoned VCs and how the current holdings of portfolio companies affect VCs' decisions about whether to rush toward liquidation[7] and move on to a new portfolio company or to attempt a turn-around. The second section focuses on the ability to estimate the probability that a public venture-backed company will go bankrupt. This chapter investigates the determinants in this situation and whether they are the same as have been described by the previous literature in the case of manufacturing non-VC-backed companies.

There are two points that support the motivation for this research. First, venture capitalists are required to hold a specific percentage of their companies after the initial public offering. VCs cannot sell their ownership at the point of an IPO due to the lock-up period (Gompers and Lerner, 1999). Hence, it is in the interest of VCs to monitor the company and its market price for a fair amount of time after the IPO. Previous literature does not reveal how VCs

[7] Throughout this manuscript, liquidation can also be referred to as reorganization, bankruptcy or declaration as defunct.

behind failed companies behave after the lock-up period. Second, earlier research has investigated the determinants of success for venture-backed companies, and this research has been conducted *at* the time of an IPO. The situation is expected to be different *after* the IPO.

In addition, previous literature investigated the determinants of bankruptcy for non-venture-backed, mostly non-high-tech firms . Assuming that the "one-size–fits-all" approach does not hold, the key determinants of bankruptcy for the sample collected should be different from for the sample(s) investigated previously in other studies.

The implications of this study are important for academics and practitioners. The paper investigates areas that have not been addressed in previous academic literature. The study takes advantage of the reasonable enhancements in the VentureXpert (VE) database. Practitioners will be interested in such a topic, since it reveals the techniques that are normally used in the industry in a situation that all venture capitalists try to avoid. This will help VCs, especially inexperienced ones, in making better decisions in such a rough time.

Venture Capital Literature

Previous literature shows that venture capitalists have consistently been able to take advantage of the status of the IPO market. Ritter (1991) showed that IPO underperformance changes from one year to another. There are "hot" IPO periods, "windows of opportunity" when it is easier for investors, such as VCs, to carry out an IPO. Therefore, a successful IPO may be due to the characteristics of the market at the time of the offering as well as the features of the company.

Reputation is a very important asset for VCs, and acquiring a good one is a goal for every VC. These concerns about reputation effect the behavior of VCs. Gompers (1996) demonstrated that the IPO timing decision made by an inexperienced VC differs from one made by a veteran

VC. This “grandstanding” hypothesis explains that companies backed by less seasoned VC firms are younger and more under-priced compared to those backed by experienced VC firms. This happens because young VCs try to signal their reputation to the market. By creating a good reputation, they are able to increase the size of their funds and consequently generate more business.

The literature highlights another difference in the behavior between young and seasoned VCs. Lerner (1994) showed that seasoned VCs are proficient at taking companies public when markets are at their peaks. Lerner attributed this to the possibility that less experienced VCs were not able to command the attention of investment bankers when markets were at their pinnacles, whereas seasoned VCs could. Consistent with the grandstanding hypothesis, Neus and Walz (2005) found that young VCs might use under-pricing as a device for credibly committing themselves to establishing their reputation.

The ability of VCs to turn around a defunct company will have an impact on the future of venture capital in general. Cumming, Fleming and Suchard (2005) show that there will be significantly more capital allocated to VCs providing financial and strategic/management expertise to entrepreneurial firms. Cumming et al. (2005) highlight that fundraising is higher among funds with higher returns and performance fees and lower fixed management fees. Unsurprisingly, VCs need to increase returns and cut costs. If a company is failing and is facing possible bankruptcy, then conflict will arise. On the one hand, if the VC decided to liquidate, that would effect the performance (rate of return) of the fund. On the other hand, if the VC decided not to liquidate, then the VC will have to bear more risk by investing more and waiting for a future, uncertain harvest. This investment will increase costs and thus management fees.

Bankruptcy Literature

The literature on bankruptcy has cited the predictability of bankrupt companies, and the evidence in the literature differentiated between the attributes and behavior of the venture capital industry and other industries. Thus, it is expected that models that have been used previously to predict bankruptcy may not work for the venture capital industry. Moreover, Altman (1993) points out that the predictability of bankruptcy for a specific industry, which is dependent on a general bankruptcy model, is debatable. He reasoned that if one is interested in a particular industry grouping, then data from healthy and failing companies in that industry should be collected.

Brigham and Ehrhardt (2002) cited the results of a recent Dun & Bradstreet compilation that ranked the causes of business failure. The two main reasons were financial factors (including high debt usage and insufficient capital) and economic factors. These financial factors may not be the main causes of business failure in the venture capital industry, due to the significant role played by VCs throughout the life of their investments.

Recent studies such the one conducted by Campbell, Hilscher, and Szilagyi (2005) revisited the determinants of corporate failures and the pricing of financially distressed firms. They found that firms with higher leverage, lower profitability, higher market-book ratios, lower market capitalization, more volatile stock returns and lower cash holdings are more likely to file for bankruptcy or to be delisted. In addition, they found that on a longer horizon market capitalization, market-book ratio and equity volatility are more persistent.

The literature about bankruptcy is very broad. For example, Altman (1968) tried to assess the analytical quality of ratio analysis. He revealed that a discriminant ratio model is an extremely accurate one in predicting bankruptcy. However, the study suffered from a sample

bias.[8] Mossman, Bell, Swartz and Turtle (1998) show that there are four main types of bankruptcy prediction models, and each of them is based on financial statement ratios, cash flows, stock returns and return standard deviations respectively. Their results indicate that no existing model adequately captures bankruptcy data. However, the cash flow model works best during the two to three years before bankruptcy, while the ratio model is best applied to the year immediately before bankruptcy.

Another venue of previous bankruptcy literature is the behavior of insiders in the case of bankruptcy or reorganization. Loderer and Sheehan (1989) and Gosnell, Keown and Pinkerton (1992) present empirical evidence that corporate managers do not sell their holdings prior to filing for bankruptcy. On the other hand, Seyhun and Bradley (1997) document that corporate insiders do engage in significant sales of their holdings in the months and years preceding bankruptcy filings.

This inconsistency in the previous literature affects this study in terms of how VCs behave in relation to bankruptcy. Although this study will not document the trading of VCs before filing for bankruptcy, it tries to determine if they want to "bail out" quickly to be able to invest in another portfolio company or if they stick around, hoping for a future turnaround.

Hypotheses and Methodology

This section explains the testing of several hypotheses regarding the behavior of venture capitalists during the bankruptcy stage of VC-backed companies, as well as the predictability of bankruptcy among such firms. Despite the fact that the determinants of bankruptcy have been investigated in the previous literature, such determinants focused generally on firms with high levels of fixed assets and debt. This study anticipates that the determinants will be different in this research, since the sample firms were backed by venture capitalists (source of a solid source

[8] The sample consisted only of publicly held manufacturing corporations.

of finance) and since they are mainly high-tech companies that depend more on intangible assets rather than on fixed assets.

The following hypotheses practically test the questions raised earlier in this study.

Hypothesis 1: A venture capitalists' decision to file for corporate reorganization or bankruptcy is a function of the percentage of commitment. Practically, higher fund commitment percentage levels compared to their average investment result in a lower tendency for VCs to liquidate the portfolio company. If the VC has already invested a lot of his/her funds in that firm and has spent a lot of time monitoring and helping to manage that firm, then the VC will be reluctant to simply write off that investment.

> $H1_0$: The VC's fund commitment/investment percentage level (PER) is unrelated to a tendency toward bankruptcy.
> $H1_A$: The higher the VC's fund commitment/investment percentage (PER) level, the higher the tendency for success (SUCCESS).

The variable (PER) is defined as the amount invested by the VC in a specific company compared to the average investment amount of that VC per company. If the percentage (PER) is more than 100%, then the VC is investing more than usual in that company. Similarly, if the percentage (PER) is equal to 100%, then the VC has invested an amount comparable to his/her average investment. This means that if a VC invests a high proportion in the portfolio company, then he/she will do everything possible to avoid bankruptcy. This includes using the available professional network and devoting more time to solving the portfolio company's problems. On the other hand, if a VC is investing a small portion of his/her fund in a non-performing portfolio company, then he/she will not be as keen to turn it around; therefore,the model expects that the PER will be positively related to success.

Applying the same concept to the sub-sample of bankrupt firms, a VC will try to list the portfolio companies in his/her portfolio for the longest time period possible in order to avoid filing for bankruptcy. This is expected to be more pronounced when the VC invests a higher proportion of his/her funds in a specific company.

> $H1S_0$: The VC's fund commitment/investment percentage level (PER) is unrelated to the duration of the life of a bankrupt company.
> $H1S_A$: The higher the VC's fund commitment/investment percentage level (PER), the higher the duration (DURATION) of the life of a bankrupt company.

The variable PER is expected to be positive in comparison to the duration of the life of a bankrupt company. In other words, it is expected that the higher the investment percentage, the longer the life of a bankrupt company.

Hypothesis 2: Reputation is a very important asset for VCs. A venture capitalist's decision to liquidate is a function of the *recent history* of that venture capitalist. The higher the number of recent successes (RECENT), the lower the tendency for success (SUCCESS). If the VC has experienced a recent reputation for placing companies successfully into IPOs (ignoring the age of the venture capital firm), then the bankruptcy will not affect that recent reputation. Therefore, the VC will decide to liquidate the company.

> $H2_0$: The number of recent successes (RECENT) reported by a VC to limited partners and potential financiers is unrelated to a tendency toward liquidation.
> $H2_A$: The higher the number of recent successes (RECENT) reported by a VC to limited partners and potential financiers, the lower the tendency for success (SUCCESS).

RECENT is the proxy that is used to measure the recent successes of a VC. The number of successes is measured by the number of IPOs in which the VC participated in the last two years. If a VC has a high number of recent successes, he/she will not be keen to turn around the

company, compared to a VC that experiences a higher failure rate. The VC with a lower rate of success will devote more time and money to turning around the portfolio company. Hence, the probability to expedite liquidation is higher when the VC has a high number of recent successes.

A concern about the above hypothesis ($H2_A$) is that it may not hold if the proxy (RECENT) is a proxy for reputation instead of a proxy for recent success.[9] Hence, the second hypothesis could be reworded as:

> $H2_0$: The number of recent successes (RECENT) reported by a VC to limited partners and potential financiers is unrelated to a tendency toward liquidation.
> H2A: The higher the number of recent successes (RECENT) reported by a VC to limited partners and potential financiers, the better the reputation gained by the VC and the higher the tendency for success (SUCCESS).

Following the above theme, the same motivation affects the behavior of a VC in extending the life of a portfolio company because the VC expects to avoid liquidation (in the case of a lack of recent successes). This intuition is supported by the fact that the VC needs more time in his/her attempt to turn around a portfolio company.

> $H2S_0$: The number of recent successes (RECENT) reported by a VC to limited partners and potential financiers is unrelated to the duration (DURATION) of a bankrupt company's life.
> $H2S_A$: The higher the number of recent successes (RECENT) reported by a VC to limited partners and potential financiers, the shorter the duration (DURATION) of its VC-backed bankrupt company's life.

RECENT is expected to be negative and significant, so the higher the number of successes accomplished by the VC during the previous two years, the shorter the duration (DURATION) of the life of a bankrupt company. The VC will spend more time, money and effort if he/she has not attained a strong reputation in the market. Moreover, this VC will be reluctant to admit failure, since that will hurt his/her reputation.

[9] I thank Professor Sudha Krishnaswami and the participants in the doctoral workshop at the University of New Orleans for this suggestion.

