

Venture capital deal selection in Australia

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Venture Capital Deal Selection in Australia

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2009

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ORIGINALITY STATEMENT

I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person, or substantial proportions of material which have been accepted for the award of any other degree or diploma at UNSW or any other educational institution, except where due acknowledgement is made in the thesis. Any contribution made to the research by others, with whom I have worked at UNSW or elsewhere, is explicitly acknowledged in the thesis. I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.

Signed

Timothy Edward Peters

Date

Abstract

All venture capital investments exhibit some form of asymmetric information. The seminal paper on the structure of venture investments, Kaplan and Stromberg (2004), investigates how venture capitalists use deal construction to control agency conflicts within funded deals and their associated internal, external and execution risks. Another key strand of the academic literature has reviewed the contractual arrangements venture capital firms reach, the process of venture capital selection and determinants of their success from a post-investment perspective (Fried and Hisrich (1994), Manigart, Vermeir and Sapienza (1996), Gompers and Lerner (2004), Wright and Robbie (1998)). This thesis also explores venture capital investment, albeit from a pre-investment standpoint. In contrast to Kaplan and Stromberg's (2004) demonstration of the use of venture capital mechanisms to control agency issues, this research addresses how agency issues influence the final selection of potential investments by venture capitalists.

Kaplan and Stromberg (2004) use post-funding metrics to capture risks, which influence post-contract design. From a pre-funding perspective, internal, external and execution risks are subjective, rare and difficult to measure. Nevertheless, this thesis uses pre-funding proxies to replicate these risks, some of which have direct empirical academic support. Information for sixty-two deals, thirty-four funded and twenty-eight unfunded, was hand collected through a combination of surveys, interviews and consultation with five of Australia's leading venture capital firms, and individuals from the Australian Private Equity and Venture Capital Association (AVCAL) board and executive.

The key results indicate that once past initial screening stages, investment proposals that have a higher likelihood of receiving venture investment are those that had prior government investment, and/or, where the entrepreneur has proposed the investment be through milestone tranches and where revenue is already being generated (for early stage ventures). The results suggest that venture capitalists tend to allocate capital to investments perceived as 'safer' with respect to agency conflicts. More specifically, venture capitalists are more reliant on signals of quality and lower risk, such as government grants, restriction of capital outlay and prior revenue generation – all of which reduce associated levels of internal and execution risk in new ventures.

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Timothy Peters

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CHAPTER 1: Introduction

Research on venture capital investments has typically focused on a *post-investment* analysis of the investee firms, in most cases after the initial investment, and quite often after the deal has been exited. The few studies¹ that have examined the actual construction of venture capital contracts each focus on the investment structures of deals that receive investment, rather than the reasons why particular deals receive funding. This is not surprising as data on unfunded deals is very difficult to obtain, particularly in any meaningful scale.

1.1 Contribution to Academic Literature

It is commonly accepted that traditional risk based return expectations alone do not provide reasons as to why a venture capitalist would or would not invest in a deal. Kaplan and Stromberg (2004) state the fundamental risks to venture capitalists can be filtered into three main categories of potential risk, these being: internal factors, external factors and factors related to difficulty of execution/implementation.

While these issues have been reviewed from a post-investment perspective, the omission of a pre-investment analysis has exposed an important gap in the literature. Studies such as Kaplan and Stromberg (2004) have generally focused on agency issues after the initial investment decision has taken place. Kaplan and Stromberg (2004) assume that a venture capitalist attempts to control these risks, through the contractual arrangement they reach with the entrepreneur. The argument being, that where conflict arises, contracts are designed such that the asymmetric information is controlled within the deal.

Addressing the same issue of asymmetric information, this thesis examines the deal selection process and specifically targets which features are important to achieve funding as well as those factors that may potentially block a deal. Insight as to how venture capitalists think and consequently

¹ Fried and Hisrich (1994), Gompers (1995), Manigart, Vermeir and Sapienza (1996), Wright and Robbie (1998), Gompers and Lerner (2004), Kaplan and Stromberg (2004).

act, may be gained by undertaking a similar approach, by assessing deal selection through how an entrepreneur's investment proposal offsets potential asymmetric information.

The objective of this thesis is to extend the design of Kaplan and Stromberg (2004), and apply it to organisations at a stage when they are seeking capital, as opposed to those that have already gained capital. This is achieved by identifying variables that proxy the asymmetric risks identified by Kaplan and Stromberg (2004) and testing their influence on deal selection. This approach involves developing a model to help determine how venture capitalists choose to allocate capital, and not necessarily, the risks and screens they claim to use. Macmillan, Siegel and Narasimha (1985) conducted a survey of venture capitalists to obtain deal metrics that venture capitalists perceive to be important within deal selection. Unlike this thesis, this does not relate deal metrics back to which deals are selected.

1.2 Methods of Research

Publicly available data on venture capital transactions is limited and as such, most research has tended to utilise information from venture investments that exit via initial public offerings (IPOs).² Information on deals that exit through trade sales or those only screened by venture capitalists is difficult to obtain. Venture capitalists, therefore, must be approached directly to obtain information relating to the status of firms prior to investment. Further, a venture capitalist has no obligation to keep records of companies that they reject. Therefore, academic research opportunities are restricted because of the venture capitalists' desire to protect their information, which is often commercially sensitive.

The research undertaken for this thesis was assisted through the author's employment at the Australian Private Equity and Venture Capital Association (AVCAL), which was central to establishing contacts within the domestic venture industry. This significantly boosted the level of access to venture

² Ivanov, Masulis, Krishnan and Singh (2009)

capitalists, and subsequently, to previously unavailable and otherwise inaccessible data.

Data was hand collected through a combination of surveys, interviews and in consultation with five of Australia's leading venture capital firms. These venture capitalists control a combined funds under management that exceeds \$500 million, representing over twenty-five percent of the total funds under management in the Australian venture industry.^{3,4} The venture firms invest in those industries where Australian venture firms tend to dominate, including life sciences, information technology (IT) and Cleantech.

The venture capital organisations were surveyed about a range of internal, external and execution risks. The survey was constructed to capture appropriate proxies for risks similar to those identified by Kaplan and Stromberg (2004). The responses were derived from information that was available to the venture capitalist at the time of investment, both for deals that were funded and for those that were not.⁵

1.3 Overview of Results

Multivariate probit regressions were used to identify which of the selected variables were significant to the venture capital decision-making process. Notably, three significant variables, prior government investment, the use of milestone settings and revenue generation in early commercialisation ventures, all played positive roles in attracting investment from venture capitalists.

Government investment within Australia is often competitively sought, but allows for early stage entities to access significant levels of capital. This is crucial, especially given the low levels of venture and angel finance available in Australia. The findings of this thesis indicate that prior government investment acts as a strong positive signal for venture investors. However, it

³ Approximately A\$2-3 billion.

⁴ Due to confidentiality agreements these venture capitalists cannot be identified.

⁵ A copy of the survey is in Appendix B

is important to note that the ability of government to assess the viability of venture propositions was not analysed.

This thesis also tested whether or not two generic strategies which control or enhance the outlay of capital, milestone settings and later investment opportunities, are attractive propositions to venture capitalists. The results indicate that the option to allow additional investment at a later stage is not a significant variable in attracting capital. This would suggest that the risks present in venture investing are significant enough that the potential of further investment does not significantly increase the attraction of an investment. This finding is at odds with the rest of the investment world. Typically a great deal of value is placed on 'real' or 'free options' throughout traditional investment theory.

In contrast, milestone settings were found to be economically and statistically significant in attracting capital. This would suggest that venture capitalists prefer to reduce the outflow of capital, rather than increase prospective upside returns.

Revenue generation at early stages of the business cycle were found to increase the chances of receiving venture investment. The implied logic is that revenue offers the prospect of reduced execution and external risk as the firm is demonstrating a degree of acceptance by the market.

Assessing the model's accuracy through Receiver Operating Characteristic (ROC) curves provided a graphical comparison of the sensitivity and the specificity of the binary classification model applied to the data. Essentially, it allowed an assessment of the degree to which the model accurately classified a deal as funded or unfunded. The final model was able to correctly classify deals at 82.4 percent and 64.3 percent for funded and unfunded deals, respectively. In all models, there was a consistent bias to incorrectly reject a deal rather than incorrectly accept a deal.

1.4 Thesis Outline

The remainder of the thesis is set out as follows. Chapter 2 clarifies the definition of venture capital, discuss issues relevant to deal selection and provides some background on the Australian venture industry. Chapter 3 provides a review of the academic literature with a focus on deal contracts and design, leading to the identified gap of pre-investment deal classification in literature. Chapter 4 develops a set of hypotheses that will be tested in the thesis, and introduces the variables to be used as proxies for the different aspects of risk, highlighted by Kaplan and Stromberg (2004). Chapter 5 contains an overview of the methodology and assumptions employed for this research. Chapter 6 outlines a description of the data and the results of the empirical analysis. Chapter 7 provides a discussion of the key findings. Finally, Chapter 8 provides a summary of the analysis and relates it in the context of the Australian venture industry. Additionally, it outlines potential areas for further research.

CHAPTER 2: Defining Venture Capital, Issues and the Australian Environment

This chapter will clarify the definition of venture capital, discuss the rationale behind information asymmetry within venture deals and provide a background to the Australian venture capital industry.

2.1 Defining Venture Capital

Venture capital investment is remarkably different to that of investment in established organisations. Deals are commonly in areas at the cutting edge of technology, including for example, a new idea, a product, a method, or a service that has not been established firmly within the commercial cycle.

Venture capital exists to fund new ideas that cannot normally be financed through traditional means, such as a business loan or raising capital through listed equity. Venture capital is commonly seen as addressing a market gap; the level of risk is so high and unknown, that normal capital allocation does not attract sufficient funds to these high-technological oriented businesses. Key difficulties exist due to the fact that returns are not likely to be realised for at least three to eight years after investment, and a high degree of skill is required to adequately assess, value, and assist in bringing a complicated product or service to the market.

The concepts of private equity and venture capital are commonly confused with one another. In its most generic use, the term 'private equity' encompasses investing in enterprises that are unlisted before investment or those that will become private entities after completing a purchase from a public stock market⁶. This term captures early stage seed investment of approximately fifty thousand dollars through to highly publicised multi-billion dollar managerial buyouts.⁷

⁶ Commonly referred to as a public to private deal

⁷ AVCAL defines private equity to "include organisations devoted to venture capital, leveraged buyouts, consolidations, mezzanine and distressed debt investments, and a variety of hybrids such as venture leasing and venture factoring."

Private equity within global markets is strictly concerned with the larger spectrum of deals⁸. The term in this sense is limited to transactions known as leveraged buyouts (LBO) and managerial buyouts (MBO). However, while it is more common to refer to private equity in its 'media' context of LBO/MBOs, by definition, it encompasses the whole private sector of markets and generically, can be considered to be final equity investment of a corporation, where the final ownership structure does not involve any listed equity.

Venture capital in Australia (and as treated in this thesis) therefore, falls into a subset of private equity – equity investment in the earlier stages of traditionally high-technological investment. While the size of investment between venture and private equity investments can differ, the core distinction lies in the use and purpose of the capital at the time of investment.

In most cases buyout associated investments utilise capital primarily for restructuring a corporation or taking over an entity the market has undervalued. Private equity investment is driven by the valuation of an investment within established companies. MBOs and LBOs differ as to whether existing management or an external third party controls the entity after the purchase. It may be possible to replicate the concept of this thesis under a private equity model, yet the general use, approach and results would and should be vastly different given the rationale and style of buyout investments. Given that buyouts operate in established businesses, there is a greater degree of available information to the potential purchaser, and hence, much lower potential for asymmetric information.

Venture capitalists commonly target companies that cannot source capital or loans through other means due to their high level of risk. A key distinguishing feature of the asset class is that venture investments often require an injection of capital to continue to exist.

⁸ Generally deals that are above \$10 million, but often exceeding \$100 million

The Australian Private Equity and Venture Capital Association (AVCAL) defines venture capital as:

“independently managed, dedicated pools of capital that focus on equity or equity-linked investments in privately held, high-growth companies. Within venture investments, the cash utilised is necessary for the expansion of the company. Issues commonly associated within the industry include information asymmetry, high risk, heavy handholding and the long-term nature of the investments.”⁹

Wright and Robbie (1998, p.1) identify venture capital as the,

“investment by professional investors of long-term, unquoted, risk equity finance in new firms where the primary reward is an eventual capital gain, supplemented by dividend yield.”

A subtle unclear line exists between that of venture capital and growth-stage¹⁰ private equity. The most evident distinction is that of the industries of investment. A venture capitalist will typically invest in high tech industries, such as biotechnology, information technology and life sciences. Growth private equity is investment in more traditional industries, such as manufacturing, services and transportation.¹¹

Recent market events¹² have seen the buyout model tested. As such, there has been a tendency for buyout firms to use increasing levels of equity in their investments and move away being dependent on the use of leverage within deals. This continues to blur the industry as both extremes of the market are increasingly using similar pure equity strategies, particularly middle-market private equity in comparison to venture capital investment.

⁹ <http://www.avcal.com.au/html/resource/glossary.aspx>

¹⁰ Early stage private equity, as in small investment and enterprise value investment, is commonly referred to as growth private equity

¹¹ Even with this definition, the line between venture and growth private equity can be extremely blurred, even within the same manager. The managers used within this thesis were all clearly venture capitalists, given their investments to date have all been in information technology or life sciences.

¹² Post ‘credit-crisis’ July 2007

Financing risky high-technological equity ventures has received little attention in the literature when compared to other areas of private investment, such as managerial buyouts or larger mergers and acquisitions financing. Information is incredibly difficult to access given the inherently covert and discrete nature of the industry, and of the firms within the associated transactions.

2.2 Venture Capital Issues

2.2.1 Investment Selection

It is important to note that the success of a venture capitalist is not only dependent on their management and financial skills to aid a company, but also their ability to select a successful investment. The average Australian venture capitalist reviews hundreds of business plans in a year, of which only a small number are reviewed in any significant detail. A smaller fraction of those selected ever receive venture funding.

An important question that arises is how venture capitalists select deals, given that each investment is many years away from profitability and several years away from potential realisation of capital invested. Venture capitalists often state that the most important part of the deal selection process involves being comfortable with the 'people' behind the deal. This criterion usually requires the entrepreneur to be passionate or dedicated to their venture.

Venture capitalists spend a considerable amount of time carrying out due diligence on a range of factors around a business proposal. The academic literature also provides some guidance on the procedures that venture capitalists go through in approaching a deal.¹³ This thesis proposes that a limited set of factors are required to explain the decision process of whether or not to fund a deal.

Kaplan and Stromberg (2004) argue that contractual methods offset internal, external and execution agency issues within a constructed venture deal. A common assumption is that offsetting agency issues is part of deal negotiation

¹³ MacMillan, Siegel and SubbaNarasimha, 1985 and 1987, Hall and Hofer, 1989; Sapienza and Timmons, 1989

and not part of deal selection. It is proposed by this thesis that these same conflicts can act as either positive or negative signals, before a final investment proposal even reaches a negotiation phase, and therefore they are critical to deal selection.

2.2.2 Information Asymmetry

Information asymmetry varies in all venture deals, as the entrepreneur will always have more information than the venture capitalist regarding their particular entity. To overcome adverse selection of a deal, a venture capitalist will analyse multiple characteristics to reduce the level of information asymmetry. The characteristics commonly under scrutiny can range from the credibility of the company's history to levels of work intensity by staff in the past and future. Initiatives need to be such that the entrepreneur has a desire to maximise their level of work intensity.

2.2.3 High Risk, Venture Capital Beta and Valuation

As discussed above, venture investments have different financial characteristics to the more traditional routes of investing, particularly into publicly available debt and equity. Traditional methods of applying valuation techniques are important to the venture capital process. Investments in other asset classes have a history and a market that allows some guidance in the use of traditional valuation methods. The use of methods such as discounted cash flows (DCF) or pricing based upon multiples is commonly accepted for listed assets. However, within the venture world, these techniques are used, albeit primarily to gain an approximate valuation of the entity.

Venture capitalists will utilise these methods to set a valuation price of the total entity and define a 'ballpark estimate' figure for investment. From a venture capitalist's perspective, valuation or price is not a finite reason for, or against investment. If a venture capitalist makes an investment decision based on the valuation of the company, they might account for the high level of risk, but fail to account for the associated asymmetric agency problems an early stage investment often encounters.