Again, with RECENT as a proxy for reputation, then the hypothesis would be:

$H2S_0$: The number of recent successes (RECENT) reported by a VC to limited partners and potential financiers is unrelated to the duration (DURATION) of a bankrupt company's life.
$H2S_A$: The higher the number of recent successes (RECENT) reported by a VC to limited partners and potential financiers, the better the reputation gained by the VC and the longer the duration (DURATION) of its VC-backed bankrupt company's life.

Hypothesis 3: The more seasoned the venture capital firm (identified by its age [AGE] and ignoring historical success rates), the lower the tendency toward bankruptcy. If the VC is experienced and has established his/her reputation with a long, successful history, then the turnaround will be easier for him/her than for an inexperienced VC.

$H3_0$: A more seasoned VC (AGE) will not be able to turn around a failing company.
$H3_A$: The more seasoned the VC(AGE), the lower the tendency toward bankruptcy for the distressed VC-backed company and the greater the tendency for success (SUCCESS).

The AGE of the VC will be used to measure the experience of the VC, and hence his/her reputation. If a VC can survive for ten years, he/she will have a better reputation than a VC that has been in business for two years. More experience gives the advantage of more knowledge, and a better reputation ensures a better external network. The model expects AGE to be positively related to the success of a portfolio company.

The general objective of a VC is to maximize gains and minimize losses. It is expected that a seasoned VC will have the experience to better execute this objective than an inexperienced one. Thus, an experienced VC can affect the duration of the life of a bankrupt company with expertise in finance, networking and strategy. A younger VC would like to do the same, but will have limited experience that precludes him/her from doing so.

$H3S_0$: A more seasoned VC (AGE) will not be able to affect the duration of the life of a bankrupt company.
$H3S_A$: The more seasoned the VC (AGE), the longer the duration (DURATION) of the life of a bankrupt company.

AGE is expected to be positive and significant, so the higher the age of a VC in years, the longer the life of the bankrupt company. An inexperienced VC will not be able to finance a bankrupt portfolio company to the same extent as the seasoned one. One of the limitations of a young VC is the (un)availability of financing, which is affected by the ability to raise more funds. Another reason is limited strategic experience and underdeveloped professional networks.

Hypothesis 4: Although financial leverage in general is a major factor in bankruptcy, it is expected not to be significant for venture-backed companies, since they depend on VCs to fund their operations through equity or preferred securities.

$H4_0$: Financial leverage (DE) is significantly related to bankrupt VC-backed companies.
$H4_A$: Financial leverage (DE) is insignificantly related to the success (SUCCESS) of VC-backed companies.

To measure the effect of financial leverage, this study uses the ratio of debt to equity (DE). High financial leverage has always been a significant factor in predicting bankruptcy. It is assumed that the capital structure of VC-backed companies will be different from non-VC-backed companies. Hence, it is expected that debt-to-equity ratio will have no significant effect on predicting bankruptcy for VC-backed companies.

Since long-term debt is irrelevant for VC-backed companies, it is also expected to be irrelevant for the sub-sample of bankrupt companies. As discussed earlier, VC-backed portfolio companies are expected to carry a lower debt amount than non-VC-backed companies.

Therefore, it is expected that the debt-to-equity ratio (DE) will be insignificant in affecting the duration of the life of a VC-backed bankrupt company.

> $H4S_0$: Financial leverage is a major factor in the duration of the life (DURATION) of a bankrupt VC-backed company.
> $H4S_A$: Financial leverage (DE) is not a major factor in the duration of the life (DURATION) of a bankrupt VC-backed company.

Hypothesis 5: One of the monitoring techniques of VCs is the staging of financing proxied by the number of rounds (RND). This technique calls for VCs to provide financing based on the progress of the company; with each step the company completes, the management of the company is required to send a report summarizing the results of such a milestone. Then, the VCs will consider the amount that should be provided to the portfolio company. The hypothesis expects that the closer the monitoring and involvement of VCs (thus a higher number of funding rounds), the higher the probability of success due to the additional professional and strategic expertise that the VC contributes to the portfolio company.

> $H5_0$: The number of rounds ("closer monitoring") (RNDS) is unrelated to the success (SUCCESS) of a portfolio company.
> $H5_A$: The higher the number of rounds (RNDS), the higher the probability of success (SUCCESS).

RNDS is a proxy for the degree of VC monitoring of portfolio companies. It is expected that the higher the level of involvement of VCs in their investments, the better the results of their portfolio companies. Therefore, this variable is positive and significant.

In the case of the sub-sample of bankrupt companies, the picture is expected to be different. The degree of monitoring is not expected to affect the duration (DURATION) of the life of bankrupt companies. Close monitoring is expected to be effective during the early years of companies. Therefore, there should be a time lag between monitoring and outcome. If companies

benefited from closer monitoring and still went bankrupt, then it is expected that the effect of this monitoring would be trivial in extending the life of those companies.

> $H5S_0$: The higher the number of rounds ("closer monitoring") (RNDS), the longer the duration (DURATION) of the life of a portfolio company.
> $H5S_A$: The number of rounds (RNDS) is unrelated to the duration (DURATION) of the life of a portfolio company.

RNDS is expected to have an insignificant effect on the life of a bankrupt VC-backed company. In other words, the hypotheses suggest that monitoring is *not effective* during the latter stages of a VC-backed company's life.

These hypotheses can be tested by conducting a logistic model and an OLS that include all of the above determinants. Appendix I summarizes the models and relates them to the predictable hypotheses. The proposed models are as follows:

LOGIT analysis

The first set of the hypotheses posed ($H1_A$, $H2_A$, $H3_A$, $H4_A$, and $H5_A$) concerning the likelihood of success or failure are tested by the following logistic model:

$$Success = \alpha + \beta_1^{+} PER + \beta_2^{+} RNDS + \beta_3^{-/+} RECENT + \beta_4^{+} AGE + \beta_5^{Insig} DE + \beta_6 MB + \beta_7 IND + \beta_8 SALES + \varepsilon$$

Where:

- SUCCESS is a dummy variable equal to "one" if the portfolio company did not file for bankruptcy, and "zero" otherwise.
- PER is the percentage of the fund that is invested in the portfolio company. One of the problems of this ratio is that each portfolio company is funded by a variety of VC funds. Some companies are funded by 30 funds. In addition, this variable is new to venture capital literature. Several measurements were used as a proxy in order to achieve the most accurate result: (a) PCAV of fund j, equals total estimated amount of fund j's

investment in company i divided by fund j's average company investment. In order to get around the problem of consolidating the effect of many funds into one ratio, the mean and median were calculated. PCAVMN equals the mean of the ratio of PCAV that relates to company i, which had funds j through k. Similarly, PCAVMD equals the median of the ratio PCAV that relates to company i, which had funds j through k. (b) PCMX of fund j, equals total estimated amount of fund j's investment in company i divided by funds j's maximum company investment. PCMXMN equals the mean of the ratio of PCMX that relates to company i, which had funds j through k and, PCMXMD equals the median of the ratio PCMX that relates to company i, which had funds j through k. The expected sign for this variable is "+" for $H1_A$.

- RNDS is the average number of rounds that a venture capitalist invested in the portfolio company. The expected sign for this variable is "+" for $H5_A$.
- RECENT refers to the number of recent successes of the venture capital fund within the last two years (excluding the year of delisting). The number of recent successes is measured by the number of IPOs in which the VC firm took part. Again, many funds invest in one company, while RECENT is a ratio that is specific to each fund. To overcome this problem, the same technique is used here. RECMN is the mean of RECENT of funds j and k that invest in company i, and RECMD is the median of RECENT of funds j and k that invest in company i. The expected sign for this variable is "-/+" for $H2_A$.
- AGE refers to the average age of the venture capital firms that invest in company i. This is used as a proxy for the level of experience of a VC. AGE is calculated as the number of

years between the firm's inception and the delisting year of the portfolio company. The expected sign for this variable is "+" for $H3_A$.

- DE is the portfolio company's ratio of debt to equity. The expected sign for this variable is "insignificant" for $H4_A$.
- MB is the portfolio company's ratio of market to book.
- IND is a dummy variable equal to "one" if the company is high-tech and "zero" otherwise.
- SALES is the portfolio company's sales.
- ε is the random error term.

The LOGIT model measures the probability of SUCCESS of a public VC-backed company. The model proposes that the commitment of a VC's proxied PER held by the fund in the portfolio company has a positive relation with success. Similarly, the experience of a VC's proxied AGE has a positive relation with success. In addition, the model infers that financial leverage (DE) will not be a significant factor for bankruptcy. In addition, a high number of recent successes by the VC (RECENT) will be negatively related to the success of portfolio firms. On the other hand, if RECENT is a proxy for reputation, a positive relation is established with success, and, finally, it is expected that the closer the monitoring of a VC's proxied RNDS, the higher the probability of success.

OLS analysis

The second set of the hypotheses posed ($HS1_A$, $HS2_A$, $HS3_A$, $HS4_A$, and $HS5_A$) concerning the likelihood of success or failure is tested by the following OLS model:

$$DURATION = \alpha + \beta_1 \overset{+}{PER} + \beta_2 \overset{Insig}{LNRNDS} + \beta_3 \overset{-/+}{LNRECENT} + \beta_4 \overset{+}{LNAGE} + \beta_5 \overset{Insig}{DE} + \beta_6 MB + \beta_7 IND + \beta_8 LNSALES + \varepsilon$$

Where:

- DURATION is the number of years of the life of a bankrupt portfolio company. It is calculated as the year of delisting minus the year of IPO.
- LNRNDS is the Ln of the RNDS variable.
- LNRECENT is the Ln of the RECENT variable. LNRECMN and LNRECMD variables follow the same application.
- LNAGE is the Ln of the AGE variable.
- LNSALES is the Ln of the SALES variable.

The regression model measures the effect of a VC's monitoring techniques and of the characteristics of the VC and the company on the duration of the life of a bankrupt VC-backed company. Most of the arguments discussed above apply here. The model expects that the higher the commitment (PER) of the VC in a portfolio company, the longer its life. On the other hand, the number of recent successes (RECENT) is expected to have either a negative or a positive relation with the duration (DURATION) of the life of a bankrupt company. Moreover, the experience of a VC (proxied by AGE) should have a positive effect on the life of a bankrupt company. Finally, closer monitoring (RNDS) is expected to have an insignificant effect on extending the life of a bankrupt company.

Data and Sample Selection

The data collection is composed of a mix of variables collected from private databases, such as the SDC database, and hand-collected data from newswires, such as Lexus-Nexus. This study covers the period from 1990 to 2004. It has been stated that the data available from the SDC database in the 1970s and 1980s are not accurate. For example, data concerning the number of rounds were overstated. It has been found that spurious rounds are most frequent in older firms

and in earlier records (Gompers and Lerner, 1999). Furthermore, working with data gathered after 1990 is reasonably justified as the total number of years for the sample will be 15.

The data was collected from the Securities Data Corporation's (SDC) Global New Issues Database, containing IPOs between January 1, 1990 and December 31, 2004. To be included, the IPO must have occurred in the U.S. and the company must be a venture-backed company. The search retrieved 2,317 companies. Only those with an IPO flag were selected, so the number of companies dropped to 2,169.

Second, it was necessary to collect the permanent numbers (PERMNO) for all of these companies, since the CRSP database and the matched CRSP/COMPUSTAT use the PERMNO. The CUSIP and ticker for each company was tabulated and entered into the CRSP database to get the PERMNO. In this process, five companies were eliminated because of a lack of a PERMNO. The final sample, up to this step, consists of 2,164 companies. The companies that were eliminated were researched in other databases such as Factiva, Mergent and Hoover's Online to ensure that this elimination was not an error.