Extremely High Level of Unknown Risk

The earlier the investment the more uncertainty that exists within the project and the less accurate cash flow forecasts become. Clearly, with the long uncertain timeframe of venture capital investments, this reduces the reliance on methods such as the Capital Asset Pricing Model (CAPM) or Discounted Cash Flows (DCF) as investment protocols, thus reducing them to mere guidelines for investment. Assessing the value associated for a venture investment is an educated guess at best. The earlier the investment takes place in the life cycle, the larger the variability in the potential value becomes. A single venture capital investment has little or no correlation to the market. They have a high level of risk that may attract internal rates of return exceeding fifty percent. Generally, within the Australian market, these high levels of risk have not been rewarded by high levels of returns.

Does venture capital investment have beta to the market?

While venture markets have low correlation to traditional markets, the use of CAPM requires there to be a connection to market pricing. Some level of market correlation is possible through the availability of capital to raise a fund and capital obtainable for deal exits. Essentially, beta is very low and may be clearly argued on a deal-specific basis. Key points being:

- o *The ability to raise capital?* – The closest ties to the market occur during the fund-raising process where the venture capitalist engages the market to raise capital for a fund. Capital is easier to access during bull markets, while capital is generally difficult to raise in a bear market. Assuming a venture firm has raised a fund; they will have capital they need to deploy, usually within a time-frame of three to five years. Hence, the restrictive ability to raise capital in a market downturn does not directly translate to a beta for a market pricing mechanism.
- o *Are Initial Public Offerings (IPOs) a direct link to listed markets?* – While a significant proportion of venture capital deals are exited through IPOs, the venture capitalist has significant control over when this will occur, if at all. The ability to control the

timing of exits and the method of exit reduces the impact that the public markets can have on the venture industry.

Valuation

Valuation is limited and provides an approximate value to the venture capitalist. Some venture capitalists have stated that valuations act as a ranking, selectively choosing how much of the fund should be spent on a specific project. The valuation placed on a corporation does not represent an accurate portrayal of enterprise value. For this thesis, venture capitalists are assumed to have undertaken a preliminary screening of the proposals for the purpose of valuation. Academic research supports this, as Fried and Hisrich (1994) state that general investment size is one of the first things a venture capitalist will observe.

Valuation is generally carried out in extensive market studies that will only occur for the relatively small number of firms that progress to a significant due diligence stage.¹⁴ The paper also suggests that financial history is more important to later stage ventures, reflecting the fact that the numbers are more applicable. Valuation of investments is an important part of the venture capital cycle.

To investigate how venture capitalists value companies, Dittmann, Maug and Kemper (2004) analyse the valuation methods used through questionnaires of fifty-three German venture capitalists. It was found that most venture capital firms claim to use discounted cash flows but also provide evidence that those that clearly subject themselves to the discipline imposed by this approach have a significantly lower incidence of failed investments. The study found that the use of additional valuation methods: lowered the failure rate of fund returns; was positively correlated to increased scrutiny of deals and was related to an assessment of time value required with an entrepreneur. It is important to note that Dittmann et al. (2004) use information that is collected at the venture firm level, not on a deal basis.

¹⁴ As stated above, 10 percent or lower.

2.2.4 Agency Issues in Venture Deals

The agency dilemma is central to every investment that is considered. Venture capital investments give rise to a high level of asymmetric information that occurs between the entrepreneur and the venture capitalist. This is simply the nature of the industry. Various mechanisms are typically utilised to better align the interests of both parties. Many of these mechanisms are standard practice. Common examples include, the requirement of a board seat, a minority stake holding in the firm¹⁵ and anti-dilution clauses. Given they are common in most if not all venture deals, the use of these techniques cannot form part of deal selection. They are a minimum requirement that must be offered to even approach a venture capitalist.¹⁶

The core source of agency conflicts is that both parties will always attempt to act in their own best interests. In early stage high-technological investment, the investee is at a distinct informational advantage to the venture capitalist. As future outcomes are highly unpredictable, it is the venture capitalist's role to align the interests of both the entrepreneur and the fund when investing in a project.

There is an intense amount of work undertaken to perform due diligence on a deal. This can often range from three to twenty-four months, from initial approach to capital being invested. After a deal has been entered, further attention is required as most investments will need continuous monitoring over a long time before an actual return can be realized. A venture capitalist will value their time in the same manner as their capital input.

Given the large volume of work required leading up to and even after a deal is funded, venture capitalists need to be assured that the structure of the proposal is to their liking. Due diligence can include a thorough check of the

¹⁵ To retain the entrepreneurs' economic interest in the entity, it is desirable to have the entrepreneur be a majority shareholder.

¹⁶ The degree to which final clauses differ may vary. e.g., if external risks are high, anti-dilution clauses may be more important. However, this is a protection of the venture capitalist's investment and as such is likely to be altered at the negotiation phase of proceedings.

business, the people associated with it, the science, the industry, analysis of the proposition potential and the financial position of the company. After the initial due diligence is completed, it is still vital that the deal structure is such that the interests of the venture capitalist are aligned with that of the entrepreneur.

Asymmetric information relates to historical facts of a corporation, as well as aligning the future interest of the entrepreneur with that of the potential investor.

- o *Past Context* – From a historical context, the venture capitalist needs to be reassured that the entrepreneur has made significant effort in the past. This may be evidenced by the fact that others (investors, government, other venture firms etc.) have backed the project, thus reducing the level of information asymmetry, as independent third parties have verified the organisation.
- o *Future Interest* – The venture capitalist faces the problem of securing the interest of the entrepreneur in the future, commonly referred to as the hold-up problem. A significant proportion of the value associated with venture deals involves the intellectual property of the founders of the company. The deal needs to ensure that the effort and interests of the entrepreneur are fully committed and aligned to the future of the company in order for it to be successful.

Other aspects of the deal concern the venture capitalist's time and money. From a valuation perspective, how funds are spent and how they are utilised in the future is central to a deal's success or failure. Often, options such as the venture capitalist having an opportunity to invest at an advantage compared to later incoming investors can provide further incentive for the investment. Other clauses in the deal can include anti-dilution control, which effectively fixes the venture capitalist's percentage ownership of the investment.

Additionally, milestone payments can allow the control of the cash issued at the original investment. Further metrics can be utilised to give a venture firm additional control of their investment. Analysing these from a deal decision perspective will demonstrate whether a venture capitalist prefers one metric to another, or if the propositions of these strategies are relevant to the actual decision to invest. At the same time, the venture capitalist values the time and commitment that is necessary to support a venture being successful. A range of factors contribute to this including: the estimated length of investment, the potential methods of exit and the existing experience of personnel within the company.

Essentially, in the reverse, this provides an insight as to how entrepreneurs manage the agency conflicts. Given that these issues separate the successful deals from the deals that essentially fail at the 'final stage', they give an insight into aspects that must be satisfied in order to receive investment. It is proposed that from a pre-investment perspective issues might exist that cannot be offset by a contractual arrangement and therefore will be viewed by the venture capitalist as rejected for investment.

2.3 The Australian Venture Capital Industry

At present, the Australian venture sector does not provide a notable economic stimulus to the domestic economy. The Australian Venture Capital Review¹⁷ in December 2005 highlighted the significant underdevelopment and lack of scale of the Australian industry.

The Australian venture capital industry has had mixed success. It has not reached critical mass, whereby it is self-sustaining, with abundant capital and scope to consistently create "blockbuster deals" and risk-adjusted returns. In the absence of such funds, the industry has performed relatively poorly in a global context, and in comparison to the domestic buyout industry. The federal government has undertaken several methods to assist the industry,

¹⁷ As carried out by the Australian Federal Government, leaning on work carried out by Watson, Brian and Lerner, Josh, The Public Venture Capital Challenge: The Australian Case(June 30, 2007). Available at SSRN: <http://ssrn.com/abstract=1027445>

directly to venture funds as well as direct assistance to underlying portfolio firms, both before and during venture investment.

2.3.1 Australian Venture Capital in the Global Context

The expansion of the Australian venture capital industry has been slower than growth experienced overseas. Lerner and Watson (2007) identify that there was a boom in venture capital in the United States during the 1980s and 1990s, which saw the level of venture funds under management increase from US\$1 billion to US\$125 billion.¹⁸ While not as concentrated as the United States, Europe has become a substantial venture market growing throughout 1998 to 2007 with over €117 billion raised by European venture funds.¹⁹

The Australian venture capital industry has experienced a much more moderate pace of growth. According to the Australian Bureau of Statistics (ABS), as at 30 June 2008, approximately A\$3 billion was accumulated in earlier stage funds. Australian venture capital is heavily reliant on the local investment and superannuation industry, which provides over eighty percent of funds to Australian venture capital.²⁰

Investment by venture capitalists into high-technological entities has fluctuated and trended downward since the end of the 'tech bubble' in 2000. As seen in Figure 1A of Appendix A, the broader early stage industry has been in decline over the past several years.²¹

As of June 30 2007, the early stage sector had A\$766 million invested in companies. In 2007, venture capital investment raised A\$398.1 million during a period when the market was focused on the buyout end of private equity.

¹⁸ As at 2007.

¹⁹ 1998-2006: EVCA/Thomson Financial/ PricewaterhouseCoopers; 2007: PEREP Analytics on behalf of EVCA

²⁰ Australian Bureau of Statistics 2007, 2007-08 Venture Capital and Later Stage Private Equity Australia, cat. No. 5678.0, Canberra.

²¹ Note, some of these figures do incorporate early stage private equity investment, which is not strictly speaking venture capital, and as such is likely to overstate the size of the industry.

The effects of the global financial crisis saw this fall sharply to \$174.3 million through 2008.¹⁷

Australian venture capital remains a relatively small sector of the national economy, particularly in a global context. In other regions of the world, predominantly the United States, venture capital provides a major stimulus to the economy. Even when taking into account a ratio on level of Gross Domestic Product (GDP), venture capital in the United States had eight times more fund raising and 13.6 times more investment than venture activity in Australia²². If the population of the two nations is used as a ratio metric, the United States exceeds Australia by 8.5 times in terms of venture fund raising and 14.3 times by level of venture investment.²²

2.3.2 Australian Venture Capital Performance

Within the Australian market, there are vast discrepancies in returns to the buyout and venture industry sectors. Top quartile results in the domestic venture industry have struggled, returning only 3.3 percent per annum over fund lifetime. Further, a significant downside exists as the lower quartile returns are -14.8 percent.²³ For an industry with a high level of risk, the returns have not matched expected risk. During the same period (1985-2008), the entire Australian All Ordinaries Index returned 7.4 percent.

Australian private equity likewise has seen a significant variation between its upper and lower quartiles. However, the upper returns on private equity investment have exceeded 14 percent while lower ends have lost only 2.5 percent. As with many alternative investments, vast discrepancies in success and profits in both venture and buyout firms suggests that a large inefficient market exists. Due to the private nature of funds, there is very little evidence available concerning how different funds analyse and differentiate their investments. There are several reasons for this lack of information, as discussed below.

²² Australian Private Equity and Venture Capital Association (AVCAL), from January 2006 to March 2008, www.avcal.com.au, November 2008

²³ Figure 2A of Appendix A, returns on funds formed between 1985 and 2007, through to June 2008

The broader private equity industry lacks data when compared to other sectors of the financial industry. The industry is not regulated to an extent that requires detailed information to be accessible, whether for industry bodies, personnel within the industry or academic research. Fundamentally, the belief exists that due to the confidential nature of the industry, disclosure of information is not necessary, and information about transactions is kept secret in order to remain successful.

The emergence of leveraged buyouts into mainstream finance, particularly through media exposure, has led to governments and the public to require greater access to information on how funds operate. Consequently, an increasing amount of academic research has examined the buyout industry. (e.g. Berger and Udell, 2005; Kaplan and Schoar, 2005; Gompers and Lerner, 2000)

Venture capital has not received as much attention, and consequently it has slowly emerged as an area of study for mainstream financial research. Venture studies have tended to examine issues for which data is publicly available. For example, global and Australian studies have looked at the impact of venture capital after deals have been exited. Commonly this information is accessed through exchanges, where exits have taken place through Initial Public Offerings (Brav and Gompers (1997) and da Silva Rosa, Velayuthen and Walter (2003)), where, due to the nature of the exit strategy, information is readily accessible.

2.3.3 Size Relative to the Economy

The difference in the returns and the opportunities available in venture capital and private equity provide an explanation for the levels of growth in each of the sectors. Australian private equity (buyouts), while still relatively immature in a global context, have grown far faster than the venture sector.

Buyout funds raised between 2003 and 2007 represented 2.43 percent of Australian nominal GDP and 1.76 percent of the market capitalisation of the Australian Securities Exchange (ASX). Leveraged at even moderate levels,

these funds have the ability to have a significant and important impact on the Australian financial sector and overall economy.

2.3.4 Limited Partner Investment

Limited Partners provide the capital to create the venture industry. It is vital to understand their views on the industry to be aware of how capital will be allocated to the sector in the future. Within Australia, pension funds are the primary source of funding for domestic private equity and venture capital funds.

However, a significant difference exists between the overall level of investment between Australian superannuation (pension) funds, which are around one to two percent of underlying capital under management, and that of the United States, which is much higher, approximately five to ten percent invested in the broader private equity spectrum. The legal and institutional structures between Australia and the United States are very similar; yet the attitude of both investors and the returns to the market are markedly different.

A 2007 report by Collier Capital, surveying thirty-five Limited Partners globally, indicated the past performance of Australian venture investment has been poor. Only twenty percent of current Limited Partners investing in the sector had achieved net returns above sixteen percent since they began investing in Australian venture capital.

Limited Partners investing in the Australian buyout and North American venture markets have fared better. Of the Limited Partners surveyed, fifty percent of those investing in Australian buyouts had received net returns exceeding sixteen percent per annum. For those investing in the North American venture market, returns were forty-seven percent since commencing their investment programs.²⁴

²⁴ Global Private Equity Barometer: Australia Snapshot; Collier Capital December 2007.

No doubt, returns have had a large impact on the ability of Australian venture firms to attract capital. While the A\$1+ trillion Australian superannuation industry provides over fifty percent of funding to Australian venture firms, as at June 2005, less than 0.1 percent of superannuation funds under management was invested in Australian 'early stage' venture capital.²⁵ The domestic asset class has not distinguished itself from Australian private equity and international venture investment opportunities.

2.3.5 Future Funding Aspirations

Funding to the venture capital sector in Australia is unlikely to change in the short term given the past poor performance. A survey published in 2008, of Australian superannuation funds indicated that Australian venture capital is seen as the least attractive private equity segment for investment within the next two to five years. The twelve choices in order of preference were: distressed investments, American venture capital, secondary positions, Asian buyout, American buyout, Emerging markets, Asian venture capital, European venture capital, Socially Responsible Investing (SRI) buyout, Australian buyout and Australian venture capital.²⁶

2.3.6 Lack of Australian Venture Performance

As stated by Cumming, Fleming and Suchard (2005), Australia's legal environment is similar to other common law countries such as the United States and United Kingdom. However, given the relatively late start of the Australian venture capital industry, Australian tax laws are seen as a major barrier, potentially leading to lower levels of investment. Capital gains tax on pension funds are seven and a half percent and tax is withheld by the Australian Taxation Office (ATO) if the investor is a non-resident.²⁷

Alternatively, in the United States and Europe, taxable gains are directly passed through to the taxable investors leading to the aggregate burden of

²⁵ Australian Bureau of Statistics 2007, 2006-07 Venture Capital and Later Stage Private Equity Australia, cat. No. 5678.0, Canberra.

²⁶ Study of Australian Superannuation Fund Attitudes to Private Equity Investing; UNSW & Adveq, Professor John Evans, May 2008. The survey covered approximately 20-25% of FUM of the Australian Superannuation Industry

²⁷ This changed in June 2008, dropping from 15% to 7.5%

the fund being zero. The unfavourable taxation and the overall lack of funding support to the sector have consistently been major reasons cited by Australian venture capitalists for lack of success in the local industry²⁸. The ability of the market to achieve substantial returns has significantly hindered the sector, particularly during the bull run of the Australian listed market.²⁹ Successful venture capitalists have only been able to point to their individual successes, not the historical returns to the market as a whole.

2.3.7 Underperforming Relative to Australian Buyout

There is a remarkable difference between the rates of return to venture investments in Australia in comparison to the United States. In Australia as of June 30, 2008 the horizon internal rate of return (IRR) for a ten-year period of venture investments was -1.4 percent.³⁰ In comparison, the rate for the United States was 16.6 percent across all venture investments.³¹ In the United States, the earlier the stage of investment, the higher the returns generated. Early or seed venture investment, presumably with much more risk, returned an average of 32.9 percent. Investment at later stages of investment with less risk had declining levels of returns with balanced venture at 14.4 percent and later stage venture at 8.5 percent.

In the Australian industry, the best comparison available of this is that venture investment returns are far below those of buyout returns. The implication is that the investment return does not offset the excess risk involved. Many have stated that the Australian venture industry is yet to reach a 'critical mass', where it is large enough to support itself^{32 33 34}.

²⁸ Submission to the Review of Business Taxation, Australian Venture Capital Association and Deloitte Touche Tohmatsu, 1999

²⁹ In comparison, the Australian All Ordinaries Index, returned 16.6% per annum, from 1 January 2003 to 31 December 2007

³⁰ AVCAL Thomson Financial Yearbook 2008.

³¹ NVCA Thomson Venture Capital Performance: Q2 2008.

³² <http://www.tvp.com.au/blog/index.html> Allan Aaron, Technology Venture Partners, Director, AVCAL Board Member, September 2007.

³³ http://www.biotechnews.com.au/article/141242/super_way_invest_biotech A Super Way to Invest in Biotech, Australian Life Scientist, October 2005.

³⁴ http://parlinfo.aph.gov.au/parlInfo/genpdf/chamber/hansardr/2002-12-04/0105/hansard_frag.pdf;fileType%3Dapplication%2Fpdf

House of Representatives: Taxation Laws Amendment (Venture Capital) Bill 2002 Second Reading Speech, Wednesday, 4 December 2002.

This is a view backed by the Australian Federal Government, which has directly addressed this issue through the Innovation Investment Fund (IIF) program, established in 1998.³⁵ The IIF program provides capital assistance from the government aimed at supporting the development of new venture capital managers within the industry.

Several self-sustaining managers have grown out of the IIF program. However, in the ten-year period preceding the introduction of the IIF program the funds averaged a return of only -1.4 percent as of June 30, 2008. This lags well behind the returns of the wider private equity market, which were 9.3 percent over the same period.³⁶ The original IIF managers have continued to grow and raise further funds, but the objective of creating a critical mass of venture funds to reflect US venture returns has not materialised.

2.3.8 Tax Treatment of Venture Capital in Australia

Australia has two tax flow-through schemes available for investors in venture capital. However, they have both been unsuccessful in achieving their intended outcomes. The first scheme implemented in 2002, the Venture Capital Limited Partnerships (VCLP) scheme, has attracted over thirty-five separate funds. However, this is only available to foreign investors and, in some cases, can extend to investments into later stage buyout funds.

In 2007, in order to attract domestic investment into the sector, the Australian Government introduced the Early Stage Venture Capital Limited Partnerships (ESVCLP) scheme. While this is available to domestic investors, the uptake in the industry has been very poor, with only one firm applying for a partnership. Hence, even though Australia has a vehicle, which entitles investors to “flow-through income tax treatment and a complete tax exemption for income, both revenue and capital, received by its partners whether

³⁵ [http://www.ausindustry.gov.au/VentureCapital/InnovationInvestmentFundIIF/Pages/InnovationInvestmentFund\(IIF\).aspx](http://www.ausindustry.gov.au/VentureCapital/InnovationInvestmentFundIIF/Pages/InnovationInvestmentFund(IIF).aspx)

³⁶ Thomson Financial & Australian Venture Capital Association Limited Survey, Fiscal Year Ended June 30, 2008.

resident or non-resident,”³⁷ the restrictions in place on the investments have limited the uptake by the industry, effectively limiting availability of the tax exemption.

While an apparent tax-free structure exists for both foreign and domestic investors, there are specific issues that have led to resistance within the industry towards using the ESVCLP structure. Notably, there is a major clause, which forces divestment when an entity exceeds \$250 million and multiple restrictions, which restrict a venture capitalist from taking an investment company offshore. ESVCLP forces funds participating in the scheme automatically to divest any asset when it reaches \$250 million in value.

If investments move overseas and are no longer considered an Australian enterprise, an Australian venture capitalist must create another fund vehicle to continue investment. This is complex, costly and a disincentive to investors to use ESVCLP. It creates valuation difficulties, with investors at different stages and can trigger taxation events. Due to these difficulties, only one ESVCLP structure has been registered to date.³⁸

The lack of a suitable tax structure may explain the slow growth of the industry and the flow-on effects to poor performance. Lack of sufficient financing can lead to the best entrepreneurs making slow progress toward commercialisation, if their product is ever commercialised at all. Within the broader private equity industry, the percentage of drawdown increases with later stages of investment. As seen in Table 1A of Appendix A, earlier stage investments as of June 2007 have access to only 23.8 percent of unused commitments, while expansion and later stages have 35.4 percent and 42.2 percent of unused commitments, respectively.

Prospects of fundraising improved during 2007, but with the onset of the global financial crisis, the access to capital has significantly reduced

³⁷ AusIndustry Website, <http://www.ausindustry.gov.au/index.cfm>. April 2008.

³⁸ AVCAL Submission to the Review of the National Innovation System, April 2008.

throughout 2008 and 2009. Recent figures from 2008, suggest that early stage investment has improved to about 40 percent of commitment.³⁹ The lack of fund raising since June 2008 will likely lead to a decline in capital being able to be called down.

2.3.9 Government Funding

With the recent reduction in Government grants available to early stage enterprises, Australian venture capitalists will find it increasingly difficult to raise funds, particularly from overseas institutions. The recent cancellation of the Australian Federal Government grant program, '*Commercial Ready*', which provided nearly \$200 million a year to Australian early stage investments, is a huge disadvantage to the industry. The direct effect will be lower returns to investors, which is likely to result in less money flowing into the broader sector of venture early stage investment. This will potentially offset the advantageous change that was recently introduced reducing the managed funds taxation rate, which was implemented to increase fund flows, particularly from overseas.⁴⁰

In most circumstances, confining the final product/service to the Australian market is not enough to achieve a substantial return. Most successful venture investments have to relocate offshore, or at the very least consider how to approach the international market as part of an expansion plan. Australia's geographical distance from the main global markets puts many new ventures at an immediate disadvantage. Not only are the potential customers located offshore, but also the potential buyers of the company are often located overseas. This is an additional cost in terms of money and time to the venture capitalist. Many Australian venture capitalists' used programs such as *Commercial Ready* as a drawcard for international investors. Capital supplied through government grants enabled international investors to reduce effectively their risk exposure in a less mature Australian industry.

³⁹ Australian Bureau of Statistics 2007, 2006-07 Venture Capital and Later Stage Private Equity Australia, cat. No. 5678.0, Canberra.

⁴⁰ Assistant Treasurer: Chris Bowen's website <http://www.chrisbowen.net/pages/allNews.do?newsId=1044>

2.3.10 Australian Venture Capital Underperformance

As stated above, there are several reasons that have contributed to the relative underperformance of the Australian venture capital industry in comparison to other markets. Essentially, the fundamental driver of success in other markets, most notably the US, and a key element lacking in Australia, is a quantifiable 'track-record' of performance and experience built from as early as the 1960s and 1970s. The Australian industry only began to grow from the late 1980s.

While the exits achieved by firms have shown a considerable return, the lack of any volume of exits and the continued timeline of those exits is significantly low. A survey of twenty-six venture firms identified only twenty-two companies that were exited completely by a positive cash exit. The average of these exits resulted in an internal rate of return (IRR) of 40.5 percent and a cash multiple of 4.3⁴¹. The returns are promising to the individual company, but given these same funds invested in upwards of two hundred investments post 2000, this represents only ten percent of deals. To compete on a global scale in attracting funds, significant returns need to be achieved. Australian venture managers, like other alternative⁴² managers must exceed or at the very least match the returns of US venture capitalists to attract the attention of international limited partners.

⁴¹ Australian Venture Capital Exits, AVCAL Conference Presentation, October 2008, Dr Mike Hirshorn

⁴² Taken to be any form of unlisted investment, i.e. Private Equity, Hedge Funds, Infrastructure, Unlisted Property, Timber, etc.

CHAPTER 3: Review of the Literature

The objective of this chapter is to provide a general overview of the venture capital literature. The chapter highlights a gap in the academic literature, in that prior studies primarily focus on a post-investment analysis in preference to that of pre-investment.

3.1 Venture Field Review

A major review of the venture literature undertaken by Barry (1994) identified a range of important issues related to the venture capital industry. Central to Barry's (1994) review was how market imperfections remain problematic and how increasing competition reduces returns from super-normal levels towards that of a standard market return. The underlying observation was the suggestion of the maturation and stabilisation of venture capital markets in the United States, particularly in comparison to that of the rest of the world. The Barry review focuses on the operation of the supply side of the market, and the behaviour of venture firms that supply capital.

Many studies examine the success of venture capital input after they have exited the enterprise. They examine, for example, how venture capitalists impact a deal and whether they add value. The research focuses on the post-effects of the venture firm on the entity that receives investment, observing the success the venture capitalist has in creating a sustainable company once sold. Studies have focused on analysing these aspects of the venture capital sector because information is readily available to academics.⁴³

Ivanov, Masulis, Krishnan and Singh (2009) analyse the long-run performance of venture investments, post-IPO. Ivanov et al (2009) suggest that highly respected venture capitalists select better quality firms and have a positive association with long-term performance due to their skill in nurturing the

⁴³ Additional studies include; the impact of the venture capitalist on firm success (Sapienza and Timmons, 1989); the discrimination criteria used to evaluate potential deals (MacMillan et al., 1985); the factors that split successful (post-investment) deals against those that are unsuccessful (MacMillan, Zemmann and SubbaNarasimha, 1987); the thought process of venture capitalists (Hall and Hofer, 1989); the structure and governance of venture capital organizations (Sahlman, 1990) and; the incentives of networking (Bygrave, 1987, 1988).

ventures. This is driven by venture capital reputation, not just venture capital backing.

However, this thesis suggests that *finding* the next highly successful venture backed deal such as “Google”, “Pharmaxis” or “Hitwise”⁴⁴ is based on a combination of chance and skill. However, it requires that a manager consistently invests in deals that have lower levels of asymmetric information. Skill comes through the assistance of the venture capitalist to bring the idea to market.⁴⁵

3.2 Literature Gap

The literature has examined how venture firms operate (Fried and Hisrich, 1994; Manigart et al. 2002), how they control for agency issues within selected deals (Kaplan and Stromberg, 2004), and the long-term performance of companies receiving venture investment (Gompers, 1995; Gompers and Lerner, 2004; Wright and Robbie, 1998). A venture capitalist invests in the credibility and potential of the opportunity presented to them, and has to identify these investments out of thousands of potential proposals. A substantial gap exists within the academic literature assessing how and why particular investments are chosen, independent of their later success or failure.

This thesis addresses the notion that an established venture capital industry invests based on a consistent underlying rationale of controlling agency risks as investment potential arises. Particular signals to the venture capitalist must exhibit a high level of influence on selection. Research previously undertaken on agency conflicts, addresses this issue post investment (Kaplan and Stromberg, 2003 and 2004). The intention of this thesis is to examine similar conflicts at a different point in the investment timeline, namely pre-investment.

⁴⁴ Pharmaxis (<http://www.pharmaxis.com.au>) and Hitwise (<http://www.hitwise.com.au>) are stated to be two of the most successful Australian venture capital exits in life sciences and information technology.

⁴⁵ Many entrepreneurs will approach several venture capitalists. In the small Australian industry, many of the successful deals are found in several venture portfolios.

Three key papers are critical to the formation of this thesis, each addresses investment selection and contractual issues, but fails to test the reliance of the two concepts together. Macmillan et al. (1985) survey venture capitalists to determine what they perceive to be the most important criteria for deal selection. Vinig and de Haan (2005) analyse the screening process utilised by venture capitalists. Kaplan and Stromberg (2004) investigate investment deals, assessing which contractual controls are utilised in different scenarios of a select group of funded deals.

These studies have analysed what venture capitalists look at when assessing deals (Macmillan et al., 1985), the venture capitalist's view on the process they employ when screening deals (Vinig and de Haan, 2005) and how deals have been contracted *after* an investment decision has taken place (Kaplan and Stromberg 2004).

Macmillan et al. (1985) state that five of the top ten most important criteria are linked to the entrepreneur's experience and/or personality. "There is no question that irrespective of the horse (the product), horse race (market), or odds (financial criteria), it is the jockey (entrepreneur) who fundamentally determines whether the venture capitalist will place a bet at all." (Macmillan et al., 1985, p.119)

Despite this, an enormous amount of attention is given to the business plan. Macmillan et al. (1985) state that while the business plan is required, it is not sufficient in its own right. "The business plan should also show as clearly as possible that the 'jockey is fit to ride'." (Macmillan et al., 1985, p.119) In their view, it is no more than a checkpoint on the path to gaining investment.

Vinig and de Haan (2005) state that both American and Dutch Venture Capitalists regard the entrepreneur behind the deal as the most important criteria to an investment. However, they question the ability of an entrepreneur's drive and ambition to be translated to a business plan. They question the relationship of the screening process through to investment, and eventual performance of the entity.

Kaplan and Stromberg (2004) investigate, how deals are controlled, highlighting where the venture capitalist wants to influence, restrict or control a particular scenario. They take a selection of funded deals and retrospectively assess how asymmetric issues were controlled by varying contractual methods.

Few studies have analysed successfully funded deals utilising information that is available pre-investment. Hence, limited investigations have taken place that demonstrate what criteria are important to a venture firm. Most have looked to evaluate the criteria for successful ventures from data related purely to funded deals, utilising post-investment data to support their conclusions (Dittmann, Maug and Kemper, 2004; Kaplan and Stromberg, 2003 and 2004).

However the literature, does not address the factors that *influence* the investment decision. The aim of this thesis is to analyse firms that were reviewed for investment, observe characteristics that are subject to information asymmetry and note the final outcome – that is does the venture capitalist invest or not. The studies listed above ask venture capitalists what they look for, what they screen, and what/how they control an investment. They do not, however, question or tie the concept back to what *actually* determines deal selection.

Characteristics that are assessed are those of the firm itself at the time it is seeking investment. Therefore, this thesis places a greater level of significance on the aspects of the firm at the time of the investment pitch to the venture firm. It is less concerned with the final deal or contract that follows once a deal execution has taken place. This thesis takes the assumption that different characteristics of the proposed business are critical to obtaining venture investment.

3.2.1 Contractual Issues in Venture Capital

Traditional 'start-up' firms are often forced to seek equity injections as they have little opportunity to gain access to debt given the immaturity of their business. However, the concept of deal structuring is similar to that of

achieving the optimal capital structure (Jensen and Meckling, 1976). Here a business must take into account the considerations of the division of ownership through the position of debt and equity. The existence of conflicts of interest and informational asymmetries that occur within venture deals mimic that of the debt versus equity conflict.

The key distinction between venture capital and so-called 'mainstream' corporate finance relates to the problem of asymmetric information. Several studies have investigated the issue of the complications of asymmetric information, how it is overcome by venture capitalists and the levels of success achieved through various methods, including rigorous due diligence. Difficulty is increased, by the fact that the venture capitalist does not have a listed market to compare the investment to in terms of valuation, governance, market dynamics, etc. Their best benchmark can often be within their own portfolio, given their specialisation in certain industries.

Conflicts cause large inefficiencies and differing points of view as to how to manage a corporation, particularly in the start-up phase of its existence. Additionally, as mentioned in Kaplan and Stromberg (2004), new ventures pose additional problems with conflict resolution due to the high degree of information asymmetry, hold-up problems⁴⁶ and conflicts over control of the entity.

Limited empirical research has assessed the factors that influence the structure of deals in the venture market and those factors, which entice a venture firm to invest in or reject a deal. Much of this work has been heavily restricted due to the hesitant nature of venture capitalists to supply data. Most potential investments will require a venture firm to sign a non-disclosure statement. If a venture firm does not invest in the company, it is then restricted as to the level of information it can offer for analysis.

⁴⁶ A hold-up problem occurs when two parties have the opportunity to reach a Pareto efficient outcome. However, it can be assumed the necessary arrangements needed to reach this outcome shifts the control of power once a deal has taken place. Despite the possibility of a Pareto efficient outcome, agreement might not be reached, due to this potential shift in power.

Regardless of whether the venture capitalist can place a valuation on the firm in order to proceed with an investment, they must feel confident that the agency issues associated with the deal, in the past, present and future are deemed to be within their control. From a historical perspective, due diligence must support the fact that the information provided by the company is credible. A current perspective must place a realistic valuation on the company, while the future issues concern maintaining the intellectual property associated with the incumbent management, committed and interested in the future and ongoing prosperity of the company.