Third, the PERMNO for each company was tabulated and entered into the CRSP delisting database. This step was important in identifying healthy companies from defunct ones. This database shows the current status of each company (traded vs. delisted), the date of delisting and the reason for delisting. The CRSP codes divide the delisting into several categories: code 100: active, code 200: mergers, code 300: change of exchanges, code 400: liquidations, code 500: dropped, code 600: expirations and code 900: domestic companies that became foreign. The research identified two main categories: the main sample of the study, consisting of companies that were bankrupt, liquidated or delisted because of insolvency, and the matching group,

consisting of active firms and companies that have been the subject of mergers.[10] Merged companies were considered healthy because they were active when the matched bankrupt companies delisted, and they remained active and stand-alone firms for about six months after the date of delisting for matched bankrupt companies.

The healthy companies' group has codes of 100 (active and still traded up to 12/31/2004) and 200 to 290 (mergers). The defunct group contains all of the 400 codes (400, 401, 403, 450, 460, 470, 480 and 490) that were assigned to liquidated companies. In addition, companies that had been dropped or delisted by the exchanges for reasons of insolvency were included in this group. All of the codes between 550 and 574 (550, 551, 552, 560, 561, 570, 572, 573 and 574) were selected. Examples include: company request, liquidation, insufficient capital and/or equity, bankruptcy or declared insolvent, insufficient float or assets and an insufficient number of shareholders. The total sample included 319 defunct companies and 1230 healthy companies.

Fourth, the 319 companies were matched with a group of 319 healthy companies. The match was based on the year of the IPO, so the study measures the behavior of these companies during the same time period. In addition, they were matched according to industry (high-tech vs. non-high-tech). The third matching criterion is the two-digit SIC code, and may go to only one digit SIC code, and the final criterion is size of assets.

Fifth, the above sample of 638 companies was entered into the merged CRSP/COMPUSTAT database to download variables specific to the portfolio companies such as sales, common equity and debt.

Sixth, the SDC VentureXpert (VE) database (containing variables related to portfolio companies) was used to select the venture capital funds for the period 1/1/1990 to 12/31/2004.

[10] Mergers are included to extend the matching group, so a more accurate matching sample is used. Of course, the merged company has a merger date AFTER the delisting date of the bankrupt company.

Again, the same conditions (the IPO occurred in the U.S. and the company was venture-backed) were satisfied. This step is important in downloading the variables that are related to the venture capitalists that supported these VC-backed public companies.

Finally, the outcome of the fifth and sixth steps was merged to form the final sample, which consists of 380 companies divided into two groups: 180 defunct companies and 180 healthy companies.

Summary Statistics

This section shows the summary statistics for portfolio companies that filed for an IPO and interprets the summary statistics of the selected sample. Table 5 shows the timeline of delisting, the number of companies delisted each year and the percentage of delisting for each year. It was expected that the year 2000 would have the highest percentage of delisting (defunct companies), since that was the year that the internet bubble burst; however, only 28 companies delisted during that year (7.37% of the total sample). The highest numbers of delisted companies occurred in 2001, 2002 and 2003. In 2001, 82 companies were delisted (defunct), which comprised 21.58% of the companies in the sample. In 2002 and 2003, a total of 28.42% of the companies in the sample were delisted. This trend shows that VC-backed companies did not die right at the time of the bursting of the bubble, but survived for a longer amount of time. The effect of VCs is investigated in the second part of the empirical results.

Table 5, Panel B shows the duration in years of the life of bankrupt portfolio companies. The general trend of the duration is negatively sloped. The percentage of portfolio companies that lived longer is negatively proportional to the duration in years. A large portion of the companies in the sample survived between two and four years. 76, 78 and 48 companies

survived for two, three and four years respectively. The total percentage for these three years adds up to approximately 53% of the total sample.

Table 5, Panel A

Number of Portfolio Companies, Percentage of the Total Sample in Each Delisting Year

Year of Delisting	Number of Companies	%
1993	4	1.05%
1994	6	1.58%
1995	22	5.79%
1996	6	1.58%
1997	12	3.16%
1998	34	8.95%
1999	58	15.26%
2000	28	7.37%
2001	82	21.58%
2002	70	18.42%
2003	38	10.00%
2004	20	5.26%
TOTAL	380	100.00%

Table 5, Panel B

Number of Bankrupt Portfolio Companies, Percentage of Total Sub-Sample in Each Period of Duration of Life

Duration	Number of Companies	%
1	14	7.37%
2	38	20.00%
3	39	20.53%
4	24	12.63%
5	16	8.42%
6	13	6.84%
7	13	6.84%
8	7	3.68%
9	10	5.26%
10	5	2.63%
11	6	3.16%
12	5	2.63%
TOTAL	190	100.00%

Table 6 shows the summary statistics for the variables used to test the hypotheses. In addition, the two groups that comprise the full sample are investigated: namely, healthy and bankrupt portfolio companies. The data is right-skewed for the healthy companies and is the same for the bankrupt companies, except for the MB ratio, which is left-skewed. The full sample follows the same trends of the sub-samples of right-skewed data except for the MB ratio.

Table 6

Summary Statistics for Original Sample

Success/Fail	Success		Fail		Total		
	Mean	Median	Mean	Median	N	Mean	Median
RECENTMN	2.80	1.48	2.80	1.50	380	2.80	1.50
RECENTMD	1.83	1.00	1.98	1.00	380	1.91	1.00
PCAVMN	109.31	91.04	115.98	97.52	380	112.65	93.40
PCMXMN	28.02	24.47	29.46	24.67	380	28.74	24.56
PCAVMD	91.07	77.20	95.95	76.52	380	93.51	76.94
PCMXMD	22.21	16.38	25.43	17.92	380	23.82	17.04
AGE	20.23	19.23	19.75	18.50	380	19.99	18.75
MB	0.44	0.34	-0.41	0.11	380	0.02	0.26
IND	0.84	1.00	0.86	1.00	380	0.85	1.00
SALES	253.51	65.07	119.22	17.91	380	186.37	37.48
ASSETS	331.42	130.87	310.04	38.85	355	321.42	76.22
RNDS	1.69	1.50	1.60	1.50	380	1.64	1.50

Comparing the two sub-samples, the VCs of the bankrupt companies have more investment participation (PCAVMN, PCMXMN, PCAVMD and PCMXMD) than the healthy ones. This is expected since they act as financiers as well as consultants. Bankrupt companies require more financing than healthy ones, since they cannot generate enough revenue to survive. The ratio MB is significantly different between the two groups. The mean for the bankrupt companies is negative and equal to 0.41, while the median is 0.11. This is due to the negative tangible common equity they have. The mean and median for healthy companies are 0.44 and

0.34 respectively. SALES for the healthy companies is also more than twice that of bankrupt firms. The mean of healthy firms is $253.51 million, while for the bankrupt firms it is only $119.22 million.

Empirical Results

To answer the questions raised and test the hypotheses explained earlier, the tests are divided into two parts: the first one examines the full sample of bankrupt (defunct) and healthy companies, while the second examines the sub-sample of bankrupt companies only.

Table 7 shows the results of a LOGIT analysis. The sample consists of 190 bankrupt portfolio companies matched with 190 healthy companies. The dependent variable SUCCESS is a dummy variable equal to “one” if the company is healthy and “zero” if the company is defunct. In column 1, the RNDS is also positive and marginally statistically significant at the 10% level. This shows that monitoring has a positive impact on the likelihood of success for VC-backed companies, as predicted by the hypothesis. The SALES variable is positive and statistically significant at the 5% level. This result is consistent with the previous literature since larger amount of sales is expected increase the likelihood of the company’s survival.

Columns 2 and 3 follow the results of column 1 in both statistical and economic significance, except for the variable of the number of rounds (RNDS), which becomes insignificant. In column 4, the participation involvement variable (PCMXMD) is statistically significant and negative. The negative sign is not consistent with the predictable hypothesis ($H1_A$). This result needs more research to reveal the reasons behind its negativity and hence we leave it for future research.

None of the other variables are significant in terms of the four regressions in Table 7. As predicted, the financial leverage ratio (DE) is statistically insignificant. This is consistent with

the prediction ($H4_A$), because of the irrelevancy of debt dependency. AGE is also insignificant, but it is inconsistent with the predictable hypothesis ($H3_A$). The industry classification (IND) as a high-tech company is insignificant, which suggests that the industry has no effect on the probability of bankruptcy. The characteristics of VCs proxied by the recent success of IPOs (RECENTMN and RECENTMD) and investment participation (PCAVMN, PCMXMN, PCAVMD and PCMXMD) are insignificant. These unpredicted insignificant results show that there are external factors that affect bankruptcy. The characteristics and behavior (or motivation) of VCs do not overcome those external factors.

Table 8 shows that although the VC's motivation, behavior and characteristics were not significant factors in predicting bankruptcy, the VC is a significant factor in extending the life of a failed portfolio company. This is consistent with the main objective of VCs, which is to maximize gains and minimize losses. In addition, by using VC experience, professional networking and equity financing strategies, the life of these portfolio companies can be extended.

RECENT (proxied by RECENTMN and RECENTMD) is negative and significant at the 1% level in all four regressions. This is consistent with the predictable hypothesis ($H2S_A$). This means that the lack of recent success will motivate VCs to extend the life of their portfolio companies as much as possible. Reporting failing companies affects the reputation of VCs and decreases their ability to raise future funds. The investment of a VC's PER is statistically significant except when the PCAVMD variable is used.

The experience of VCs (AGE) is positive and significant in all of the regressions. This is consistent with the prediction ($H3S_A$) and with previous literature. The results suggest that the higher the number of years of experience, the better the ability to affect the duration of the life of

Table 7

LOGIT Analysis Results

	(1)		(2)		(3)		(4)	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
CONSTANT	-0.3304	0.4277	-0.3006	0.4842	-0.3389	0.4151	-0.2415	0.5634
RECENTMN	0.0085	0.7704	0.0030	0.9166				
RECENTMD					-0.0079	0.8290	-0.0132	0.7195
PCAVMN	-0.0016	0.2154						
PCMXMN			-0.0063	0.2551				
PCAVMD					-0.0013	0.3257		
PCMXMD							-0.0089	0.0729
AGE	-0.0035	0.5120	-0.0040	0.4862	-0.0033	0.5040	-0.0041	0.4532
DE	-0.0049	0.5379	-0.0041	0.5145	-0.0043	0.5202	-0.0040	0.5057
MB	0.0011	0.3949	0.0009	0.3803	0.0010	0.3798	0.0009	0.3643
IND	-0.0649	0.8369	-0.0493	0.8752	-0.0444	0.8882	-0.0474	0.8804
SALES	0.0008	0.0129	0.0008	0.0135	0.0008	0.0133	0.0008	0.0146
RNDS	0.2785	0.0883	0.2726	0.0943	0.2631	0.1040	0.2749	0.0886
Log Likelihood	-255.6382		-255.7706		-255.9228		-263.3959	
P-value	0.0499		0.0545		0.0602		0.0273	

Table 8

OLS Regression Results

	(1)		(2)		(3)		(4)	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
CONSTANT	0.2343	0.8621	0.3687	0.7922	-0.9359	0.5070	-1.1374	0.4252
LNRECENTMN	-1.4630	0.0000	-1.5026	0.0000				
LNRECENTMD					-1.8456	0.0000	-1.8772	0.0000
PCAVMN	-0.0039	0.0279						
PCMXMN			-0.0139	0.0716				
PCAVMD					-0.0042	0.0482		
PCMXMD							-0.0099	0.1720
LNAGE	2.2273	0.0000	2.1885	0.0000	2.6791	0.0000	2.6948	0.0000
DE	0.0049	0.6959	0.0102	0.4096	0.0135	0.2963	0.0155	0.2344
MB	-0.0004	0.8294	-0.0012	0.5086	-0.0017	0.3956	-0.0019	0.3224
IND	-1.2015	0.0152	-1.1863	0.0169	-1.4944	0.0037	-1.4330	0.0055
LNSALES	0.0194	0.8038	0.0088	0.9107	0.0860	0.2915	0.0826	0.3144
LNRNDS	0.3298	0.4707	0.2783	0.5427	0.2783	0.5550	0.2361	0.6178
Adjusted R-squared	0.4433		0.4383		0.39504		0.38818	
P-value	0.0000		0.0000		0.0000		0.0000	

a portfolio company. As expected, the financial leverage variables (DE) is not significant, since portfolio companies depend on equity for their financing. This result is confirmed by the insignificance of the sales variable, which shows that these companies are not able to produce enough revenue for their survival; hence, they depend on their VCs ($H4S_A$).

The industry type is an important factor in extending the life of a bankrupt company. IND is a dummy variable equal to "one" if the company is high-tech and "zero" otherwise. IND is negative and statistically significant at the 1% and 5% levels. The monitoring variable proxied RNDS is insignificant in all of the regressions ($H5S_A$) due to the lag between monitoring and the outcome.

Robustness Checks

The LOGIT analysis reported in Table 9 is suspected to suffer from potential bias.[11] Specifically, there are two issues involved: endogeneity and sample selection bias. First, there may be an endogeneity created by the omission of an important variable, which results in spurious conclusions. This is because one or more variables in the original LOGIT analysis may be affected by such an omission. The suggested variable is a proxy that controls the ability of VCs to be involved in the decision-making of portfolio companies. One possible variable is the percentage of VC ownership of the portfolio company *at* the time of the IPO. This variable can only be obtained through prospectuses, and it is not available through any database to which the University of New Orleans subscribes. Hence, the robustness check cannot use that specific variable. However, another variable was used to assess the control of VCs in their portfolio companies: seats reserved on the board of directors.

[11] I thank Dr. Sudha Krishnaswami and the participants in the dissertation workshop for pointing out this potential bias.

In the suggested robustness check, the LOGIT analysis will use the variable EXEC% that is measured by the division of the number of non-managing board members by the total number of board members. It is assumed that VCs do not participate in day-to-day operations and hence do not assume direct management positions, but they do control strategic decisions through reserving non-managing board seats. This proxy is expected to capture the power of VCs over their portfolio companies.

The second concern is the matching sample selection bias. It is suspected that some portfolio companies in the matching sample are not healthy, so it would be incorrect to benchmark these companies against the troubled companies. To correct for this bias, if it exists, the LOGIT analysis will use only the matching sample of companies that did not file for bankruptcy for four or more years after the year of delisting of the troubled portfolio companies. Four years seems a reasonable amount of time for two reasons. First, five years will bias the sample because the LOGIT analysis has to eliminate the year 2001 and all subsequent years.[12] If the year 2001 and subsequent years are eliminated from the LOGIT analysis, only about 37% of the original sample will be used, which will lead to sample bias. As discussed earlier, the largest percentage of delistings occurred in 2001. And second, three years of health is a short period of time. Therefore, the selection of four years after the delisting of the troubled portfolio company is believed to be the optimum number of years for the matching sample to prove to be healthy.

Table 9 repeats the LOGIT analysis as in Table 7 with the above two differences. Namely, it adds the EXEC% variable and finishes the delistings as of 2001. *None* of the companies delisted *after* 2001 was included in this LOGIT analysis. The results are very similar

[12] A follow-up has been conducted by ensuring that all of the companies included in the matching sample were not delisted because of bankruptcy/reorganization as of 12/31/2005.

Table 9

Robustness Check for LOGIT Analysis (as in Table 7)

	(1)		(2)		(3)		(4)	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
CONSTANT	-1.3750	0.0844	-1.2603	0.1191	-1.3855	0.0816	-1.3165	0.0986
RECENTMN	0.0097	0.8029	0.0006	0.9870				
RECENTMD					-0.0011	0.9817	-0.0115	0.8197
PCAVMN	-0.0017	0.3311						
PCMXMN			-0.0097	0.2083				
PCAVMD					-0.0016	0.3855		
PCMXMD							-0.0101	0.1207
AGE	0.0149	0.5285	0.0132	0.5768	0.0154	0.5153	0.0155	0.5114
DE	0.1861	0.1256	0.1934	0.1165	0.1838	0.1314	0.1945	0.1175
MB	0.0192	0.2320	0.0186	0.2447	0.0191	0.2348	0.0195	0.2229
IND	0.2683	0.5890	0.2698	0.5876	0.2784	0.5764	0.2960	0.5535
SALES	0.0014	0.0394	0.0013	0.0405	0.0014	0.0390	0.0014	0.0422
RNDS	0.5222	0.0442	0.5388	0.0400	0.5189	0.0450	0.5321	0.0402
EXEC%	0.0018	0.7893	0.0024	0.7206	0.0017	0.7974	0.0022	0.7372
Log Likelihood	-265.0557		-264.4118		-265.2914		-263.5814	

to that of Table 7. Again, the two main variables that are statistically significant are SALES and RNDS.

Another suspicion is related to the OLS analysis. The results of Table 8 may be biased if the DURATION is affected by unaccounted for (omitted) variables from the regression. These variables are related to exogenous factors that are not company- or VC-specific. To test for this bias, the sample period is divided into three different periods: from 1990 to 1993 (YR9093), from 1994 to 1996 (YR9496) and from 1997 to 2000 (YR9700). Therefore, two variables were added to the OLS regression and the analysis was repeated. YR9093 is a dummy variable that is equal to "one" if the company filed for an IPO during 1990, 1991, 1992 or 1993; otherwise it is equal to "zero." YR9497 is a dummy variable that is equal to "one" if the company filed for an IPO during 1994, 1995 or 1996; otherwise it is equal to "zero."

Table 10 shows the results of this robustness check. All of the hypotheses hold except for $H1_A$. The PER variable was expected to be positive, but it became insignificant in all four regressions except for PCAVMD. This result suggests that, when the dummy variables were grouped to distinguish between "hot" and "cold" IPO times, PER becomes insignificant. This may be due to the introduction of the supply and demand of funds, which is proxied by the market activity ("hot" vs. "cold"). In this case, the percentage of investment (high or low investment activity) is determined by the supply of funds to VCs.

Another difference in these checks is a change in significance of the control variables. SALES turned out to be significant in three of the four regressions, compared to being insignificant in the original test. Also, IND (dummy for industry) is now insignificant. This could be because the market activity ("hot" vs. "cold") proxies for the amount of high-tech companies introduced to the market during such periods, and so SALES becomes an important factor in

Table 10

Robustness Check for OLS Analysis (as in Table 8)

	(1)		(2)		(3)		(4)	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
CONSTANT	-1.9642	0.1557	-1.8931	0.1868	-2.9105	0.0325	0.2973	0.8269
LNRECMN	-1.0683	0.0000	-1.0816	0.0000				
LNRECMD					-1.4062	0.0000	-1.4152	0.0000
PCAVMN	-0.0022	0.1879						
PCMXMN			-0.0081	0.2575				
PCAVMD					-0.0033	0.0780		
PCMXMD							-0.0066	0.3058
LNAGE	2.0780	0.0000	2.0604	0.0000	2.3155	0.0000	2.3622	0.0000
DE	-0.0046	0.6661	-0.0016	0.8742	0.0000	0.9991	0.0013	0.9051
MB	0.0008	0.6093	0.0004	0.8196	0.0001	0.9297	0.0000	0.9769
IND	-0.5504	0.2159	-0.5470	0.2198	-0.6052	0.1774	-0.5409	0.2287
LNSALES	0.1366	0.0838	0.1260	0.1083	0.2315	0.0041	0.2209	0.0063
LNRNDS	0.0156	0.9702	0.0013	0.9976	0.0320	0.9385	0.0128	0.9756
YR9093	3.1940	0.0000	3.2172	0.0000	3.4737	0.0000	-2.2364	0.0000
YR9496	1.0111	0.0072	1.0439	0.0054	1.2816	0.0006	-3.5058	0.0000
Adjusted R-squared	0.6179		0.6167		0.6131		0.6078	
P-value	0.0000		0.0000		0.0000		0.0000	

determining the DURATION of portfolio companies. These changes in control variables did not affect the analysis of the hypotheses.

Conclusions

The venture capital industry has grown rapidly since the early 1980s when the "New Prudent Investor Rule" rule was issued. This rule allowed institutional investors to enter the venture capital industry. Since then, the industry has attracted many scholars and professionals. Although venture capital has undergone studies that have attempted to investigate and understand how it works, these did not cover all of its aspects. This study investigates the monitoring of portfolio companies by their venture capitalists and how the unique characteristics of the industry affect troubled VC-backed companies. The motivation of the paper is to investigate the effect of venture capitalists on VC-backed public troubled companies. The issues raised in this essay have not been tested previously; hence, this study will fill part of the gap in the literature.

The first section reveals that VC monitoring of portfolio companies has a positive effect on the success of those companies. Moreover, a low amount of sales is the main predictor of bankruptcy. This is consistent with previous research concluding that VC-backed companies generate more revenue than non-VC-backed companies. As expected, financial leverage is not a significant factor in predicting bankruptcy for VC-backed portfolio companies.

The second section researches the partial effect of VCs on extending the life of their portfolio companies, which means that VCs can only affect their portfolio companies for a limited amount of time. This effect depends on the reputation, experience and behavior of VCs. The results show that more experienced VCs and VCs whose portfolio companies have not gone public during the previous two years tend to extend the life of their bankrupt portfolio

companies. A higher level of monitoring does not have a significant effect on extending the life of a failed portfolio companies. The high-tech industry has a negative effect on the duration of life, while as expected, financial leverage is insignificant in affecting the life of bankrupt portfolio companies.

This study confirms that VCs continue to have an effect on the companies in which they have invested, even after they go public. In addition, the study specifies the key factors that affect the success of VC-backed companies and the effect on the life of bankrupt portfolio companies.

Chapter 4: U.S. Venture Capitalists and International Investments

Venture capitalists (VCs) always look for the best deal to maximize their profits. One way to find the best deals and thus maximize returns is to invest internationally as well as domestically. Previous research confirms the importance of the close proximity of portfolio companies to their venture capitalists. Contrary to previous research studies, the case of international investments highlights the fact that U.S.-based venture capitalists are thousands of miles away from their portfolio companies. This location expansion is expected to affect VCs' monitoring techniques as well as their characteristics. Experienced and larger VCs are hypothetically more likely to invest internationally than newer and smaller ones. In addition, VCs are more likely to syndicate their international investments, since that would minimize their risk. Finally, it is predicted that VCs would tighten their monitoring techniques, such as providing a greater number of funding rounds with a lower amount of capital per round, hence emphasizing the staging of financing. The study reveals that, currently, U.S. VCs syndicate with a lower number of VC firms and funds, which is negatively related to the likelihood of success. Moreover, the study reveals that U.S.-based VCs should intervene more in the activities of their international portfolio companies and should not delegate their duties to foreign VC funds.

"Ever since companies began to shift work overseas, outsourcing has been portrayed as a killer of good-paying U.S. jobs. But now executives are discovering how outsourcing can not only cut costs but also boost quality and even create new types of jobs at home."

Pete Engardio (2006)

Introduction

Recent professional literature has highlighted the recent move by venture capitalists toward investing internationally. Sheahan (2004) stated that VCs continue to make more international investments, investing $761 million into Business Process Outsourcing (BPO)[13] startups in the first half of 2004, up from $495 million during the same period in 2003. This chapter investigates the characteristics of domestic U.S. venture capital funds that invest in international portfolio companies and how the monitoring techniques of venture capitalists are affected by international investments.