3.2.2 Asymmetric problems in venture capital

It is important to consider a broad range of issues across the venture investment spectrum during the assessment process including: asymmetric problems, contracting theories, post-investment issues⁴⁷, external risks, execution risks, internal risks, valuation, steps in the decision process and the range of investible companies.

Information asymmetry occurs where one stakeholder (the principal) has more information than the other party (the agent) does. A common form of an asymmetric problem is adverse selection where a buyer or seller has unequal levels or access to information.⁴⁸ When an entrepreneur seeks venture capital, they are generally going to have more information about their company; hence there will always naturally be some degree of asymmetric information.

3.2.3 Addressing contracting issues

Similar to other investment managers, a venture capitalist must undertake due diligence on an investment with an initial lack of information. The venture capitalist attempts to overcome adverse selection through screening deals thoroughly. However, a crucial skill of venture managers lies in the ability to

⁴⁷ Addressed in Kaplan and Stromberg (2004) as: (1) work level and knowledge, (2) control and (3) hold-up threat to leave

⁴⁸ A common example would be a person looking to sell their car. The seller has more information (knowledge) of the real value of the car (based on history, crashes, complications with the vehicle) and the buyer does not necessarily have access to the same level of information, particularly if they are uninformed, i.e., a private as opposed to a trade buyer.

undertake due diligence, correctly taking into account asymmetry within a deal. This is incorporated within the valuation of the company as there is no efficient market by which to guide valuation.

Traditional finance research has examined other, more indirect methods to account for the extent of agency issues and have aligned such research into variables, which are common amongst risk analysis of listed stocks. These include firm age and size, research and development intensity and market-to-book ratios. Clearly, most of these variables would not be available, if at all reliable to any venture capitalist or angel investor, which would explain why they are not typically used.

These variables capture different risks that are more relevant in listed entities. The above variables have been shown to link to risk levels in established market driven corporations. An equity investment within an efficient listed market, allows for a mechanism of pricing an expected return, in line with the expected level of risk with respect to the market. This is a considerable limitation to the venture capitalist and therefore not likely to provide any insight to the formation of the deal.

Kaplan and Stromberg (2003) argue that financial contractual theory simplifies the process of 'real world' contracts. The primary reason being that the venture capitalist has the ability to separately allocate cash flow rights, board and voting rights, liquidation rights and a range of other situation control rights. The paper demonstrates that venture capitalists adequately deal with the principal agent and control theories, outlined by Holmstrom (1979) and Aghion and Bolton (1992), yet there are additional complexities which remain unexplained.

Kaplan and Stromberg (2004) observe standard venture assessments, analysing; the market size, the strategy, the technology, customer adoption, competition, the management team and the deal terms. However, Kaplan and Stromberg (2004) then state that venture investments are susceptible to additional risks, which focus on key areas of uncertainty and which are

common to venture investing. They categorise these risks into internal (e.g. managerial), external (e.g. market, industry) and execution (e.g. product, strategy and technology).

While financial pricing must play a role within the valuation of a deal, it is a traditional financial concept assumed to have been dealt with at the early stages of venture capitalist screening. A clear gap identified within the literature is between Macmillan et al. (1985), Vinig and de Haan (2002) and the Kaplan and Stromberg (2003 and 2004), none of them review what is the state of the firm before an investment is made, and what factors influence the deal selection of that firm.

3.3 Kaplan and Stromberg (2004)

Traditional risk based return expectations alone do not provide reasons as to why a venture capitalist would or would not invest in a deal. Kaplan and Stromberg (2003), state that the financing methods common in venture capital such as allocating cash flow, board, voting, liquidation and other control rights, implement desired levels of control and incentives for a particular investment. Kaplan and Stromberg (2004), collated data from sixty-seven companies by eleven different venture capital firms examining how each employs these different controls under different situations.

The data provided for each company included the term sheet, stock and security purchase agreements, business plan and the venture capitalist's internal analysis. Kaplan and Stromberg (2004) conclude that internal risks are important to the contract design, while ensuring that the entrepreneur shares any external risks. Additionally, they suggest that venture firms take into account the issues related with hold-up theories within their contract design.

Kaplan and Stromberg (2004) propose the strongest argument regarding the way in which agency and hold-up problems interact with the design of contracts within venture investments. Kaplan and Stromberg (2004) suggest

that agency theories hold steady and are designed in such a way to deal with the asymmetric information common to the industry.

The fundamentals of scrutinising an investment can be filtered into three main categories of potential risk: internal factors, external factors and factors related to difficulty of execution/implementation. Each of these is analysed post-investment by the venture capitalist. Kaplan and Stromberg (2004) use funded deals within their analysis. Therefore, the final contract takes into account the negotiation phase and assesses the final structure of the deal.

By taking this approach, Kaplan and Stromberg (2004) exclude the deal offer put forward to the venture capitalists before negotiation. It is possible and quite logical that information exists within pre-investment indicators that can be useful to the later decision-making process. Kaplan and Stromberg (2004) examine four key themes in reference to how they address the associated risk.

These include:

1 The importance of the future entrepreneur's work level and current knowledge of the deal

The arrangement between the entrepreneur and venture capitalist needs to be set so that it is in their interest for the deal to proceed and for them to continue working efficiently. The venture capitalist is looking to maximise the work level of the entrepreneur after the investment proceeds. The ability to observe this factor prior to investment is virtually impossible and after the cash has been committed, it can be too late. The venture capitalist needs to offset this potential risk. A common approach is to boost the entrepreneur's incentives by offering a high percentage of the returns, albeit these can be conditioned on milestones to generate higher pay-for-performance sensitivity. Here, the cause of asymmetric information is due to the fact the entrepreneur knows more of the quality of the potential investment and the level of dedication they are willing to commit to the project in the future.

A great idea can attract investment, but the need remains for the investor to be satisfied that interests are aligned. If not all capital is secured, the entrepreneur will continue to work hard to ensure that targets are met. Alternatively, an entrepreneur can offer a different method of accepting capital. The signal of seeking capital through tranches or at a later stage may reduce risk associated to the venture capitalist. Commonly, such options are negotiated at a later stage, however in the first instance this is likely to be at the initiation of the venture capitalist not the entrepreneur.

2 *Ongoing contractual issues*

Post-investment, conflicts of interest may emerge where it is optimal for the venture capitalist to be in a position to take control of the board and decision-making. At other times, it may be best for the entrepreneur to retain decision-making control, commonly when the venture is performing well.

When the venture capitalist considers an equity investment, there is an inherent conflict between minority and majority shareholders. A majority of investments undertaken by Australian venture capitalists require a board seat⁴⁹ for investment to proceed. This requirement does not vary by deal, but is a clear, standard approach utilised by most Australian venture capitalists in their investments. This perceived disparity can be offset by the venture capitalist taking a minority equity position to incentivise the entrepreneur.

3 *Hold-up issue – the threat to leave*

Kaplan and Stromberg (2004) demonstrate that post-investment arrangements must be established prior to executing an initial deal given that disagreements can often arise. Conflicts are usually associated with which party should retain control in certain situations in the future. Further, the main problem lies with the current position of the company and the 'human capital' associated with the company. This is also known as the 'hold-up' problem (Hart and Moore, 1994) where an entrepreneur can credibly threaten to leave the company.

⁴⁹ All five venture capitalists surveyed within this thesis, stated the requirement of a board seat was compulsory within any of their acquisitions.

Hart and Moore (1994) demonstrate that an optimal repayment structure exists and is restricted by the project return and the quality of the project. The final structure is consistent with the long-term potential of each. The venture capitalist must deal with this through a combination of short term (i.e. salary payment) and long-term (i.e. equity ownership) financial payments to the entrepreneur. Long-term equity ownership means that the entrepreneur will only earn their full equity after a significant period of time, typically, one would assume at a period after the venture capitalist has exited.

4 Business acumen

It is important to assess the value of the entrepreneur to the business at the time of the investment. The venture capitalist must consider this from a scientific/technical perspective as well as the degree of the entrepreneur's business acumen, essentially the ability to run the commercial aspects of the entity. It may be argued that the venture capitalist fulfils this role and therefore this is not required to attract investment.

3.3.1 Kaplan and Stromberg Assumptions

Kaplan and Stromberg (2004) attempt to address the contractual issues of an entrepreneur seeking capital and identify issues that arise at different stages: after the company has been short listed from a range of investible companies, after the company has been valued and after the company has been through the decision process. Each of these issues reveals information in its own right; together they create potential for further information. There is potential information in how an entrepreneur addresses agency theories, whether the investment proposition plays a role within investment selection, and whether internal and external risks assist to define deal selection in a similar manner to contract theory.

3.3.2 Internal Risks

The core concern of internal agency risk in venture investment flows from the entrepreneur being better informed than the venture capitalist about the opportunity. The less that is known about the firm and the entrepreneur the more likely it is that the internal risks are higher. Kaplan and Stromberg

(2004) state that internal risk is reliant on entity control and contingent compensation to the entrepreneur. They assume both control and compensation are derived from the negotiations of the firm with the venture capitalist, and that no information regarding these concerns is presented to them at the time of original pitch.

Milestone and Later Investment

Kaplan and Stromberg (2004) suggest milestone investment is a legitimate form of controlling internal risks. Milestone payments provide an obvious reduction in the exposure to downside risk.⁵⁰ Though, contractual clauses can be negotiated by the venture capitalist, intuitive entrepreneurs promote such strategies as an indication of a belief in their ability and their product. Milestone settings reduce a venture capitalist's initial outlay and may potentially reduce the downside risk of the investment. This allows the venture firm to increase its knowledge of the company and its potential while ensuring the venture capitalist a restricted level of exposure.

Later investment opportunities provide the opportunity to invest additional capital at a similar valuation to the initial offer. This gives the venture capitalist an opportunity to learn more about the company before exercising the option to commit further capital.

Milestone investments allow a reduced exposure to external market forces, and can allow the venture capitalist to have an investment without as much capital at risk. Likewise later investment, allowing for additional upside may be an attractive proposition to offset the internal risk. Both structural offers of payment are intended to be a clear signal that addresses internal risks similar to that of short term debt signalling identified by Ross (1977) and Diamond (1991).

⁵⁰ A weakness arises in how to position milestones correctly; the inclusion of milestones prior to negotiations indicates the likelihood of a developed business plan concentrating on cash flow management. Further information is not assessable within this study due to limited access to data.

Negotiation does allow for different contractual agreements, yet the proposal of this thesis is to test the significance of an entrepreneur pitching a particular payment method. This thesis will look to test the hypothesis that the option of one or both of these methods of deploying capital acts as a positive or negative signal with respect to obtaining venture investment.

Managerial Skills

Academic literature supports this notion, for example, Manigart, Vermeir and Sapienza (1996) find that venture capitalists do not see an incumbent CEO's⁵¹ lack of experience as an asymmetric issue. More specifically, the venture capitalist was more concerned with the length of time employees had worked together. Venture capitalists across the five countries examined in the Manigart et al., (1996) paper⁵² believed that they added more to ventures already performing in a successful capacity as well as those in early stages.

Manigart, et al. (1996) examine how and when venture capitalists provide the value added to their portfolio 'beyond the provision of capital.' The study used surveys across the United States, United Kingdom, France and Belgium and the Netherlands. Consistent with earlier studies, they found that venture capitalists considered their strategic involvement as the most important role, stating that providing financial assistance was less important. They also stated that their (the venture capitalist) connections within a network was seen as very important and again a place where they can add value.

Further, Kanninen and Keuschnigg (2003) highlight the importance of the portfolio of a venture capitalist from an alternative view. Venture capitalists primarily provide finance to start-ups but also add value through the corporate advice they give and time spent with the company. This leads to a time consuming trade off between the advice and size of the portfolio. Diminishing returns are seen within a larger portfolio. Additionally, the less support that the entrepreneurs receive from the venture capitalists, the larger share of the company they may wish to retain.

⁵¹ Often the founder of the entity

⁵² United States, United Kingdom, France, Belgium, and the Netherlands

3.3.3 External and Execution Risks

External risks are deemed to be outside the control of the venture capitalist, and are related to the potential failure of the investment. These are highlighted by Macmillan et al. (1985) and include: loss of entire investment, risk of being unable to bail out a venture in stress if necessary, the risk of failure to implement the venture idea and competitive risk.

Holmstrom (1979) states that contingent payoffs such as pay for performance are not effective for offsetting external risks, while Prendergast (2002) finds the reverse and Dessein (2002) suggests that control should increase with external risks. Scaling external risks of one investment against that of another is incredibly difficult. Data restraints exist as there are limited firms to allow for a comparative analysis in the start-up phase. As a result of these data limitations, the ability to carry out this risk analysis should be a core competency of a venture capitalist.

While external risks pose a threat, perhaps the only tangible way to deal with them is to avoid investment in any company perceived to be too risky. As stated in Kaplan and Stromberg (2004), both venture capitalists and entrepreneurs are 'equally uncertain' of external risks to both parties. Kaplan and Stromberg's examples include the level of future demand for the undeveloped product or the response from competitors. The structure of the deal proposal and even the negotiations afterwards are independent of the market's eventual impact on the organisation.

Revenue

The ability to generate revenue is an obvious indicator of a need for the particular product or service a firm provides. Therefore, an intuitive assumption is that revenue generation would be a positive variable to attracting venture investment, given that it 'proves' some existence of a market.

Kaplan and Stromberg (2004) identified major differences between the execution strengths of pre-revenue against that of post-revenue

investments.⁵³ They find that the lack of revenue is positively and significantly correlated to the level of perceived risk within execution. An association of decreased risk could be linked to the likelihood of deal acceptance. This thesis will investigate the proposition that revenue plays a role in signalling a reduction in execution risk and increases the likelihood of attracting investment.

Government Investment

Jeng and Wells (1998) demonstrate that government policies have a strong influence on the success of venture capital within a specific country. Higher levels of appropriate regulatory framework, government grant investment, (particularly in times of economic downturn) are factors associated with higher success in the country's venture capital industry. To an individual investment, government backing can act as proof of prior third-party investment, bridging any economic financing gaps, and additionally reducing information asymmetry to the venture capitalist.

Consequently, government investment can be viewed in either a positive or a negative light. Positively, it acts as a vetting process against other proposals. Success in attracting government funding is likely to reduce information asymmetry thereby providing a form of external certification of the investment, which venture capitalists appear to value when deciding where to place their investment. Further, companies that are successful in attracting government grants gain additional capital without diluting equity investment.

Alternatively, an assumption may be that venture capitalists are not particularly skilled at what they do and are free-riding on government assistance. Therefore, government investment is not necessarily a sign of a credible investment, rather, a signal that attracts potential venture investors. Further, it highlights the constraint of venture funding available.⁵⁴

⁵³ Pre-revenue being the existence of revenue generation before investment by the venture capitalist

⁵⁴ If prior funding is a signal of 'lower risk' this could partially explain lower returns experienced by Australian venture capital managers

Within Australia, the federal government has attempted to address the market gap of high technology new ventures with multiple competitive based programs. Australian based incentives, such as the Commercial Ready and its predecessors, R&D Start⁵⁵ and Grants for Industry Research and Development (GIRD)⁵⁶, provided more than \$200 million a year in early stage high technological funding. Government grants serve to mimic income from a revenue-generating customer. Their competitive nature means that successful firms have been screened, potentially an indicator to offset execution risk.

Given the government has some level of screening in place for applications, this would in theory provide a reduction in internal risks to the venture capitalist. This thesis will examine the effect of prior government grants and whether this variable alters the likelihood of attracting investment.

3.4 Other influences

Asymmetric information exists within all deals where the entrepreneur knows more of the quality of the potential investment than the venture manager. Lazear (1986) shows that venture capitalists can design contracts that have greater pay-for-performance, which in turn attracts a better 'quality' entrepreneur. Ross and Diamond (1991) also suggest that liquidation rights can also be utilised to a similar effect.

Vinig and De Hann (2002) compare the screening process of business plans by the venture capitalists in the Netherlands and the US through interviews and questionnaires. Venture capitalists identify clearly important criteria to consider including exit potential (time and method) and stage of investment.

3.4.1 Exit Criteria – Time and Method

The likelihood of an exit is one of the most important factors in determining investment. A venture capitalist does not make a return from creating a viable

⁵⁵ <http://www.ausindustry.gov.au/InnovationandRandD/RandDStart/Pages/home.aspx>

⁵⁶ <http://www.ausindustry.gov.au/InnovationandRandD/RandDStart/Documents/doc57027320020111010536.rtf>

company that is a “going concern”. They make profit through creating value in an entity and then exiting from their investment. Therefore, it is feasible to expect that individual venture investment can be linked to the potential of exits.