Previous literature points to the importance in the investment of physical proximity between a venture capitalist and his/her portfolio company (Lerner, 1995). Close proximity (a few miles) to the portfolio company allows the VC to visit it more often and monitor it better. Extant literature does not describe how monitoring would change if the VC were U.S.-based and had an investee thousands of miles away. This study fills that gap and studies the impact of distance on other VC monitoring tools such as staging of finances and increasing the number of rounds of financing to offset the distance barrier. This study also investigates the characteristics of VCs that invest in portfolio companies with respect to factors like experience, industry and syndication.

[13] Also known as "offshoring" services (Sheahan, 2004).

Related Literature

A review of the literature comparing the U.S. VC industry to VC counterparts in other countries shows that VCs operate differently if they invest outside of their domestic market. The literature on monitoring the involvement by VCs of their portfolio companies based on geographic proximity is also reviewed.

Studies point to differences between U.S. and international venture capitalists that impact how they behave with their portfolio companies. For example, Wang, Wang and Lu (2002) found that VCs' equity stakeholding, board seats and IPO timing were all beneficial components that they brought to the portfolio companies. In a comparative study, they found that Singaporean VC participation in their portfolio companies was significant but still lagged behind the U.S.

Sapienza, Manigart and Vermeir (1996) compared VC governance in the U.S., the U.K., the Netherlands and France. Regression results revealed that VCs were driven by different factors in different markets, and that VCs in France were the least involved as well as the least likely to add value to portfolio companies.

The involvement of VCs in portfolio company management has also been widely documented. Gorman and Sahlman (1989) illustrated that VCs are members of the board of directors and typically have the power to fire senior management. Lerner (1995) found that the representation of venture capitalists increases around events such as CEO turnover, and that VCs try to minimize the cost of oversight by supervising local firms. Therefore, VCs are likely to have a director nearby, and proximity is an important factor in board membership.

As expected, poor performance among portfolio companies does not appear to result in greater monitoring than good performers receive (Sapienza, Manigart and Vermeir, 1996).

Consistent with Lerner (1995), VCs are likely to engage in a face-to-face oversight of their investments, especially in early stage ventures and in the presence of uncertainties (Sapienza, Manigart and Vermeir, 1996). Bygrave (1987 and 1988) showed that the level of uncertainty was directly correlated with co-investing[14] and information-sharing among venture capitalists, as the members of these networks typically share resources. Norton and Tenenbaum (1993) and Bygrave (1987 and 1988) demonstrated that VCs can control risk by specializing in a specific stage and industry, thus increasing their knowledge levels, and then gain access to network, information and deal flows from other VCs.

Engaging in international investments in a pioneer manner may cause VCs to experience fewer networking activities compared to domestic investments. The loss of the networking asset may discourage a VC from going international. Some studies, though, suggest that distance could be insignificant. Petersen and Rajan (2002) found that the distance between commercial banks and small business customers carried less magnitude as technological advancement improved. This trait may apply to the venture capital industry.

Predictable Hypotheses and Methodology

It is expected that the role in this case will be different for portfolio companies located only a few miles away from their VCs. The following hypotheses formulate the research questions of this essay.

Hypothesis 1: Seasoned venture capitalists will invest more internationally. Seasoned VCs (FMAGE) have accumulated the experience needed to take more risks and can better handle complex situations. Inexperienced VCs will be busy trying to accumulate knowledge and to develop networks to manage and monitor domestic portfolio companies.

[14] Co-investing refers to the sharing of investments among a group of VCs. Typically, there is a lead VC who invites the other VCs to participate in an investment.

$H1_0$: The experience of VC firms is unrelated to the likelihood of investing internationally.
$H1_A$: The experience of VC firms (FMAGE) is significant and positively related to the likelihood of investing internationally (INTL).

FMAGE will be used to proxy for the VC's experience. Lerner (1994) used this proxy to differentiate between seasoned and inexperienced VCs. The study expects that FMAGE is directly related to a VC's tendency to invest internationally (INTL). Experience can proxy for knowledge acquired by VCs, and it is expected that the more knowledge acquired, the better the ability to engage in riskier investments.

Hypothesis 2: Larger VC funds (FDINV) will have a greater tendency to invest internationally (INTL) because their portfolios are large enough to balance risks from both domestic and international investments.

$H2_0$: The size of the venture capital fund is unrelated to the probability of investing internationally.
$H2_A$: The larger the venture capital fund (FDINV), the higher the tendency to invest internationally (INTL) as well as domestically.

The size of a VC fund, measured as the fund's total investments (FDINV), is an important factor in deciding about investment in risky projects. Larger funds are willing to take more risks than smaller ones, because they have a larger number of portfolio companies in their funds. In other words, their investment portfolios are more diversified and can bear the added risk of international investments (INTL). It is expected that large VC funds will tend to invest more in international portfolio companies compared to smaller VC funds.

Hypothesis 3: Venture capitalists are expected to monitor their international portfolio companies more closely. Specifically, the amount invested in the international investee per round

(RNDS$) will be smaller than that for a domestic portfolio company, and the number of rounds (RNDS) will be higher for an international portfolio company than for a domestic one.

> $H3_0$: Techniques for monitoring international investments are the same as domestic techniques.
> $H3_A$: VCs will have a larger monitoring effect (more RNDS and less RNDS$) if it is an international portfolio company (INTL) rather than a domestic portfolio company.

The monitoring techniques used by VCs are the number of rounds (RNDS) and the average dollar value given to the portfolio company per round (RNDS$). In each round, it is expected that the portfolio company will update the VC about the status of the company. Since the international portfolio company is further away from the VC, they will require as many reports as possible. Monitoring can be tightened by increasing the number of rounds and by awarding less funding per round.Therefore, it is expected that an international portfolio company will have a positive relation with number of rounds (RNDS) and a negative one with the average dollar value per round (RNDS$).

Hypothesis 4: VCs are engaged in network interaction, thereby sharing resources. In addition, investing internationally means more risk. Therefore, VCs would try to syndicate their international investments among the network. In other words, they will try to divide that risk among more participants than they would in a domestic investment. Lerner (1994) showed that VCs tend to syndicate with one another in the first round of funding. This is because syndication is a device by which the established VC obtains information to decide whether or not to invest in risky firms.

> $H4_0$: There are no syndication differences between a VC's international investments and domestic investments.
> $H4_A$: A VC will syndicate (NOFM/NOFD) his/her international investments (INTL) more than his/her domestic investments.

There are two proxies used: the number of VC firms (NOFM) and the number of VC funds (NOFD). If investing internationally incurs more risk than domestic investment, and assuming that VCs are rational investors (i.e., risk-averse), then they will try to decrease their own risk. This syndication is also coupled with sharing opinions (certification of the quality of investments, or a second opinion) as discussed above (Lerner, 1994). Hence, syndication is expected to be more pronounced in international investments than in domestic investments. Therefore, syndication will have a positive relation with international investments. By sharing risk and obtaining external opinions from other VCs, the probability of SUCCESS is expected to be higher. Thus, syndication variables are expected to be positively related to the probability of success.

Hypothesis 5: One disadvantage of the monitoring techniques described above is the time lag between the portfolio company's actual occurrence of problems and its report to its VC. As location may be an obstacle to effective monitoring, VCs may try to find other methods to effectively monitor investments thousands of miles away. One such method is to collaborate with and delegate the monitoring to a foreign counterpart.

> $H5_0$: Delegation of monitoring (EXEC% and FOR%) is not a technique used by U.S. VCs to effectively monitor their foreign investments.
> $H5_A$: A U.S. VC will not monitor his/her international investments (INTL) him/herself, but will delegate (EXEC% and FOR%) it to a foreign VC counterpart.

Two things must occur to prove the delegation hypothesis. First, the percentage of non-managing directors as a portion of the total number of directors (EXEC%) will be smaller in the case of delegation because only the agent VC will sit on the board of directors. Second, the percentage of foreign VC funds to the total number of funds (FOR%) invested in the portfolio company must be higher in the case of delegation. As a result, it is expected that international

investments (INTL) would have a negative relation with the percentage of non-managing directors (EXEC%) and a positive one with the percentage of foreign VC funds (FOR%). The same predictions are expected in terms of the likelihood of success of the foreign investment.

In this essay, two logistic models are used (Appendix II summarizes the logistic models):

LOGIT analysis I

$$INTL = \alpha + \beta_1 \overset{+}{FMAGE} + \beta_2 COAGE + \beta_3 \overset{+}{RNDS} + \beta_4 \overset{-}{RNDS\$} + \beta_5 \overset{+}{NOFM / NOFD} + \beta_6 \overset{+}{FDINV} + \beta_7 IND + \beta_8 \overset{-}{EXEC\%} + \beta_9 \overset{+}{FOR\%} + \varepsilon$$

Where:

- INTL is a dummy variable equal to "one" if the portfolio company is an international portfolio company funded by a U.S. VC fund, and "zero" otherwise.
- FMAGE is the age of the venture capital firm, measured in years. This is a proxy for the experience of the VC.
- COAGE is the age of the portfolio company, measured in years. This is a proxy for the establishment/experience of the portfolio company.
- RNDS refers to the number of rounds the VC used to fund that portfolio company.
- RNDS$ is the average U.S. dollar amount in millions per round.
- FDINV is the average size of a VC fund's investment (in U.S.$ millions) that is invested in all portfolio company by that specific fund. This is a proxy for the fund size.
- IND is a dummy variable equal to "one" if the VC specializes in the high-tech industry and "zero" otherwise.
- EXEC% is the percentage of the non-managing members of the board of directors to the total number of the board of directors.

- FOR% is the percentage of foreign VC funds to the total number of VC funds that are invested in the portfolio company.
- ε is the random error term.

The first logistic model predicts the relationship between VC characteristics and monitoring techniques and the probability that VCs will fund international companies rather than domestic ones. The model estimates that there will be a positive relation between VC experience and international investment. Moreover, international investments will be characterized by more monitoring efforts by VCs than domestic counterparts. Since investing internationally is regarded as a riskier investment than investing domestically, there will be tendency for VCs to reduce risk. Hence, the model predicts that large VCs will be more willing to invest internationally and will try to syndicate their investments among other VCs.

LOGIT analysis II

$$SUCCESS = \alpha + \beta_1 \overset{+}{FMAGE} + \beta_2 COAGE + \beta_3 \overset{+}{RNDS} + \beta_4 \overset{-}{RNDS\$} + \beta_5 \overset{+}{NOFM} / NOFD +$$
$$\beta_6 \overset{+}{FDINV} + \beta_7 IND + \beta_8 \overset{-}{EXEC\%} + \beta_9 \overset{+}{FOR\%} + \varepsilon$$

- Where SUCCESS is a dummy variable equal to “one” if the company has gone public and “zero” otherwise.

The second logistic regression measures the relation between the probability of success of international investments, VC characteristics and the monitoring techniques used. This model utilizes a sub-sample that includes international portfolio companies only. The model simply shows the best practices that can be followed by VCs to enjoy a higher probability of success. In

the latter part of the paper, these two models will be compared in order to highlight the policy implications and possible changes to VC practices.

Data and Sample Selection

The data have been collected from the Securities Data Corporation's (SDC) VentureXpert. The VentureXpert database consists of segments that differentiate between firms, funds and portfolio companies' variables. This study utilizes the portfolio company segment of the SDC VentureXpert database. The sample collected is restricted to U.S.-based VC funds that invest in international portfolio companies (located in any country other than the U.S.). The sample consists of funds created from the period of 1/1/1990 to 12/31/2004. A matching sample was collected that has the same restrictions, except it includes VC funds that invest in U.S. portfolio companies instead of international ones.