Jeng and Wells (1998) investigate a macro impact of venture capital activity across twenty-one countries and the different variables that influence the level of venture investment across jurisdictions. Two of the variables the paper considers are the importance of IPOs and the impact of government policies. IPOs are shown to have no effect on seed or early stage venture investing but a significant effect on the later stages of investment.

The logical impact of the above is that an exit is going to be of more importance the closer to an exit. Exits can be executed through the public (IPO) or private (trade sale) markets. This thesis will look to see if the indication of either method has any influence on the proposal.

While little can be done about limiting the exaction risks, a suitable proxy for this is the time to exit, or liquidation period. The longer the period to exit, presents increased opportunity for risk.

3.4.2 Stage of Investment

Sapienza et al. (2002) show that required return theories hold true for both venture specialists investing purely in early stage projects as well as those who are diversified across their investments. As discussed in Chapter 2, US venture returns are higher at earlier stages of venture investment. In an efficient venture market, this represents additional risk receiving a higher return. The stage of the venture investments influences the required return. Different potential investments will have different levels of risk and asymmetric information.

Higher returns are generally associated with a higher intensity of involvement and shorter holding periods. Higher return requirements are purely an offset for the risk involved with more untested companies and do not necessarily

counteract the asymmetries of the deal associated. Given that greater asymmetry exists with earlier deals it is expected that a direct relationship of more structuring by the venture capitalist is going to exist in the infancy period of a particular project.

The thesis will investigate if proposed conflicts of interest are consistent across different stages of investment. This is important as an early stage test investment can attract a significantly different array of agency conflicts than a later stage expansion deal. Additionally, many Australian venture capitalists are not stage-specific investors and it is reasonable to assume they will attract the interest of both early stage and late stage investment proposals.

3.5 Decision Process

Fried and Hisrich (1994) are among the few to consider a methodology for developing a model of the venture decision-making process. They propose a general six-stage process and state the different criteria assessed within each stage. The stages of screening proposed by Fried and Hisrich include; a venture capital firm specific screen, generic screen, first phase evaluation, second evaluation and closing.

Different aspects of the business presented and the state of the venture firm itself clearly have an effect on the outcome of the investment. Studies that examined this issue taken a slightly different approach in each case. These include the company's market, product/service, technology, strategy, potential/current competition, management, deal terms and the general financing environment.

Consistent with Macmillan et al. (1985), six of the ten most frequently rated criteria relate to the entrepreneur.⁵⁷ In the context of studying deal selection, it is anticipated that the criteria of deal structure will be heavily based on the

⁵⁷ The six criteria include, capable of sustained intense effort, thoroughly familiar with market, demonstrated leadership in past, evaluates and reacts to risk well, track record relevant to venture, and articulates venture well.

entrepreneur's association with the company and the informational asymmetries associated with the entrepreneur.

3.6 Overview

A significant portion of the existing literature has concentrated on analysing how a venture capitalist utilises various strategies to overcome agency problems. Predominately, these have been analysed after the later success of the investment, retrospectively screening for successful investments. Little research has looked at how and why venture capitalists initially invest in particular projects. This thesis sets out to test if the Kaplan and Stromberg (2004) approach of assessing contractual agency issues can be applied in a similar manner to test the venture capitalist's decision to invest.

Kaplan and Stromberg source data from investments that had been selected by the venture capitalist. A large part of the venture screening process is attempting to manage agency problems pre-funding by selecting the best deals. Kaplan and Stromberg (2004) show what types of contractual arrangements venture capitalists use post-investment to manage agency problems, some of which are identified pre-funding. This thesis attempts to identify those pre-funding agency problems that influence venture investment after initial screening.

Given that Kaplan and Stromberg (2004) chose companies in which the venture firm had already decided to make an investment, it indicates how venture firms are prepared to deal with agency issues that they believe they can control in post-investment contract design. However, it does not address which agency issues are likely to result in deal rejection. Kaplan and Stromberg (2004) demonstrated that deals are constructed in a way to compensate for the agency issues each business proposition presents.

This thesis seeks to identify where agency issues become a problem to the extent they inhibit deal selection. Through this process it will highlight what fundamental structures of an investment proposal are rejected or accepted by a venture firm. Kaplan and Stromberg (2004) concepts are used to address

whether deals are constructed to offset conflicts of interests, or if conflicts of interest are the cause for deal selection or rejection.

Observed signals that offset external risks to an investment include prior revenue generation and government investment. Internal risks need to be observed with respect to the present prosperity and position of the company. Additionally, it is crucial that the entrepreneur and the venture capitalist have an alignment of interests both at the time of investment and as the corporation develops in the future. Prior to investment, the venture capitalist will be concerned with their cash allocation. Generally, the venture capitalist has the option to protect their downside losses through milestone investments or to expand their upside potential through an advantageous position of later investment. The act of the entrepreneur signalling this at the beginning of negotiations may have an impact on attracting investment. The findings by Kaplan and Stromberg (2004) are based on investments that have finalised contracts. Therefore, they take into account negotiations and the variables that are used are those of the final contract, not those from the initial interaction with the entrepreneur.

CHAPTER 4: Hypotheses Development

Kaplan and Stromberg (2004) provide a basis for assessing agency conflicts categorising them as internal, external and execution risks. From a pre-funding perspective, these risks are subjective, rare and hard to obtain. As such, this thesis uses pre-funding proxies to imitate the existence of potential risk conflicts as set out in Kaplan and Stromberg (2004). The variable proxies, which are discussed below, have direct empirical academic support for their association with venture investment.

4.1 External and Execution Risks

External risks are those outside the control of the venture capitalist, and are related to the potential failure of the investment. Within first stage screening as defined in Fried and Hisrich (1994), venture capitalists conduct market studies to determine the success of the potential venture. It is important to note a venture capitalist cannot change the market, and is able to employ other tests to observe the acceptance of an investment. A venture capitalist cannot control external risk, but can be aware of the degree to which it exists. Execution risks are closely associated and related to the factors that influence business implementation.

Examples of risk that proxy both external and execution risk include the generation of revenue (market acceptance) and other prior investors (third party validation). The alternative to early stage investors within the much smaller Australian market is prior government investment and/or grants. The existence of more seed stage investors, particularly in the United States, is substituted by the ability for these companies to access competitive grant funds.⁵⁸

4.1.1 Revenue

Revenue can be perceived to be a test of external views toward a potential investment and the credibility of the entity. It is an actual test of market

⁵⁸ Examples would include angel investors.

acceptance of the product or service. A concern arises in that the various stages of the venture cycle, which are mutually exclusive, lead to significant collinearity and potentially skew the results.

Hypothesis 1: Enterprises which have revenue at early stages of the venture cycle will be more likely to attract venture funding.

The basis of this assumption is that early stages deals that are already producing revenue have reduced levels of external risk. Given that the market has shown some validation, through a willingness to pay for the product/service on offer, it would be logical to assume an increase in the likelihood of an investment vis-à-vis another corporation without revenue generation. Revenue generation effectively is a proxy for execution and external risk, given the market has shown some level of acceptance of the product/service and provided a source of further funds.

4.1.2 Prior Government Investment

The history of an investment presents the credibility of the opportunity as observed by external parties. As noted above, a source of revenue is a basic indicator that the firm's market presence may exist. This may be one indicator of investment potential. However many venture capitalists invest well before significant revenue is generated from the main core of the business. In Australia, a major source of cash flow for many start-ups is government grants.⁵⁹ These grants are competitive in nature and commonly target sections of industry where a clear gap in funding exists.

Competitive government investment gives an indication of a credible business opportunity, offers founders and eventual investors the advantage of non-dilutive cash flow. The hypothesis proposed by this thesis is that government funding acts as an indicator of reliable potential investment. Effectively, it acts as a competitive screening tool for venture investment. To a degree it

⁵⁹ Two major programs run by AusIndustry, COMET and Commercial Ready have supported 1,493 companies and 524 grants, respectively. Together this equates to just over A\$1 billion in grant funding, nearly half the dedicated Australian venture capital sector. (AusIndustry Presentation August 2008).

additionally acts as execution and external risk proxy, as funding has been supplied in the interests of establishing going concern corporation, by two parties.⁶⁰

It is commonly stated within the industry that factors such as the entrepreneur's own funds invested in the company prove the desire for the company to succeed and the belief the founder has in the firm, similar to bonding activities described in Jensen and Meckling (1976). Further credibility is obtained by factors such as third party funding and existing business contracts, which displays others' beliefs in the company.⁶¹

Hypothesis 2: Prior government funding at all stages of development will increase the likelihood of venture capital funding.

As discussed, it is expected that deals that have been backed by other entities, government, businesses or the entrepreneur themselves, are more likely to be deals accepted by the venture capitalists.

4.2 Internal Risks

The core of internal agency risk in venture investment flows from the fact that the entrepreneur is better informed than the venture capitalist about the opportunity. Venture investors have the ability to negotiate and many details of deals are only put in place months after the original pitch has taken place

This thesis does not examine the method that venture firms employ to offset agency conflicts (as in Kaplan and Stromberg (2004)), but rather if particular signals related to the risks of the venture create a positive or negative indication for the venture investor to base their investment decision.

⁶⁰ Obviously, one the government, and two the source of the private investment to match government funding.

⁶¹ Jensen and Meckling (1976) refer to these as bonding activities.

An entrepreneur can use signals relating to the capital deployment, such as later investment options⁶² and milestone settings of the payments. These options have the potential to reduce the risk to the venture capitalist through increased control in capital outlay.

4.2.1 Later Investment and Milestone Structures

This thesis examines whether the indication of an entrepreneur to either allow the venture capitalist to exercise a later investment option and/or set the payments of the investment in milestone increases the acceptance of investment. Further, agency issues should decline through these mechanisms as both indicate the entrepreneur's backing and belief in the success of a project. To the venture capitalist, later investment options or milestone payments can present a reduced amount of exposure to an investment whilst still participating in the upside of further investment at a later stage.

The two investment structures differ as to how they offset risk. Both act as a signal, however, milestone investment protects the capital at risk for the venture capitalist, whilst a later investment advantage allows the venture capitalist to capture additional gains. Kaplan and Stromberg (2003), find that nearly ninety-five percent of venture capitalists in the US use anti-dilution protection within their deals. While this does not add to their potential upside risk, it does prevent them from being diluted out of future gains.

The past credibility and the future control of the entrepreneur are vital to the venture capitalist as investment criteria. A venture capitalist must test the past credibility of the company and the individuals within it. Venture capitalists are commonly concerned that an entrepreneur has put in maximum effort to the company. The fact that every available source of funds has been utilised shows credibility of the company and the need for venture capital funds.

⁶² A later investment option is any advantage a venture capitalist may receive over new investors which enter in a subsequent fund raising round. This does not include early public listings before an exit where a venture capitalist can invest into the public stock.

Later investment options allow the venture capitalist to avoid being penalised for entering into a deal at an early stage and being diluted out of the position at a later stage. Milestone settings act in a similar way to restrict the flow of cash to the investment company. Commonly these structures are included in later stages of negotiations and entrepreneurs can use them as a signal to the venture firm to reduce the conflicts associated with agency costs.

Hypothesis 3: More sophisticated approaches of accessing funding; using structures such as later investment and milestone setting will increase the likelihood a particular entity receives venture funds.

4.2.2 Management Experience

Prior research (Sapienza, 1992 and Smith, 2005) has examined the value a venture capitalist can bring over and above the actual skills of an entrepreneur. For example, venture capital skills include: the knowledge of the process of commercialisation, financial and business strategy.

This thesis uses a proxy for business skills. This could be a relevant business qualification (CA⁶³/CFA⁶⁴/MBA⁶⁵), significant experience in a similar job or the venture capitalist had formed a view there was no need to replace the existing management from a business perspective, should the deal take place.

This thesis attempts to address the question of whether the ability of existing management of the business influences the outcome of a business being accepted for investment. Similarly, the business alliances of the company should be of less importance to a deal as venture firms claim to provide additional value through their contacts.

This is observed, particularly within an industry-specific fund, where the venture capitalist commonly invests in similar industries and has expertise and sufficient contacts within the field. As stated in Manigart et al. (1996), it

⁶³ Chartered Accountant.

⁶⁴ Chartered Financial Analyst.

⁶⁵ Master of Business Administration.

would be logical to assume that existing business skills would increase in value in later stages of investments.

Hypothesis 4: Potential early stage venture investments will have no preference towards companies that are adequately resourced with business skills. Later stage investments (i.e. commercialisation and expansion) will have a preference to firms with business skills.

4.3 Liquidation

The venture capitalist is also concerned with the deal structure in relation to the organisation in the future. If a deal is to move forward, a venture capitalist must be satisfied with how and when value can be extracted from the company. The presumption being, within venture investment potential exit plans at the time of investment may not exist when the venture capitalist wishes to exit several years in the future (i.e. a particular party to execute a trade sale). As such, multiple exit paths identified by the venture capitalist may have some bearing on the potential for investment.⁶⁶

The aspects of the planned exit that will be used as proxies by this thesis observe *exit proceedings* (public equity listing, trade sale or combination of both) and *realisation of investment* (expected time of return as suggested by the entrepreneur).

Hypothesis 5: The availability of multiple exit strategies will increase the likelihood of receiving venture funding.

A general assumption is that venture capitalists will look to accept deals presented with potential for multiple exit methods. Markets can fluctuate and change dramatically over time. The greater the options available for exit the safer a venture capitalist should feel about any underlying investment. An investment that is only suitable for a trade sale might not provide an adequate

⁶⁶ While an entrepreneur can suggest, and likely will suggest exit routes for the investment, in practice the venture capitalist manages an exit. Therefore, for the purpose of this thesis, venture capitalists were asked in the survey, whether the proposed investment in their opinion could be exited by trade sale or public offering.

exit if the potential buyers no longer exist when the venture capitalist tries to exit. Likewise, a firm intending to exit via the public markets, will face difficulties, if it attempts to do so at a time when the broader capital markets are effectively closed down.

Hypothesis 6: Shorter expected time to realisation will increase the likelihood of receiving venture funds.

Similarly, a venture capitalist should observe the expected time to liquidation. Shorter time-periods are associated with less risk. The greater the value that the venture capitalist can extract at any particular time; the less likely it will be that they will lose all of their investment over the life of the deal.

4.4 Stage of Venture Investment

The term 'venture capital' captures a large range of investments from seed prototype deals through to commercialising and expanding an already proven product albeit within a high tech industry. For the purpose of this thesis, the core group is to be split into three sub-groups, to establish if there are any significant changes evident across the 'investment spectrum'.

For the purposes of this thesis, the three stages of venture investing are defined as:

- **Test Stage** - the purpose of funding is not for commercialisation but to test the effectiveness of the potential product, idea, model or prototype;
- **Commercialisation Stage** – capital injection is utilised to push the product into market, from a state of no or very little current revenue;
- **Expansion Stage** – the underlying company has a current and somewhat stable revenue stream, the capital injection is for expanding the company.

Although each stage presents a different opportunity to an investor, a venture investment can be for the purpose of cross-stage investment, through both test and commercialisation or commercialisation and expansion phases.

However, this links with other variables as to the timing of a firm approaching a venture capital firm. Venture capitalists may be more or less reluctant to take on deals at different times with different characteristics.

The argument could be made that different stages of venture investments require different signals for a venture capitalist to choose to invest. Using stages as a variable itself does not address the potential conflict. It is more appropriate to split the data into earlier and later investments to attempt to find differences within early or late stage venture investments.

This involves creating a subset from the original group of portfolio companies and categorising them dependent on their intended investment purpose. It is likely that particular criteria may hold constant across the lifecycle, but that other variables may change, as their importance may be different at a test stage, compared to an expansion stage deal.

The results could overlap as a particular investment could be for one stage only or for cross-stage, 'test and commercialisation' or commercialisation and expansion'. To test how results shifted across the venture cycle the same regression (1) is estimated, but in selective universes, dependent on the proposal being tagged for test, commercialisation or expansion. This presents the opportunity to highlight the similarities and differences of each sector with respect to the entire investment spectrum as well as highlight new interaction-based variables that can be fed back into the overall model.

4.5 Variable Overview

An overview of the variables tested in this thesis are reported below in Table 1; in depth descriptions of each of the variables is contained in the subsequent sections.