The collected variables reveal the specific mechanisms used to monitor international investments. More specific data, such as accounting data about international portfolio companies, were difficult to obtain, since the SDC database does not include a complete set of accounting variables for the portfolio companies.

Another significant problem with the VentureXpert database is the discrepancy of the data reported for the same company. This is because the compiled data are based on voluntary submission by venture capitalists. To minimize this problem, companies that submitted conflicting data were eliminated.

The total sample collected, after eliminating the discrepancy data, consists of 18,372 companies. This number is divided into 4,307 international portfolio companies that are funded by one or more U.S.-based VC funds and 14,065 U.S. domestic companies that are funded by one or more U.S.-based VC funds.

Summary Statistics

Table 10 illustrates investment target countries and the frequency of investment by U.S.-based VC funds in terms of investment in portfolio companies. The preferred country for U.S.-based VCs is the United Kingdom, with a total of 821 portfolio companies, or 19.06% of the total number of international portfolio companies. This is because of the lack of a language barrier and the healthy economy in the UK, which is regarded as one of Europe's most imporatnt financial hub. The second most preferred country is Canada, with a total of 416 companies, or 9.66% of the total number of international portfolio companies. Other countries that are preferred by U.S. VC funds are France, South Korea, Germany, Israel, Australia, India, Japan, Sweden and China. Additional preferred countries are presented in Table 10. In addition, the table reveals that Latin America is not yet a preferred destination for VCs compared to other parts of the world. The first country to appear is Brazil, ranked 23rd with only 32 investments, equal to 0.74% of the total number of international portfolio companies.

Table 11

Preferred Countries for U.S.-Based VCs and the Number of Portfolio Companies per Country

Rank	Nation	Number of Portfolio Companies	Percentage of Total
1	United Kingdom	821	19.06%
2	Canada	416	9.66%
3	France	408	9.47%
4	South Korea	281	6.52%
5	Germany	268	6.22%
6	Israel	232	5.39%
7	Australia	224	5.20%
8	India	158	3.67%
9	Japan	138	3.20%
10	Sweden	138	3.20%
11	China	122	2.83%
12	Ireland	96	2.23%

Table 11 (Continued)

Rank	Nation	Number of Portfolio Companies	Percentage of Total
13	Netherlands	92	2.14%
14	Finland	79	1.83%
15	Switzerland	77	1.79%
16	Singapore	73	1.69%
17	Belgium	71	1.65%
18	Hong Kong	59	1.37%
19	Denmark	55	1.28%
20	Taiwan	53	1.23%
21	Italy	49	1.14%
22	Spain	43	1.00%
23	Brazil	32	0.74%
24	Norway	30	0.70%
25	Poland	29	0.67%
26	Austria	28	0.65%
27	New Zealand	24	0.56%
27	Argentina	21	0.49%
	Other	190	4.41%
	Total International	4307	100.00%
	United States	14065	
	TOTAL	18372	

Table 12 presents the summary statistics and shows the mean and median for the variables used in the empirical analysis. The table is divided into three parts: international companies, U.S.-based companies and the total sample. Moreover, the table shows the results of equality of means and equality of variances between the two independent samples. The two samples have unequal means except for the variable COAGE, and have unequal variances except for FMAGE. The average rate of success (SUCCESS), delisted as public company, for international investments is 13%, compared to 10.68% for domestic investments. These VCs that invest internationally could be motivated by their higher rates of success. The mean age of VC firms that invest internationally is slightly higher than of those that are domestic (19.89 vs. 19.11 years), as is the mean age of the international portfolio companies vis-à-vis domestic companies

(8.92 vs. 8.65 years). It may be that VC firms invest internationally to enhance their reputations. Older VCs are more capable of benefiting from a good reputation, leading to a washout in the age variable. On the other hand, portfolio firms have similar roles regardless of their country domination. A review of the summary statistics of the variables of monitoring techniques reveals significant differences. On the one hand, the number of funding rounds (RNDS) for international companies is fewer than for domestic companies (2.54 vs. 3.25 rounds). However, international portfolio companies receive more funding per round (RNDS$) than U.S. companies ($15.3 million vs. $10.94 million).

VC funds also seem to syndicate (NOFM/NOFD) domestic investments more than international ones. The number of firms and funds that participate in domestic investments (4.8 U.S. VC firms and 5.87 U.S. VC funds) is greater than participation in international investments (3.67 U.S. VC firms and 4.25 U.S. VC funds).

The summary statistics reveal, in contrast to expectations, that smaller U.S. VC firms invest internationally and that these investees undergo fewer funding rounds and more dollar funding per round, with a lower level of syndication than domestic investments. In addition, the percentage of companies that are high-tech as compared to total portfolio companies is much higher for domestic ones (50.35% vs. 42.79% for international investments).

As expected by the delegation hypotheses (EXEC% and FOR%), VCs that invest internationally do not reserve many seats on the board of directors of the investee, but instead delegate monitoring to a one or a few foreign VC funds. The percentage of foreign VC funds to total funds is much higher in the case of an international investment compared to a domestic one (48.86% vs. 4.42%). The percentage of non-managing directors compared to the total number of directors is 20.92% for international portfolio companies and 4.42% for domestic companies.

Table 12

Summary Statistics

	International Companies		U.S. Companies		Total Sample		Equality of Means		Equality of Variances	
	Mean	Median	Mean	Median	Mean	Median	t-test	P-Value	F-test	P-Value
SUCCESS	0.1303	0.0000	0.1068	0.0000	0.1123	0.0000	4.2692	0.0000	70.8066	0.0000
FMAGE	19.8387	19.0000	19.1132	18.8000	19.2833	19.0000	4.5170	0.0000	0.1316	0.7168
COAGE	8.9252	6.0000	8.6562	7.0000	8.7190	6.0000	1.4904	0.1361	19.3866	0.0000
RNDS	2.5410	2.0000	3.2515	3.0000	3.0849	2.0000	-17.7005	0.0000	259.8817	0.0000
RNDS$	15.3074	3.9000	10.9422	5.3550	11.9655	5.0000	5.2778	0.0000	122.1007	0.0000
NOFM	3.6678	3.0000	4.8162	4.0000	4.5470	3.0000	-18.7106	0.0000	648.1061	0.0000
NOFD	4.2547	3.0000	5.8672	4.0000	5.4892	4.0000	-19.7670	0.0000	709.9555	0.0000
FDINV	12.4315	10.4590	66.6960	6.3552	53.9747	7.1531	-9.8929	0.0000	377.5644	0.0000
IND	0.4279	0.0000	0.5038	1.0000	0.4860	0.0000	-8.7372	0.0000	294.1812	0.0000
EXEC%	20.9239	0.0000	29.8357	33.3333	27.7465	30.0000	161.3502	0.0000	-21.3755	0.0000
FOR%	46.8570	50.0000	4.4177	0.0000	14.3669	0.0000	147.0892	0.0000	5295.2696	0.0000

Empirical Results

This section interprets the results of the LOGIT analysis conducted to uncover the monitoring techniques and characteristics of venture capitalists. Table 13 uncovers the relation between investing internationally (INTL) and monitoring techniques used, such as the number of rounds (RNDS) and the average funding per round (RNDS$). In addition, in two regressions Table 13 also includes the variables that test the delegation hypothesis (EXEC% and FOR%). Moreover, Table 14 reveals the determinants of success rates (SUCCESS) among international portfolio companies (INTL).

Table 13 uses a LOGIT analysis to highlight the relation between the decision to invest internationally (by U.S. VC funds) and the monitoring techniques used, as well as VCs' characteristics. In this analysis the dependent variable is INTL, which is a dummy variable equal to "one" when the portfolio company is located in a country other than the U.S. and "zero" otherwise.

Results shown in column 1 suggest that the age of the VC firm proxied for experience (FMAGE), the number of funding rounds (RNDS), the number of VC firms (NOFM), the number of VC funds (NOFD), VC fund size (FDINV) and classification as high-tech (IND) are all statistically and economically significant.

AGE is positive and statistically significant. This proves the first hypothesis ($H1_A$) that the more experience the VC firm has, the higher the likelihood of investment in an international portfolio company. The age of the portfolio company is also positive. Although marginally statistically and economically significant, it suggests that VCs prefer to invest in more mature portfolio companies than in younger ones. This is expected because it is easier to monitor and control an older company than a younger one.

Both of the two variables of monitoring (RNDS and RNDS$) are statistically significant. The results of this analysis are not consistent with the third hypothesis ($H3_A$) of tightened monitoring techniques. Actually, the results suggest that VCs do not tighten their monitoring. Hence, the number of rounds is negatively related to the investment of an international portfolio company, contrary to the expectation of a positive relationship. Similarly, the average dollar amount per round (RNDS$) is positively related to the likelihood of investing internationally. Together, these results suggest that VCs are not using the staging of financing as a monitoring mechanism. Moreover, they are decreasing the number of rounds and increasing the average dollar amount per round for their international investments. The above results do not allow for many report submissions about the progress from the portfolio companies to their VCs. A complete view of the monitoring picture is highlighted in the interpretation of column 2 of this table.

The syndication proxy in this regression is the number of firms (NOFM). The fourth hypothesis suggests that VC funds prefer to syndicate their risky investments, as in this case. The empirical results show that the likelihood of less syndication is more pronounced in international investments. This is contrary to the testable hypothesis ($H4_A$). This may be because VCs are more likely to collaborate with foreign counterparts than domestic ones. In this case, it is difficult to keep a healthy network with international counterparts, given the distance barriers.

The size of funds proxied by the value of fund investments in US dollars (FDINV) is negatively related to the likelihood of investing internationally. Again, this is not consistent with the second hypothesis ($H2_A$), which predicted a positive relation. This result highlights the fact that smaller VC funds are more likely to invest internationally than larger ones. This is because smaller VC funds aim to establish themselves very quickly, so they accept more risky

investments (such as international investments) to achieve higher returns. This justification is consistent with the grandstanding hypothesis.

The last variable in column 1 is a control variable concerning the high-tech industry. IND is a dummy variable equal to "one" if the portfolio company produces a high-tech product. The relation appears negative and it is both statistically and economically significant. This shows that VCs are not likely to invest in high-tech international portfolio companies. One obvious reason is the difficulty of monitoring such companies compared to monitoring low-tech ones.

Column 2 in Table 13 repeats the same LOGIT regression, but adds two more variables that proxy for the delegation hypothesis ($H5_A$). This addition of the two variables increased the adjusted R-Square of the LOGIT from 0.06 in column 1 to 0.65 in column 2. The first variable EXEC% is the percentage of non-managing directors compared to the total number of directors in the portfolio company. This is a proxy for the involvement of the VC or his/her agent in the portfolio company. The higher the percentage of non-managing directors, the higher the involvement of the VC. This is based on the previous literature stating that VCs prefer to reserve one or more board seats. The other variable FOR% is the percentage of foreign (non-U.S.-based) VC funds to the total number of VC funds that invest in the portfolio company. This is a proxy of the level of dependency on foreign funds in monitoring the portfolio companies. Of course, the higher the percentage of foreign VC funds, the higher the involvement of foreign entities, and hence the delegation of a significant amount of monitoring to them.

The results show that EXEC% is negatively related to INTL, while FOR% is positively related. Both are statistically and economically significant. This means that in an international investment setting (INTL), VCs do not reserve many seats among the directors, which means that only one or very few VC funds are monitoring the portfolio company. Moreover, more

foreign VC funds are involved when U.S.-based VC funds invest in the international portfolio company. The combination of these two variables suggests that U.S.-based VC funds prefer to collaborate with a foreign VC counterpart and that the U.S.-based VC funds are not likely to sit on the board; instead, they delegate their monitoring responsibilities to their foreign partner(s).

In column 3, the LOGIT regression is similar to column 1, but replaces the syndication variable NOFM with NOFD. The main results are statistically and economically the same as column 1, except for the age of the portfolio company. The variable became marginally insignificant with a P-value of 0.1041. The new variable of the "number of funds" is significant and negative, which confirms the previous results.

Column 4 repeats the LOGIT analysis, as in column 2, but again is in column 3 replacing NOFM with NOFD. The results of this regression are very similar to the results shown in column 2. The variable number of funds is negative and significant. It became more economically significant than the results demonstrated in column 3.

Table 14 uses logistic analysis and researches the probability of the success of portfolio companies, taking into account VC monitoring techniques. The dependent variable SUCCESS is a dummy variable equal to "one" if the portfolio company has gone public, and "zero" otherwise. The independent variables used in this analysis are the same as those used in Table 13.

The analysis in column 1 reveals that all of the independent variables are statistically significant, except for the variable RNDS. The sample in this LOGIT regression includes international portfolio companies only. The results show that the age of the VC firms (FMAGE) is positive and statistically significant. This is expected since the older the firm, the more experience it has, and the more value added to the portfolio company. This result is also consistent with the previous literature. In addition, the age of portfolio companies (COAGE) is

Table 13

Logistic Regression I

	(1)		(2)		(3)		(4)	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
CONSTANT	-0.7342	0.0000	-2.0590	0.0000	-0.7607	0.0000	-2.1550	0.0000
FMAGE	0.0113	0.0000	0.0226	0.0000	0.0117	0.0000	0.0235	0.0000
COAGE	0.0029	0.0805	0.0079	0.0011	0.0027	0.1041	0.0076	0.0016
RNDS	-0.0904	0.0000	-0.0594	0.0007	-0.0716	0.0000	-0.0399	0.0271
RNDS$	0.0013	0.0004	0.0028	0.0000	0.0013	0.0003	0.0027	0.0000
NOFM	-0.0689	0.0000	-0.2020	0.0000				
NOFD					-0.0648	0.0000	-0.1624	0.0000
FDINV	-0.0018	0.0000	-0.0025	0.0003	-0.0018	0.0000	-0.0027	0.0003
IND	-0.2578	0.0000	-0.2709	0.0000	-0.2575	0.0000	-0.2841	0.0000
EXEC%			-0.0089	0.0000			-0.0089	0.0000
FOR%			0.0847	0.0000			0.0840	0.0000
Nagelkerke R Square	0.06		0.65		0.06		0.65	
Chi-square	713.75	0.00	10391.32	0.00	744.41	0.00	10386.84	0.00

statistically and economically significant, and it is positively related to the probability of success (SUCCESS). This result is intuitive, since the more mature portfolio companies are more established in their markets than their younger counterparts.

The number of rounds (RNDS) turned out to be insignificant in all four LOGIT regressions, while the average amount of dollars (RNDS$) was positive and statistically significant. This suggests that the more generous the VC funds are toward the portfolio companies (on average, per round), the higher the likelihood of success.

Syndication proxied by the two variables NOFM and NOFD is positively related to the probability of success (SUCCESS) of the portfolio companies. The fund size (FDINV) is negatively related to success and statistically significant. This shows that smaller VC funds are more successful than larger funds in investing internationally. This is consistent with the LOGIT regressions of Table 13, which showed that smaller VC funds are more likely to invest internationally than larger VC funds. The cause of this unpredictability needs more research, which is beyond the motivation of this manuscript. Confirming the results of Table 13, the status of the portfolio company as high-tech negatively relates to success. Moreover, it is statistically and economically significant. This contributes to the argument that high-tech companies are harder to control than companies in other industries with more tangible assets.

In column 2, the two variables EXEC% and FOREIGN% were added to the LOGIT analysis. The R-Square increased from 0.08 to 0.13. Although it increased, it did not increase significantly, as the previous set of regressions in Table 13 had. Both variables are statistically significant. EXEC% is positively related to the likelihood of success, while FOREIGN% negatively relates to the likelihood of the success of the portfolio companies. These results have very serious implications for venture capitalists. The LOGIT analysis suggests that VC funds

Table 14

Logistic Regression II

	(1)		(2)		(3)		(4)	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
CONSTANT	-2.4173	0.0000	-2.4340	0.0000	-2.3381	0.0000	-2.3813	0.0000
FMAGE	0.0184	0.0000	0.0153	0.0003	0.0176	0.0000	0.0147	0.0005
COAGE	0.0283	0.0000	0.0301	0.0000	0.0279	0.0000	0.0299	0.0000
RNDS	-0.0148	0.5988	-0.0273	0.3438	-0.0048	0.8704	-0.0228	0.4469
RNDS$	0.0024	0.0001	0.0020	0.0010	0.0025	0.0000	0.0021	0.0006
NOFM	0.0501	0.0091	0.0604	0.0018				
NOFD					0.0235	0.1421	0.0356	0.0288
FDINV	-0.0212	0.0000	-0.0128	0.0061	-0.0213	0.0000	-0.0127	0.0068
IND	-0.2843	0.0041	-0.2456	0.0150	-0.2820	0.0044	-0.2397	0.0174
EXEC%			0.0157	0.0000			0.0159	0.0000
FOR%			-0.0102	0.0000			-0.0099	0.0000
Nagelkerke R Square	0.08		0.13		0.08		0.12	
Chi-square	185.09	0.00	298.18	0.00	180.62	0.00	293.44	0.00

must increase their presence on the board of directors among the international portfolio companies and must decrease their reliance on a foreign VC counterpart. In other words, delegation ($H5_A$) decreases the likelihood of the success of the international portfolio companies.

Columns 3 and 4 repeat the LOGIT analysis of columns 1 and 2, respectively, but with the replacement of NOFM with the variable of NOFD. The results in the latter columns are very similar to columns 1 and 2 both statistically and economically.

Robustness Checks

A possible bias that might affect the results discussed above is the difference between countries. The fact that countries have different governance structures, rules and regulations may affect how VCs are investing internationally, especially in terms of delegation. To test for this bias, the above analysis is repeated with additional variables. The countries are divided into three different groups: GROUP1 includes countries from Latin America and Africa, GROUP2 includes India, China and countries from Eastern Europe and Southeast Asia and GROUP3 includes Japan, Hong Kong, Canada, Australia, and countries from Western Europe and other offshore investment hubs. The countries are categorized based on their openness to foreign investors and financial and legal development, with Group 1 being least open and Group 3 the most open.

Table 15 repeats the LOGIT regression I with two dummy variables: GROUP1 and GROUP2. The results show that all of the hypotheses hold as in Table 13, except for H3 and the control variable COAGE in some of the regressions. In the third hypothesis, RNDS is expected to be significant and positive. However, it turned out to be insignificant in the two of the four logistic regressions, when the variables that test for the delegation hypothesis are present. In other words, when there is delegation to a foreign counterpart, funding rounds are no longer used

Table 15

Robustness Checks for Logistic Regression I

	(1)		(2)		(3)		(4)	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
CONSTANT	-1.0593	0.0000	-2.5680	0.0000	-1.0747	0.0000	-2.6518	0.0000
FMAGE	0.0113	0.0000	0.0233	0.0000	0.0115	0.0000	0.0240	0.0000
COAGE	0.0000	0.9816	0.0050	0.0734	-0.0002	0.9015	0.0047	0.0884
RNDS	-0.0573	0.0000	-0.0305	0.1047	-0.0386	0.0013	-0.0084	0.6654
RNDS$	0.0012	0.0011	0.0027	0.0000	0.0013	0.0008	0.0027	0.0000
NOFM	-0.0507	0.0000	-0.1696	0.0000				
NOFD					-0.0515	0.0000	-0.1413	0.0000
FDINV	-0.0022	0.0000	-0.0022	0.0005	-0.0022	0.0000	-0.0023	0.0005
IND	-0.3541	0.0000	-0.3332	0.0000	-0.3512	0.0000	-0.3415	0.0000
EXEC%			-0.0090	0.0000			-0.0090	0.0000
FOR%			0.0870	0.0000			0.0866	0.0000
GROUP1	22.5336	0.9958	23.5709	0.9951	22.5256	0.9958	23.5670	0.9951
GROUP2	22.5056	0.9870	22.2428	0.9844	22.5011	0.9871	22.2684	0.9844
Nagelkerke R Square	0.2495		0.7281		0.2513		0.7285	
Chi-square	3313.16	0.0000	12076.18	0.0000	3339.14	0.0000	12086.01	0.0000

as a monitoring technique. This may be because of the inability of U.S.-based VCs to be involved in setting the times of reporting and funding, since the foreign counterpart has almost a complete control over the investee. This could happen in cultures that believe that foreigners (in this case, U.S. VCs) should not give orders to locals. On the other hand, when RNDS is statistically significant it shows a negative relation with INTL, which is the same result as in Table 13.

In addition, COAGE became insignificant in two regressions where the delegation hypothesis is not introduced. If there is no delegation and the U.S.-based VC acts individually, the portfolio company's age may not be important. This may happen in situations in which the investee has more certain and larger returns; therefore, U.S.-based VCs do not need a foreign VC counterpart.

Table 16 repeats the LOGIT regression II as in Table 14, with the two dummy variables GROUP1 and GROUP2. The results introduced are statistically very similar to the original tests, and they have the same signs. The GROUP2 (India, China, and countries from Eastern Europe and Southeast Asia) dummy is positive and significant at the 1% level in all regressions, suggesting that there is a positive likelihood of success in those countries compared to GROUP1 (countries from Latin America and Africa), which is insignificant. This result is intuitive, since GROUP2 is characterized by economic stability and openness to foreign investment compared to GROUP1, and VCs are expected to enjoy more success probabilities in open/stable economies than in strict ones.

Table 16

Robustness Checks for Logistic Regression II

	(1)		(2)		(3)		(4)	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
CONSTANT	-2.8790	0.0000	-2.9565	0.0000	-2.7672	0.0000	-2.8799	0.0000
FMAGE	0.0196	0.0000	0.0168	0.0001	0.0186	0.0000	0.0160	0.0002
COAGE	0.0285	0.0000	0.0307	0.0000	0.0281	0.0000	0.0304	0.0000
RNDS	0.0170	0.5450	0.0014	0.9598	0.0249	0.3912	0.0049	0.8687
RNDS$	0.0024	0.0001	0.0021	0.0009	0.0025	0.0000	0.0022	0.0005
NOFM	0.0748	0.0001	0.0800	0.0000				
NOFD					0.0408	0.0108	0.0490	0.0029
FDINV	-0.0211	0.0000	-0.0121	0.0111	-0.0210	0.0000	-0.0118	0.0131
IND	-0.3624	0.0003	-0.3081	0.0027	-0.3562	0.0004	-0.2996	0.0035
EXEC%			0.0170	0.0000			0.0172	0.0000
FOR%			-0.0094	0.0000			-0.0090	0.0000
GROUP1	0.2022	0.5514	-0.1275	0.7139	0.1838	0.5871	-0.1365	0.6938
GROUP2	1.1049	0.0000	1.1465	0.0000	1.0794	0.0000	1.1276	0.0000
Nagelkerke R Square	0.1193		0.1662		0.1161		0.1633	
Chi-square	283.84	0.0000	400.57	0.0000	275.79	0.0000	393.24	0.0000

Conclusions

Venture capitalists have constantly been looking for new deals, which has motivated them to invest internationally. This study has investigated international investments by U.S.-based venture capital firms.

Previous literature highlights the importance of VCs' geographic proximity to their portfolio companies. However, international investment has not been covered by existing research. Therefore, this essay fills a gap in the literature by uncovering the different monitoring techniques and characteristics of U.S.-based VCs in terms of their international portfolio companies and by evaluating the factors affecting the success rates of these international portfolio companies.