Table 1 – Variable Summary Table

Variable	Description	Rationale
Revenue (<i>Revenue</i>)	Does the company generate any revenue before the investment of the VC? Yes – 1 No – 0	A company producing revenue should exhibit less external risk, particularly with firms that are in earlier stages of investment.
Later investment opportunity (<i>Later</i>)	Is the venture capitalist presented with an advantage in investing at a later stage of the company at the time of the original investment? Yes – 1 No – 0	An opportunity of having an advantage to invest in later rounds of the business could essentially enhance the upside of an investment. Given that the venture capitalist will know more about the firm in the future. Later investment is an advantage, effectively a call option for the venture capitalist.
Milestone settings (<i>Milestone</i>)	Does the entrepreneur present a plan to have the investment allocated to the business in milestones? Yes – 1 No – 0	Milestone settings should allow a venture capitalist to reduce internal the downside through a controlled flow of capital. A business venture requiring a flow of funds as opposed to a lump sum payment can indicate their certainty in reaching set benchmarks of business development.

Past Government funding (Government)	Has the company received any form of competitive government assistance in the past? Yes – 1 No – 0	Previous government funding via competitive grants should indicate that the firm has met a series of external criteria and should help to legitimise the 'past' of the firm, reducing execution and external risk.
Management Experience (Business)	Does the management have appropriate Business skills/qualifications? Yes – 1 No – 0	Venture capitalists should be more concerned with the business skills of later stage ventures. Early stage ventures are associated with the technical knowledge behind the proposal. The venture capitalist brings the business skills.
Intended Method of Exit (Both Exits)	Trade Sale and/or Initial Public Offering (IPO) Both – 1 One – 0	The potential for both methods of exit should increase the likelihood that an investment takes place, as it would reduce the foreseeable liquidity risk.
Intended time frame of investment ⁶⁷ (Realisation)	1-2, 3-4, 5-6, 6+ years	It is perceived the longer the time to the expected exit, the less the likelihood of a venture capital firm investing with the company

⁶⁷ Investee nominated amount of time.

Chapter 5: Methodology

This thesis employs a multivariate probit model to classify a functional relationship between a set of variables reflecting characteristics of the proposed investment, the venture capital firm and the likelihood of receiving venture investment.

The analysis examines risks⁶⁸ highlighted in Kaplan and Stromberg (2004) by using proxies that are consistent with other characteristics that have been used in the academic literature. The proxy variables are regressed against deal selection to assess whether they are critical to the investment decision-making process of venture capitalists within Australia. The objective is to identify if venture firms invest within these guidelines, and if so, which variables are significant to the selection process. Each model is tested using Receiver Operating Characteristic (ROC) Curves, which assess the ability of the model to correctly classify the deal opportunity.

5.1 Questionnaire

Data was collected through surveys completed by the five venture capitalists.⁶⁹ The survey was designed through consultations with a range industry contacts. The intention of the survey was to collect appropriate proxies for internal, external and execution risks. Additionally, it allowed insight to the stage of the investment and the intended use of the capital for each project reviewed by the venture capitalist. At the same time, the survey had to be constructed so that it was not an onerous task for the venture capital firms to complete. Significant time was spent with each of the five venture capitalists to explain, how the data would be used, how to complete the survey and to ensure that the information would remain confidential.⁷⁰

⁶⁸ Internal, External and Execution.

⁶⁹ Seven venture firms were identified as contacts of the author, five surveys were completed. Each venture capitalist provided details of recent accepted and rejected deals, where information could be provided for all fields in the survey.

⁷⁰ A copy of the survey is located in Appendix B.

5.2 Data

The data set contains sixty-two deals, thirty-four of which were accepted (i.e. an investment was made) and twenty-eight that were not accepted (rejected) for investment by the surveyed venture capitalists. The data used within this thesis was provided by five leading Australian venture capital funds. The combined funds under management of the firms exceed \$500 million, representing over twenty-five percent of the funds under management in the Australian venture industry. Furthermore, these venture firms invest in those industries that Australian venture firms dominate, including life sciences, information technology (IT) and cleantech. These venture firms are located in Sydney, Melbourne and Brisbane, arguably the major centres of venture investment within Australia. The venture capital firms used to collect the sample represent a large, significant and diversified portion of the Australian venture capital industry.⁷¹

The venture capital organisations were surveyed on a range of internal and external agency issues. The responses were derived from information that was available to the venture capitalist at the time of investment, both for deals that were funded and for those that were not. The information was either directly obtained through the venture capitalist's completion of a survey or through giving the author access to information (business plans and investment recommendations) in order to complete the survey.

5.2.1 Sample Selection and Data Selection Issues

The nature of venture capital presents a range of issues around the selection of appropriate data for analysing credible venture investments. It is common for many venture capitalists to receive hundreds of approaches each year. Most approaches receive minimal attention; a handful receives some feedback; and an extremely small number proceed to an extensive due diligence process. Roughly, one percent of deals screened subsequently receive investment.

⁷¹ Approximately A\$2-3 billion.

While access to data from successful venture capital deals is difficult to obtain, it is even more challenging to access data for deals where the venture capitalist does not make an investment. Due to these constraints, comparable data for firms that did not receive investment must contain simple and generic information.

While it is noted that approximately one percent of deals receive investment it was not possible to have a similar number of rejected deals in the sample universe. The reason for the deviation was to obtain accurate responses from the venture capitalists. Many Australian venture capitalists have very poor records of investments, let alone unfunded deals. As such, they were only asked to provide information on several unfunded deals, not the hundreds that would be necessary to match reality.

The range of potential investments includes those that passed the “venture specific” stage of the investment process. All analysed investments are assumed to have approached the correct venture capitalist in terms of both industry and size of valuation. This approach was taken to remove those deals that were not likely to receive investment from the particular venture capitalist for a variety of reasons, which may include unrealistic investment values or, those which may have been outside of the venture capitalist’s mandated or specialised industry.

Venture capitalists were asked to provide information relating to their last three to ten funded deals and a matching number of declined deal proposals that passed the “venture specific” stage of investment.⁷²

While the sample of sixty-two deals might appear small, it is comparable to other studies that have used actual deal flow data. For example, Kaplan and

⁷² Three to ten deals was considered a reasonable number in order not to create too much of a task for a venture capitalist to complete the survey, yet large enough to provide a minimum number of deals from each firm to obtain a reasonable cross-section. “To avoid any biased selection, venture capitalists were asked to provide their most recent rejected deals. Rejected deals had to pass the initial review of the venture capitalist, where it was deemed to be an acceptable valuation, correct industry and suitable for venture funding.

Stromberg (2004) analyse sixty-seven deals from eleven venture capitalists in the United States.

5.2.2 Timing of Deals

Given the constantly changing nature of the investment landscape, the investments examined in this study occurred in a relatively stable period of the economic cycle. This economic stability may represent a reason for why some deals were chosen and others were not, across different points in time. However, different time series were not examined in this thesis as the size of the Australian industry does not provide a large enough pool of potential data for a comprehensive time series analysis across different market conditions.

All deals captured were from 2001 to 2007, a period that did not have exposure to the 'dot com' crash or the current global financial crisis. Both of these highly volatile periods would potentially skew the results as venture capitalists may act differently with their intentions to invest.

5.2.3 Size of Portfolio

Venture funds generally have five to thirty enterprises. The results of this paper appear to indicate that the optimal number of start-up firms in a venture portfolio hinges on the parameters relating to the severity of the agency problem of each deal. When considering which deals are taken on board, it is important to consider the level of investment already taken on by a venture capitalist. Acceptance of the deal may vary depending on the life-stage of the fund given the time required to exit a deal.

5.2.4 Non-Industry/Non-sector Specific

The sectoral distribution of the Australian venture industry is approximately forty-five percent life sciences (biotech, medical devices, etc), forty-five percent information technology (IT) and ten percent Cleantech. Many Australian venture firms are industry-specific given their small size restricting them to the experience of a handful of personnel. Within this thesis, the funds

that are studied cover all three of the major investment sectors of Australian Venture Capital.

5.3 General Assumptions

For the purpose of this thesis, successful deals are those in which the identified manager directly invests in the company. Unsuccessful deals are those deals which passed an initial screening but, were not funded by the manager. No attempt was made to identify if rejected deals were successful in attracting funds from another fund manager nor was the ultimate level of “success” of a successful deal examined through post-investment tracking of the performance of investments.

The relatively immature nature of Australian venture capital means there are very few deals that have exited. An analysis of exits would provide some evidence of the success of venture managers. However, this validation is not possible (at present) in the Australian industry.

This thesis does not focus on the projected economic or scientific feasibility of the presented business. It is assumed that all deals are economically feasible and it is the structure of the deal proposition put forward in discussions with the venture capitalist and the entrepreneur, originating from the business plan, which leads to the acceptance or rejection of the deal.

For the purposes of assessing the business plans, all information is taken to be a true and fair representation of information of the associated businesses. Given that all proposed deals within this thesis passed initial screening, this assumption is realistic.

Initial screening is understood to mean that the investment is in the respective industry and general ‘ballpark’ of investment size for the particular fund. Deals are often rejected because of market conditions associated with the investment. The common timeframe (2001-2007) of these deals attempts to offset this issue. All deals analysed within this study were at a stage where the venture firm conducted due diligence on the company.

5.4 Model Estimation

This thesis attempts to predict variables that influence the degree of asymmetric information and that are easily available to the venture capitalist thereby influencing which potential investments receive capital. As noted above, a successful deal (=1) is defined as a deal which the venture capitalist undertook and invested in either by itself or through a syndicate. Alternatively, an unsuccessful deal (=0) is that which the surveyed venture firms do not make an investment. This prediction is tested by estimating a regression of deal selection against that of variables highlighted by the literature.

Model 1

$$(1) \text{ Deal Selection}^{73} = \beta_0 + \beta_1 \text{Revenue} + \beta_2 \text{Prior Government} + \beta_3 \text{Later Investment} + \beta_4 \text{Milestone} + \beta_5 \text{Exit Methods} + \beta_6 \text{Time to realisation} + \varepsilon$$

The left hand side (LHS) or dependent variable of the model(s) is the deal selection dummy, taking a value of one for successful and zero for unsuccessful funded deals. The right hand side (RHS) or independent variables are the variables that are predicted to explain the decision to invest in a company, as described in Table 1 of Chapter 4.

5.4.1 Sub-model: Stage Dependent Estimation

To test if all interactions are consistent or vary across different investment stages, the standard model regression will be repeated in three separate stage dependent universes, test, commercialise and expand. Some investments have been identified as belonging to more than one of these categories and as such these universes will overlap.

5.4.2 Sub-model: Revenue Estimation

Since the revenue variable is positive (i.e., dummy variable takes a value of 1) in all investments from commercialise and expand stage through to

⁷³ Deal Selection: 0=no investment, 1=investment made.

expansion, indicating revenue generation, including it in Model 1 induces collinearity and so obscures any potential significance that revenue might have for different stages (specifically, the test stage).⁷⁴ In a separate model, an interaction variable is created which captures revenue within a test stage.

(2) Interaction test stage revenue =

- 1 Revenue and test stage
- 0 No revenue and/or test stage

It is assumed that revenue within the standard model will not have an impact, given it is common to most, and particularly all later stage deals. Within the second model, revenue should cause a positive attraction of venture funds, within early stage ventures.

5.5 Receiver Operating Characteristic (ROC) Curves

A probit specification is used to estimate the investment classification model, where the dependent variable is a dummy for whether the venture capitalists invest in the company or not.⁷⁵ Receiver Operating Characteristic curves (ROC curves) work in conjunction with a binary classification model to analyse the selection criteria of the various models estimated. A ROC curve is a graphical representation of a binary choice, which plots the accuracy of correctly predicting an actual positive against the proportion of negatives that are correctly identified. This allows a comparison of different models to predict the effectiveness of the binary classification method.

⁷⁴ Logically all deals that are in expansion stage, that is, they have already had some form of commercialisation, would have generated revenue. Therefore, distinguishing between potential investments that do and do not have revenue at this stage is redundant.

⁷⁵ Similar results are achieved using a logit model.

Figure 1: ROC Example⁷⁶

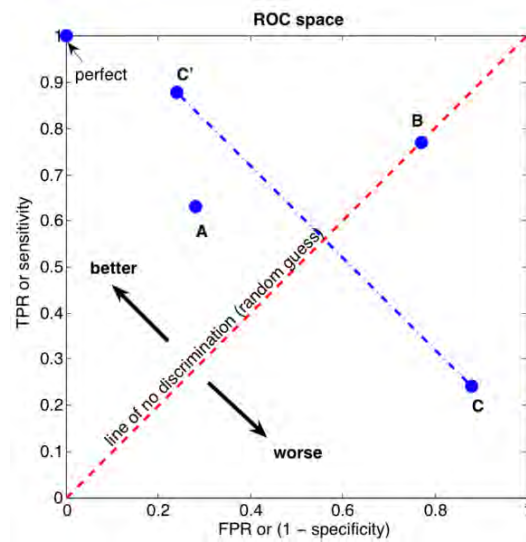


Figure 1 – ROC curves demonstrate the trade-off in classification models between defining correct positive and correct negative classifications. Further to the left implies a model that gives a better estimate than a 'random guess'.

⁷⁶ http://en.wikipedia.org/wiki/Receiver_operating_characteristic

5.6 Expanded data

For a selection of deals it was possible to get access to additional data such as the deal size, the size of later investment, number of milestone tranches, value of government grants received and the number of business personnel involved in the company. This data was obtained for seventeen deals from the same venture capital fund. The fund had the capability to fund deals from \$500,000 through to \$5 million. Although the data set is too small to estimate regression analysis, it does provide additional useful insights to the full sample models and the capability to suggest a more accurate model based on continuous variables rather than dummy variables.

5.7 Summary

The restrictions of access to venture data, limited this thesis to collect information on sixty-two potential deals. The sample, however, is of comparable size to prior studies. The models are not a predictive look at what deals a venture capitalist may take on, but a retrospective attempt to categorise potential investments to identify whether they are able to be classified by the variables indicated in this thesis. The model could be used to predict from a pool of deals, which are more likely than others to receive funding. Additionally, the models will attempt to answer each of the hypotheses outlined in Chapter 4.

CHAPTER 6: Results

6.1 Summary Statistics

Data is significantly limited by lack of access to information from firms that did not receive investment from the venture capital fund. It is difficult to access detailed information on companies, as equal data streams had to be available for both successful and unsuccessful deals. From sixty-two deals, thirty-four deals were invested and twenty-eight did not receive investment.

Just over 76 percent of the investment proposals were generating revenue prior to investment. This was due to the fact that a majority of the firms were at or past commercialisation stage and therefore had to be producing revenue. Firms at earlier stages of investment had a different breakdown as reported in Table 3, on the next page. Alternative control of capital allocation⁷⁷ were found in just over half of investment proposals, 55 percent contained later investment options, while 58 percent had milestone payments. Prior government grant investment and business expertise were separately present in 60 percent and 58 percent of the deals respectively. Over 80 percent of investments had a trade sale as an intended mode of exit, and only 66 percent stated an IPO as an exit. However, 48 % of firms listed one method compared to 58% for both methods of exit .

Table 2 – Summary Statistics

	Number
Venture Managers	5
Portfolio Companies	62
Invested Companies	34
Uninvested companies	28
No prior revenue/Revenue	15 (24%) / 47 (76%)
No Later / Later Investment	28 (45%) / 34 (55%)
No Milestones / Milestone Payments	26 (42%) / 36 (58%)
No Government / Government Backing	25 (40%) / 37 (60%)
No Business / Business Expertise	26 (42%) / 36 (58%)
IPO / Trade Sale Exit	41 (66%) / 51 (82%)
One method/Both	30 (48%) / 32 (52%)
Average expected time to exit	5.58 Range (2 – 8 years)

⁷⁷ Such as the option to invest later or through at the discretion of milestones.

6.2 Variable Breakdown and Correlation

Table 3, on the next page, presents a breakdown of the variables at each stage within the companies tested. Investments were spread across the full potential cycle of a typical venture capitalist. As Table 3 shows, a reasonable proportion of both invested and uninvested deals were represented at each stage of investment. Critical to model construction, Table 3 highlights that companies that are at a post-commercialisation stage are all producing revenue. As a result, it was necessary to change the revenue variable to an interactive variable in later models. No other variable drastically stands out as being significantly affected by the various stage of investment.

Table 4, on the page after Table 3, is a correlation matrix of the seven identified variables and the dependent deal selection variable. Two variables, prior government investment and milestone settings were positively correlated to deal selection. This provides some support for hypotheses two and three. That is, prior government funding and sophisticated investment proposals will increase the likelihood of attracting venture investment. It is important to note that other variables are statistically and economically insignificant with respect to deal selection, indicating no univariate correlation to deal selection. It is likely that revenue is not significant as 76 percent of deals have revenue and this is not distinguishable at later stages, where all of both invested and uninvested deals have prior revenue generation. The later investment variable is statistically correlated to three other variables (milestone, prior government and both exits) and so should be tested for multicollinearity within the regression.

Table 3 – Stage Summary

The table below provides a summary of the variables collected across the five identified stages of investment, test, test and commercialise, commercialise, commercialise and expand, and expand. The first number reported is the actual number of deals, while the number in parentheses is the percentage of deals within that sector of the matrix. i.e. Test and Commercialise had 12 deals, representing 19 percent of the total universe, 9 of these received investment, 3 did not. Of the 9 invested deals, 5 did not have revenue prior to investment while 4 generated revenue prior to investment. Respectively, this 56 and 44 percent of that particular sector.

	Test N = 7 (11%)		Test & Commercialise N = 12 (19%)		Commercialise N = 13 (21%)		Commercialise & Expand N = 19 (31%)		Expand N = 11 (18%)		All Deals N = 62 (100%)	
Portfolio Companies	Invested N = 3 (43%)	Uninvested N = 4 (57%)	Invested N = 9 (75%)	Uninvested N = 3 (25%)	Invested N = 3 (23%)	Uninvested N = 10 (77%)	Invested N = 13 (68%)	Uninvested N = 6 (32%)	Invested N = 6 (55%)	Uninvested N = 5 (45%)	Invested N = 34 (55%)	Uninvested N = 28 (45%)
Pre-revenue Revenue	2 (66%) 1 (33%)	1 (25%) 3 (75%)	5 (56%) 4 (44%)	2 (67%) 1 (33%)	1 (33%) 2 (67%)	4 (40%) 6 (60%)	0 (0%) 13 (100%)	0 (0%) 6 (100%)	0 (0%) 6 (100%)	0 (0%) 5 (100%)	8 (24%) 26 (76%)	7 (25%) 21 (75%)
No Later Later Investment	2 (66%) 1 (33%)	0 (0%) 4(100%)	3 (33%) 6 (67%)	2 (67%) 1 (33%)	0 (0%) 3 (100%)	6 (60%) 4 (40%)	5 (38%) 8 (62%)	3 (50%) 3 (50%)	4 (67%) 2 (33%)	3 (60%) 2 (40%)	14 (41%) 20 (59%)	14 (50%) 14 (50%)
No Milestones Milestone Payments	1 (33%) 2 (66%)	0 (0%) 4(100%)	3 (33%) 6 (67%)	2 (67%) 1 (33%)	0 (0%) 3 (100%)	8 (80%) 2 (20%)	2 (15%) 11 (85%)	2 (33%) 4 (67%)	4 (67%) 2 (33%)	4 (80%) 1 (20%)	10 (29%) 24 (71%)	16 (57%) 12 (43%)
No Backing Government Backing	1 (33%) 2 (66%)	3 (75%) 1 (25%)	3 (33%) 6 (67%)	2 (67%) 1 (33%)	0 (0%) 3 (100%)	7 (70%) 3 (30%)	2 (15%) 11 (85%)	2 (33%) 4 (67%)	1 (17%) 5 (83%)	2 (40%) 3 (60%)	7 (21%) 27 (79%)	18 (64%) 10 (36%)
No Business Business Expertise	1 (33%) 2 (66%)	3 (75%) 1(25%)	5 (56%) 4 (44%)	3 (100%) 0 (0%)	3 (100%) 0 (0%)	3 (30%) 7 (70%)	9 (69%) 4 (31%)	4 (67%) 2 (33%)	3 (50%) 3 (50%)	2 (40%) 3 (60%)	21 (62%) 13 (38%)	15 (54%) 13 (46%)
IPO Exit Trade Sale Exit ⁷⁸	3 (100%) 1 (33%)	4 (100%) 4 (100%)	8 (89%) 5 (56%)	0 (0%) 3 (100%)	1 (33%) 3 (100%)	7 (70%) 7 (70%)	7 (54%) 12 (92%)	3 (50%) 6 (100%)	5 (83%) 5 (83%)	3 (60%) 5 (100%)	24 (71%) 26 (76%)	17 (61%) 25 (89%)
One Exit Method Both Exit Methods	2 (66%) 1 (33%)	0 (0%) 4(100%)	9 (100%) 4 (44%)	3 (100%) 0 (0%)	2 (67%) 1 (33%)	6 (60%) 4 (40%)	7 (54%) 6 (46%)	3 (50%) 3 (50%)	2 (33%) 4 (67%)	2 (40%) 3 (60%)	18 (53%) 16 (47%)	14 (50%) 14 (50%)
Average expected realisation	6.00	6.00	5.67	6.00	5.33	5.40	5.85	6.00	4.00	6.00	5.42	5.79

⁷⁸ Note this variable is not mutually exclusive and as such the percentages do not necessarily add to 100%.

Table 4 – Variable Correlation Matrix

The table below reports a correlation matrix of the seven identified key variables and the dependent variable (deal selection). Asterisks indicate significant correlation coefficients at the: 10 %(*), 5 %(**) and 1 %(***) confidence levels.

	Deal	Revenue	Later	Milestone	Government	Business	Both Exits	Realisation
Deal	1.0000							
Revenue	0.0171	1.0000						
Later	0.0882	-0.0586	1.0000					
Milestone	0.2797**	-0.1748	0.4110***	1.0000				
Government	0.4433***	0.0731	0.3112**	0.1677	1.0000			
Business	-0.0826	0.1748	-0.0826	-0.2714**	-0.1677	1.0000		
Both Exits	-0.0296	0.2455*	0.2301*	-0.1582	-0.0594	0.2236*	1.0000	
Realisation	-0.1154	-0.2404*	0.2063	-0.0589	-0.0915	-0.0628	0.1318	1.0000

6.3 Model Estimation

Table 5 below is the probit-based regression based on the main seven variables as highlighted in the methodology chapter. Notably, and consistent with the correlation matrix above, both milestone and government variables are significant and positive determinants of deal funding. These variables were also significant when estimated in unreported univariate regressions. Additionally, the milestone and government variables are the only two variables, significantly correlated with deal selection, and are not significantly correlated to one another, suggesting that they capture different aspects related to deal risk. The revenue variable as expected is statistically insignificant, most likely due to collinearity issue as discussed in Chapter 5.4.1. Likewise, realisation has no impact on deal selection. This is not surprising, as average expected realisation does not vary across stages of investment, as shown in Table 3.

Table 5 – Standard Model⁷⁹

	Dependent Variable – Deal Selection All variables N = 62
Constant	-0.88 (0.94)
Revenue	0.02 (0.46)
Later	-0.61 (0.46)
Milestone	0.94 (0.44)**
Government	1.35 (0.40)***
Business	0.11 (0.39)
Both exits	0.28 (0.41)
Realisation	-0.03 (0.46)
Log Likelihood	-33.57
Pseudo R²	0.2135
Area under ROC Curve	0.7841

Asterisks indicate significant correlation coefficients at the: 10 %(*), 5 %(**) and 1 %(***) confidence levels. Standard errors are displayed in parenthesis.

⁷⁹ Logit and probit exhibit minor differences, commonly only in the extreme tails of the distribution. The model characteristics and the accuracy of the model change little. The fact that most existing academic literature has used probit is incidental and without any obvious underlying reason. In each case, the calculation that displays the best classification statistics should be employed. As expected, there was minimal difference between both the logit and probit models when applied to data used within this thesis. Probit modelling was preferred as it followed methodology observed in similar types of research.

6.4 Model Reduction

Several variables were not significant which could be indicative of multi-collinearity concerns due to the reliance on dummy variables. While the correlation matrix reported in Table 4 provides some indication of potential collinearity between pairs of variables, it does not indicate collinearity between two or more variables. To help address this concern, a variance inflation factor (VIF) test was estimated, with the results reported in Table 6. The results show that no variable records a score higher than ten, the standard benchmark used to indicate multi-collinearity. Further, the tolerances (1/VIF) are between 0.2 and 0.54, suggesting that between 20% and 54% of the variance of a particular variable is not explained by the other independent variables, indicating reasonable tolerance.

Table 6 – Variance Inflation Factors (VIF)

Variable	VIF	1/VIF
Realisation	4.86	0.205622
Revenue	3.74	0.267457
Later	3.42	0.292738
Milestone	2.82	0.354209
Govern	2.73	0.366098
Both Exits	2.50	0.400478
Business	1.86	0.536580
Mean VIF	3.13	

To help bolster confidence that collinearity does not pose a significant problem, the highest three variables from the VIF table are removed from the standard regression model (see Table 7 below, 'Reduced 1'). The insignificant variables of business and 'both exits' were additionally removed in a third model, 'Reduced 2'.

Table 7 – Reduced Model

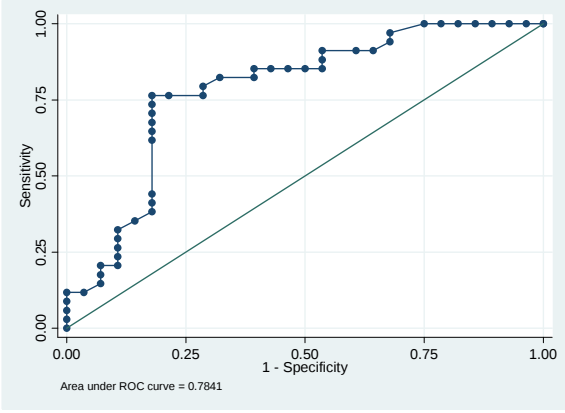
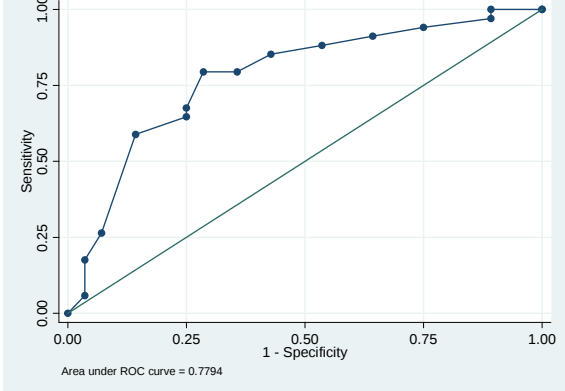
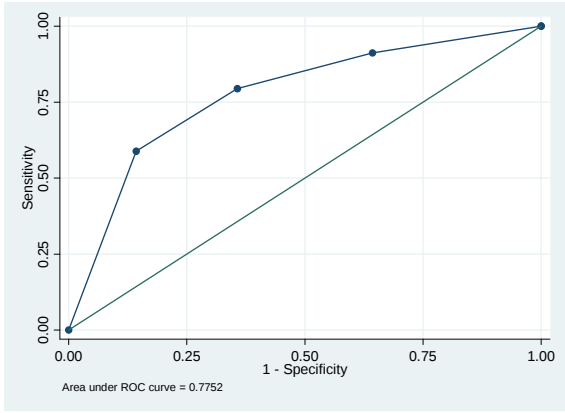
	Dependent Variable – Deal Selection	
	Reduced 1 N = 62	Reduced 2 N = 62
Constant	-1.03 (0.45)**	-0.91 (0.33)***
Revenue	n/a	n/a
Later	n/a	n/a
Milestone	0.68 (0.37)*	0.63 (0.35)*
Government	1.16 (0.36)***	1.13 (0.35)***
Business	0.13 (0.38)	n/a
Both Exits	0.06 (0.36)	n/a
Realisation	n/a	n/a
Log Likelihood	-34.67	-34.76
Pseudo R²	0.1877	0.1855
Area under ROC Curve	0.7794	0.7752

Asterisks indicate significant correlation coefficients at the: 10 %(*), 5 %(**) and 1 %(***) confidence levels. Standard errors are displayed in parenthesis.

Not surprisingly, the results of both models were similar to the original model, with minimal loss of predictive power as demonstrated by the ROC curves. Once these are removed, the two variables have minimal change to the predictive power of the model, as demonstrated in Table 7. The ROC curve only shifts from 0.7841 to 0.7752.⁸⁰ The results clearly support the hypotheses that venture investment will be attracted to firms that have prior government funding and a proposal for funds to be in milestone tranches. Prior government investment and milestone investment option were statistically significant in all three models.

⁸⁰ Further ROC analysis is contained in Table 1C of Appendix C.

Table 8 – Model 1 and Reduced Variants (ROC Curves)

Model	ROC Curve
Model 1 (Standard)	 Area under ROC curve = 0.7841
Reduced 1	 Area under ROC curve = 0.7794
Reduced 2	 Area under ROC curve = 0.7752

6.5 Stage Dependent

The second stage of regressions involved estimating, the standard model but within three stage-based categories. The results are shown in Table 9 below.

Table 9 – Stage dependent universe

	Dependent Variable – Deal Selection		
	Test N = 19	Commercialise N = 44	Expand N = 30
Constant	1.71 (1.90)	-2.11 (1.22)*	-0.49 (1.29)
Revenue	-1.18 (1.07)	0.60 (0.59)	n/a
Later	-1.45 (1.54)	-0.44 (0.57)	-0.65 (0.69)
Milestone	0.22 (0.98)	1.40 (0.58)**	1.25 (0.73)*
Government	2.05 (1.30)	1.37 (0.51)***	1.62 (0.67)**
Business	1.26 (1.01)	0.05 (0.55)	0.03 (0.61)
Both exits	0.97 (1.10)	0.32 (0.58)	0.40 (0.68)
Realisation	-0.30 (0.32)	0.05 (0.16)	-0.16 (0.19)
Log Likelihood	-8.51	-20.77	-14.92
Pseudo R²	0.3197	0.3096	0.2432
Area under ROC Curve	0.8333	0.8505	0.8325

Asterisks indicate significant correlation coefficients at the: 10 %(), 5 %(**) and 1 %(***) confidence levels*

Note: Total number of observations in each category may overlap. Revenue is dropped in expand universe due to collinearity (all potential investments have revenue)

The stage based probit regression suggests that prior government investment and milestone setting by the entrepreneur are significant indicators of the attraction of venture capital investment. Broadly, this finding is applicable and apparent throughout the investment cycle, suggesting the two variables are positive and significant at all stages of venture investment from test to commercialisation through to expansion deals. The lack of significance for prior Government investment and milestone in early stages is probably due to a small sample size.

Milestone settings had an economic and statistical significant preference for commercialisation and expansion stage investments.⁸¹ Prior government

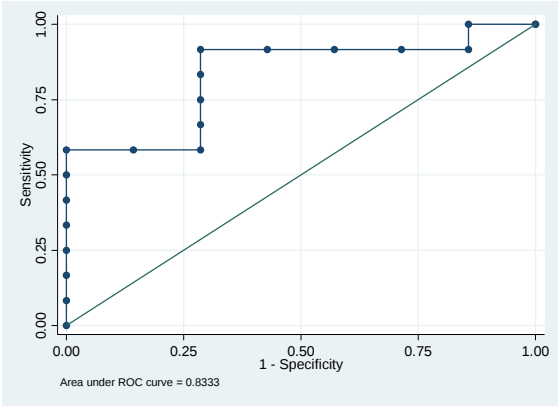
⁸¹ Notwithstanding the impact of the regression being based on a small and reduced sample.

investment was economically significant at commercialisation and expansion stages.

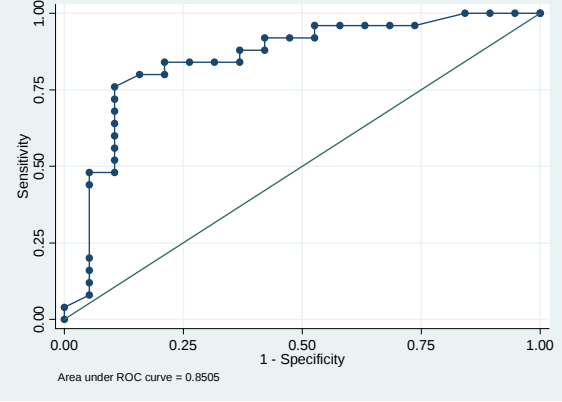
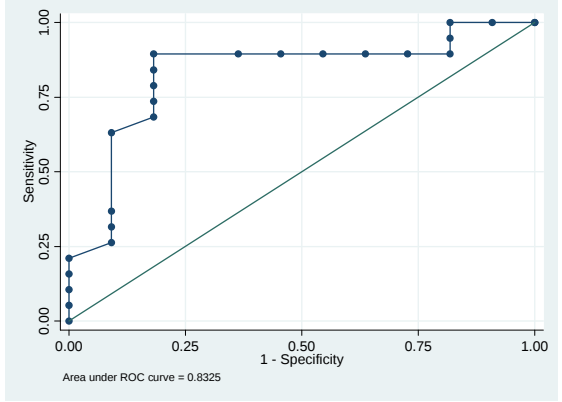
Revenue was statistically insignificant in both test and commercialise phase however this variable has a significant shift in economic significance and direction, changing from -1.18 to 0.60, indicating a bias around commercialisation based ventures. At a stage that is too early, the funding may be for the prototype, while, too late into commercialisation all firms will be producing revenue.