More experienced VCs are more likely to invest in international investments. Moreover, more established and non-high-tech international portfolio companies are preferred by VCs. In addition, smaller VC funds are more likely to invest internationally. This result is not consistent with the predictable hypothesis; however, it can be seen as a new application for the grandstanding hypothesis.

VCs do not tighten their monitoring techniques for their international portfolio companies. On the contrary, VCs require a smaller number of rounds and, on average, they provide more funding per round to their international investments. This result can be explained by the delegation hypothesis. In this case, U.S.-based VCs delegate monitoring to one or more VC counterpart(s). This foreign VC is assumed to be familiar with the environment of the portfolio company, sits as a non-managing director and helps the portfolio company management when they encounter difficulties. Contrary to what was predicted about syndication, the number of syndicates (both firms and funds) is likely to decrease in the case of international investments.

The second part of the paper uses the sub-sample of the international portfolio companies to determine the factors that affect the likelihood of success. The empirical analysis suggests that there is a positive likelihood of success when the VC firm is more experienced and the portfolio company is older and non-high-tech. Moreover, the non-tightening of monitoring techniques, as shown by the smaller number of rounds and more average funding per round, is positively related to the likelihood of success. VCs already use all of the above factors. On the other hand, VCs do not currently use the following two results that are explained by the syndication and the delegation hypotheses. First, increasing the number of syndicates (both VC firms and VC funds) positively relates to the likelihood of success, which is opposite to the strategy they are currently adopting. Also, VCs must decrease their dependency on delegation and increase their actual presence because the delegation hypothesis negatively relates to the likelihood of success.

Chapter 5: Conclusions

The venture capital industry is expected to grow both domestically and internationally because of its significant correlation with innovation. This dissertation examines the methods of the participants in this industry and, building on the previous literature, details key findings about the effects of a variety of factors on the health of both domestically and internationally controlled portfolio companies.

This study has generated a number of key findings about the effects of a variety of factors on the health of portfolio companies, and specifically examines the role of venture capitalists in troubled portfolio companies *post*-IPO. The results of various tests have proven that the number of funding rounds (a proxy for monitoring techniques) is a significant factor in differentiating between healthy and troubled companies. Specifically, it is shown that the more monitoring and attention given to portfolio companies by their VCs, the higher the probability of the companies being healthy. This finding is robust even after considering the ability/propensity of VCs to share in the management of the portfolio company, and even after using a stricter definition of success for the matching sample of healthy portfolio companies.Test results also show that VC experience and reputation, incentives provided by VCs, industry and sales volume are important factors in determining the duration of the life of VC-backed troubled companies.

This study has also proven that financial leverage is not a significant factor in predicting the bankruptcy of VC-backed, public, troubled portfolio companies. This result is inconsistent with general bankruptcy literature; however, it is consistent with the hypothetical predictions in the paper. Also, consistent monitoring and increased VC involvement can differentiate a healthy

VC-backed company from a troubled VC-backed company – which is consistent with the previous literature concerning the benefits of venture capitalists. Finally, the experience, reputation and investment incentives of VCs are all significant factors in extending the life of a troubled VC-backed company, but insignificant in differentiating a healthy company from a troubled one.

This chapter also draws new conclusions about the role of U.S.-based VCs in their international investments. This chapter reveals how VCs interact with their companies when the distance is more than just a few miles. In the case of international investments, VCs have to travel thousands of miles to monitor and be closely involved with their companies. This research demonstrates that U.S.-based VCs tend to syndicate with fewer firms and funds and also to include a foreign counterpart(s). VCs who invest internationally are likely to be more experienced than those who invest domestically, and they tend to invest in older portfolio companies and delegate the monitoring and involvement duties to foreign counterparts. This chapter proves that VCs should syndicate their international investments with a larger number of VC firms and funds. Also, they should reserve more board seats than they do now and use fewer foreign counterparts.

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Appendix I: Summary of the Predictable Hypotheses for Chapter 3

Set 1: (Logit)

$$Success = \alpha + \beta_1 \overset{+}{PER} + \beta_2 \overset{+}{RNDS} + \beta_3 \overset{-/+}{RECENT} + \beta_4 \overset{+}{AGE} + \beta_5 \overset{Insig}{DE} + \beta_6 MB + \beta_7 IND + \beta_8 SALES + \varepsilon$$

Set 2: (OLS)

$$DURATION = \alpha + \beta_1 \overset{+}{PER} + \beta_2 \overset{Insig}{LNRNDS} + \beta_3 \overset{-/+}{LNRECENT} + \beta_4 \overset{+}{LNAGE} + \beta_5 \overset{Insig}{DE} + \beta_6 MB + \beta_7 IND + \beta_8 LNSALES + \varepsilon$$

Where;

- SUCCESS is a dummy variable equals to one if the portfolio company did not file for bankruptcy and zero otherwise.
- DURATION is the number of years of life of bankrupt portfolio companies. It is calculated as the year of delisting minus the year of IPO.
- PER is the percentage of the fund that is invested in the portfolio company. One of the problems of this ratio is that each portfolio company is funded by a variety of VC funds. Some companies are funded by 30 funds. In addition, this variable is new to venture capital literature. Several measurements were used as a proxy in order to achieve the most accurate result: (a) PCAV of fund j, equals total estimated amount of fund j's investment in company i divided by fund j's average company investment. In order to get around the problem of consolidating the effect of many funds into one ratio, the mean and median were calculated. PCAVMN equals the mean of the ratio of PCAV that relates to company i, which had funds j through k. Similarly, PCAVMD equals the median of the ratio PCAV that relates to company i, which had funds j through k. (b) PCMX of fund j, equals total estimated amount of fund j's investment in company i divided by funds j's maximum company investment. PCMXMN equals the mean of the ratio of PCMX that relates to company i, which had funds j through k and, PCMXMD equals the median of the ratio PCMX that relates to company i, which had funds j through k.
- RNDS is the average number of rounds that the venture capitalists invested in the portfolio company.
- RECENT refers to the number of recent successes or failures of venture capital fund j within the last 2 years (excluding the year of delisting). The number of recent success is measured by the number of IPOS the VC was a part of. Again, many funds invest in one company, while "Recent" is a ratio that is specific for each fund. To overcome this problem, the same technique is used here. RECMN is the mean of "Recent" of fund j through k that invest in company i, and RECMD is the median of "Recent" of fund j through k that invest in company i.
- AGE refers to the average age of the venture capital firms that invest in company i. This is used as a proxy for the level of experience of VCs. Age is calculated as the number of years between the firms' inceptions until the delisted year of the portfolio company.
- DE is the portfolio company's ratio of debt to equity.
- MB is the portfolio company's ratio of market-to-book.
- IND is a dummy variable equals to one if the company is a hi-tech and zero otherwise.

- SALE is the portfolio company's sales.
- LNRNDS is Ln of the RNDS variable.
- LNRECENT is Ln of the RECENT variable. LNRECMN and LNRECMD variables follow the same application.
- LNAGE is ln of the AGE variable.
- LNSALES is the ln of Sales variable.
- ε is the random error term.

Set 1

Success or Fail Determinants and Full Effect of Venture Capitalists

Independent Variable	(Dependent Variable is SUCCESS) Predictable Sign	Sources of Variables	Hypothesis Reference
PER	+	VentureXpert	H1
RNDS	+	VentureXpert	H5
RECENT	-/+	VentureXpert	H2
AGE	+	VentureXpert	H3
DE	Insignificant	COMPUSTAT	H4
MB	Unknown	COMPUSTAT	Control Variable
SALES	+	COMPUSTAT	Control Variable
EXEC%	Unknown	VentureXpert	Control Variable
IND	Unknown	VentureXpert	Control Variable

Set 2

Life in Years for Bankrupt Portfolio Companies and Partial Effect of Venture Capitalists.

Independent Variable	(Dependent Variable is DURATION) Predictable Sign	Sources of Variables	Hypothesis Reference
PER	+	VentureXpert	H1S
LNRNDS	Insignificant	VentureXpert	H5S
LNRECENT	-/+	VentureXpert	H2S
LNAGE	+	VentureXpert	H3S
DE	Insignificant	COMPUSTAT	H4S
MB	Unknown	COMPUSTAT	Control Variable
LNSALES	+	COMPUSTAT	Control Variable
IND	Unknown	VentureXpert	Control Variable

Appendix II: Summary of the Predictable Hypotheses for Chapter 4

Set 1: LOGIT Analysis I

$$INTL = \alpha + \beta_1 \overset{+}{FMAGE} + \beta_2 COAGE + \beta_3 \overset{+}{RNDS} + \beta_4 \overset{-}{RNDS\$} + \beta_5 NOFM \overset{+}{/} NOFD + \beta_6 \overset{+}{FDINV} + \beta_7 IND + \beta_8 \overset{-}{EXEC\%} + \beta_9 \overset{+}{FOR\%} + \varepsilon$$

Set 2: LOGIT Analysis II (Best Practices)

$$SUCCESS = \alpha + \beta_1 \overset{+}{FMAGE} + \beta_2 COAGE + \beta_3 \overset{+}{RNDS} + \beta_4 \overset{-}{RNDS\$} + \beta_5 NOFM \overset{+}{/} NOFD + \beta_6 \overset{+}{FDINV} + \beta_7 IND + \beta_8 \overset{-}{EXEC\%} + \beta_9 \overset{+}{FOR\%} + \varepsilon$$

Where;

- INTL is a dummy variable equals to one if the portfolio company is an international portfolio company funded by a U.S. fund, and zero otherwise.
- SUCCESS is a dummy variable equals to one if the company went public and zero otherwise.
- FMAGE is the age of the venture capital firm, measured in years. This is a proxy for the experience of the VC.
- COAGE is the age of the portfolio company, measured in years. This is a proxy for the establishment/experience of the portfolio company.
- RNDS refers to the number of rounds the VC used to fund that portfolio company.
- RNDS$ is the average dollar amount in millions per round.
- FDINV is the average size of fund's investment in millions that is invested in all portfolio company. This is a proxy for the fund size.
- IND is a dummy variable equals to one if the VC is specialized in the hi-tech industry and zero otherwise.
- EXEC% is the percentage of the non-managing members of the board of directors to the total number to the board of directors.
- FOR% is the percentage of foreign VC funds to the total number of VC funds that invested in the portfolio company.
- ε is the random error term.

Set 1

LOGIT Analysis I

Independent Variable	(Dependent Variable is INTL) Predictable sign	Sources of Variables	Hypothesis Reference
FMAGE	+	VentureXpert	H1
FDINV	+	VentureXpert	H2
RNDS	+	VentureXpert	H3
RNDS$	-	VentureXpert	H3
SYND	+	VentureXpert	H4
EXEC%	-	VentureXpert	H5
FOR%	+	VentureXpert	H5
IND	Unknown	VentureXpert	Control Variable
COAGE	Unknown	VentureXpert	Control Variable

Vita

Khaled Abdou was born in Cairo in 1975. After he graduated from high school, he attended Helwan University in Cairo to study Business Administration and Commerce, specializing in accounting. Upon graduation, he worked as a financial analyst for El Iman Company for Brokerage and Dealings in Securities, Cairo. Khaled then passed the Uniform CPA Examination and joined Misr International Bank. He then joined Deloitte to work as a senior auditor and financial consultant.

In 2001, Khaled moved to the United States and gained his Master of Business Administration at Eastern Illinois University in 2001. He then worked as an independent financial and accounting consultant and a Chief Financial Officer in Champaign/Urbana, IL. He joined the Ph.D. program at the University of New Orleans in 2002 to enhance his Financial Economics knowledge.