As seen in Table 10, ROC curves were further shifted out to the left, covering a larger area than the ROC curves representing the full universe of potential investments. Limited differences were observed with respect to the various stages of investment.⁸²

Table 10 – Stage Dependent ROC Curves

Model	ROC Curve
Test	 Area under ROC curve = 0.8333

⁸² Further ROC analysis is contained in Table 2C of Appendix C.

Commercialise	 An ROC curve plot for the 'Commercialise' stage. The y-axis is labeled 'Sensitivity' and ranges from 0.00 to 1.00. The x-axis is labeled '1 - Specificity' and ranges from 0.00 to 1.00. A diagonal line represents the baseline. The curve is a step function with blue dots at each step. The area under the curve is 0.8505.
Expand	 An ROC curve plot for the 'Expand' stage. The y-axis is labeled 'Sensitivity' and ranges from 0.00 to 1.00. The x-axis is labeled '1 - Specificity' and ranges from 0.00 to 1.00. A diagonal line represents the baseline. The curve is a step function with blue dots at each step. The area under the curve is 0.8325.

6.6 Commercialisation and Interaction Variable Model

In the stage dependent models, test and expand stages displayed minor differences. An interaction variable was created, where the deal was intended for 'test and commercialisation' and was producing revenue prior to venture investment. This new variables was added to Reduced Model 2 in which all variables were significant.

Table 11 – Interaction Model Variable Correlation

The table below reports a correlation matrix of the three variables and the dependent variable (deal selection). Asterisks indicate significant correlation coefficients at the: 10 %(*), 5 %(**) and 1 %(***) confidence levels.

	Deal	Test	Comm	Test-Comm Stage- Revenue	Government	Milestone
Deal	1.0000					
Test	0.1111	1.0000				
Comm	-0.1130	0.3094**	1.0000			
Test-Comm Stage-Revenue	0.1497	0.2973**	0.4529***	1.0000		
Government	0.4433***	-0.0955	-0.1286	0.0019	1.0000	
Milestone	0.2797**	0.1395	-0.1677	-0.2285*	0.1677	1.0000

Table 11, indicates as expected the test and commercialisation variables are significantly positively correlated with the interaction variable., and as such they are dropped from the regression. The VIF test is run on the remaining variables to test for multicollinearity.⁸³

Table 12 – VIF (Interaction Model)

Variable	VIF	1/VIF
Milestone	1.79	0.558051
Prior Government	1.76	0.567557
Test Comm Stage Revenue	1.03	0.969577
Mean VIF	1.53	

The new model with three variables has lower potential of multicollinearity, as shown by lower VIF values and higher tolerances (1/VIF) reported in Table 12. The model does not lose any of its predictive power, demonstrated by the area under the ROC curve in Table 13. Milestone and prior government remain statistically and economically significant in Table 13. The Test/Commercialisation revenue result partially supports the hypothesis that

⁸³ Results for the full model with both test, commercialisation and interaction terms are found in the Appendix – Table 7C

early stage ventures would be preferred if they had produced revenue. The same model was run with only forty-four observations, removing all investments for test or expansion only. The pseudo R^2 and area under ROC Curve were significantly higher.⁸⁴

Table 13 – Interaction Model Regression

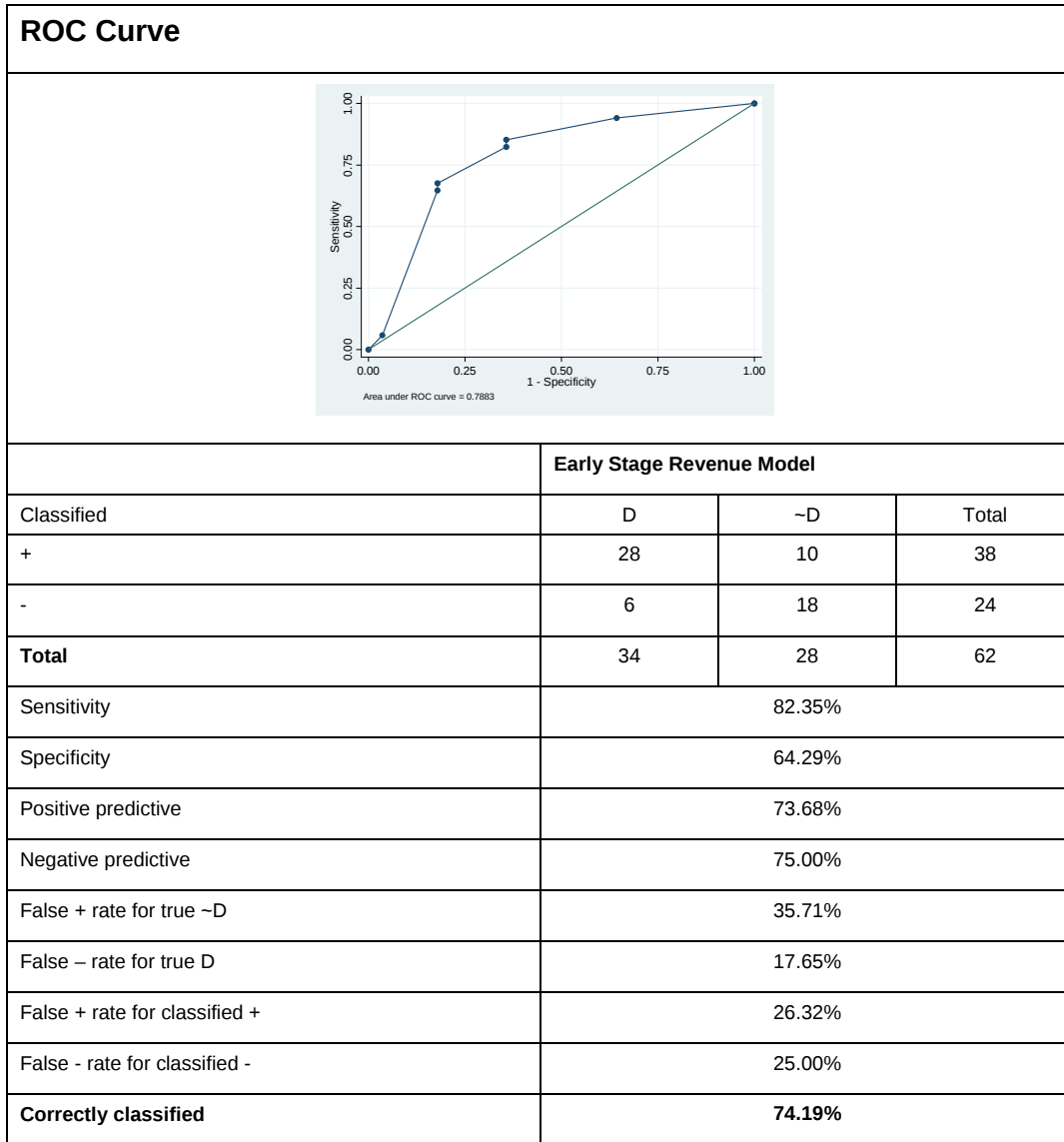
	Dependent Variable – Deal Selection N = 62
Constant	-1.10 (0.36)***
Test-comm stage revenue	1.10 (0.66)*
Milestone	0.79 (0.37)**
Government	1.15 (0.36)***
Log Likelihood	-33.29
Pseudo R^2	0.2200
Area under ROC Curve	0.7883

Asterisks indicate significant correlation coefficients at the: 10 %(), 5 %(**) and 1 %(***) confidence levels*

The interaction model ROC Curve, in Table 14, exceeds that of the standard regression model as shown in Table 8. The model is only created from three significant variables, leading to six points on the ROC curve.

⁸⁴ This can be seen in Table 5C/6C of Appendix C.

Table 14 – Interaction Model ROC Curve



6.7 Summary of Classifications

The table below provides a summary of the accuracy of classification across the seven regression models. Statistics for each model include, the area under the ROC curve, as well as the accuracy (in terms of percentage) of actual classification. Positive classification is deal acceptance, while negative classification represents deal rejection. i.e. Incorrectly Classified Positive, indicates a deal that was classified as accepted, but actually was rejected by the venture capitalist.

Table 15 – Classification Comparison of Models

	Standard	Reduce 1	Reduce 2	Test	Commercialise	Expand	Interaction variable - Early Stage
Area under ROC Curve	0.7841	0.7794	0.7752	0.8333	0.8505	0.8325	0.7883
Correctly Classified Positive	79.41%	79.41%	79.41%	91.67%	88.00%	89.47%	82.35%
Correctly Classified Negative	71.43%	64.29%	64.29%	71.43%	57.89%	63.64%	64.29%
Incorrectly Classified Positive	20.59%	20.59%	20.59%	28.57%	12.00%	10.53%	17.65%
Incorrectly Classified Negative	28.57%	35.71%	35.71%	8.33%	42.11%	36.36%	35.71%

As shown in Table 15, the models produced similar output with respect to the ROC curves, as the range of area under the curves ranged from 0.7752 to 0.8505. The models with greater areas were that of stage specific tests and therefore likely impacted by the small sample size. All models had a tendency to incorrectly classify negative (deal rejected), more so than the tendency to incorrectly classify positive (deal accepted). This would suggest that the model provided a good basis to reject a deal on the application of three aspects of the venture.⁸⁵

The variable inflation factor suggested there could be an issue with multicollinearity, and as such, some of the variables were removed, but this did not have a large impact on the classification analysis of the models as the classification results remained consistent at about 75 percent. However, additional information, such as the size of grants or revenue, and/or other variables could explain the venture capitalist accepting deals that were otherwise rejected.

6.8 Expanded Data

The first values reported in Table 16, indicate the average for that selected variable where the average is calculated from those deals with a value greater than zero. The fraction reported within parentheses is the number of deals within the selection classification of the subset that have a value greater than zero.

The extended data set consisted of; one test, four test and commercialisation; five commercialisation; six commercialisation and expand and; one expansion based deal. This represented the full spectrum of the venture cycle as defined and tested in this thesis. A number of insights were apparent but unable to be tested via a regression model, due to the small sample size.

⁸⁵ That being, prior government investment, milestone tranches and test-commercialisation stage revenue generation.

Table 16 – Expanded Data

The table below is a summary of the data collected from one firm. The data collected on 17 deals, 9 successful and 8 rejected, allowed for the replacement of the dummy variables used previously with continuous values.⁸⁶ The top row in each box represents an average of the variable⁸⁷, while the number in parentheses represents the number of deals that contained this variable, followed by the percentage within that field that contained that variable. Later investment contains a ratio for how much capital could be invested at a later date. i.e. Two, indicates that twice as much capital could be invested at advantageous terms at a later date. Milestone investment is reported as the number of milestones set by the entrepreneur to receive the intended capital. Government investment is the ratio of prior government investment with respect to the funding be sought for the current level of venture raising. Business Personnel is the number of suitable business personnel, in line with the description set out in Chapter 4.2.2. Variables for both exits and expected realisation were the same as the standard model.

	Number	Deal Size (A\$m)	Later	Milestone	Govern	Business Personnel	Both Exits	Expected Realisation
All	17	1.56	2.14 (7) 41%	1.89 (9) 53%	4.14 (11) 58%	3.25 (8) 42%	35% (6) 35%	5.18
Successful Deal	9	0.82	2.00 (5) 56%	1.86 (7) 78%	6.30 (7) 78%	3.40 (5) 56%	56% (5) 56%	4.22
Unsuccessful deal	8	2.40	2.50 (2) 25%	2.00 (2) 25%	0.36 (4) 50%	3.00 (3) 38%	13% (1) 13%	6.25

Table 16, indicates that funded deals are smaller, suggesting there is a capital allocation constraint, which may be industry or company specific. The strength of prior government funding as an indicator of likely investment was supported by the fact that ventures that received funding, had received 6.3 times the funds in prior government grants. Ventures that did not receive funding, received only 0.36 times the intended investment amount in prior government grants. Clearly, this indicates the potential that government have influence on the attraction of capital, through its investment leverage ability and the third party verification, as the majority of these funds had to be matched either by the founder or a third party, at some stage prior to receiving venture capital investment.

In terms of size, later investment and milestone tranches, showed minimal correlation to deal selection. The level of milestone tranches is similar across

⁸⁶ Note that revenue figures were not available due to confidentiality.

⁸⁷ Excluding any variables that were zero.

funded and unfunded deals while the potential number of tranches, and is actually less. Unfortunately the sample size is small, and it is not possible to use regression analysis to analyse the data. However, it is still possible to use the data in accordance with the standard model. This data suggests that the existence of milestones attracts venture investment, but the number of these milestones is redundant.⁸⁸ Similarly, the number of business personnel was reported to be fairly consistent in all deals, 3.4 in accepted deals against that of 3.0 in rejected deals.

6.9 Results Summary

The nature of this thesis was not to set out to determine efficiency, the method or competency of how a venture capitalist makes investments. Rather, this thesis attempted to identify strong perceptions and potentially conscious or subliminal drivers that lead venture capitalists to make investments. The aim was to identify key variables consistent with the literature, which affected, either in a positive or negative manner, the prospects of a business attracting funding from a venture capitalist.

As discussed above, these variables included: revenue generation before investment, prior government grants, adequate managerial backing, later investment opportunity⁸⁹, milestone setting⁹⁰, multiple potential exit methods and the expected time to realisation of investment. Given the identified variables, a probit regression was utilised to test the accuracy and effectively the consistency of these variables to classify deal selection to either selected or unselected deals.

⁸⁸ Not proven through a regression based model.

⁸⁹ A proxy for a “upside” investment.

⁹⁰ A proxy for “downside” protection.

CHAPTER 7: Discussion of the Results

7.1 Hypotheses Overview

The findings of the seven hypotheses are outlined below, with further detail in subsequent sections.

#	Hypothesis
1	<i>Enterprises which have revenue at early stages of the venture cycle will be more likely to attract venture funding</i> Result: Revenue was identified as a positive indicator of attracting venture investment in early commercialisation phases. At other stages, revenue was produced for all potential ventures and therefore indistinguishable variable for deal selection.
2	<i>Prior Government funding at all stages of development will increase the likelihood of accessing venture funding</i> Result: Prior government funding was the strongest positive indicator, both economically and statistically. This was evident throughout all models and at all stages of investment. Clearly, there is a strong connection between prior Government funding and the attraction of venture investment within Australia.
3	<i>More sophisticated approaches of accessing funding using structures such as later investment and milestone settings will increase the likelihood a particular entity receives venture funds.</i> Result: Venture firms appear to be more concerned with protecting their downside loss than boosting their upside potential. This was shown as milestone investment tranches were a statistically positive indicator of attracting venture capital investment. The option of later upside investment did not have a significant impact on venture selection.
4	<i>Potential early stage venture investments will have no preference towards companies that are adequately resourced with business skills. Later stage investments (i.e. commercialisation and expansion) will have a preference to firms with business skills.</i>

	Result: A relationship was not found to exist between business skills and deal selection, within any model. Further due diligence level interrogation would be necessary to assess this variable through a more in-depth qualitative approach.
5	<i>The availability of multiple exit strategies will increase the likelihood of receiving venture funding.</i> Result: Multiple exit strategies were not shown to be statistically significant in attracting venture investment.
6	<i>Shorter expected time to realisation will increase the likelihood of receiving venture funds.</i> Result: Time to exit realisation did not have a significant impact on attracting venture investment, regardless of the stage of the venture.

7.2 External and Execution Risk

External risks are deemed to be outside the control of the venture capitalist, a market reason to stay away from the investment. Dummy variables that were examined included revenue, indicating some form of acceptance by the market; and the entity receiving prior government grants, indicating the third party potential seen to create a sustainable company.

7.2.1 Revenue Generation

Hypothesis 1: Enterprises which have revenue at early stages of the venture cycle will be more likely to attract venture funding.

Revenue was generated in all later stage investments; therefore, it could not be used as a dependent variable within the model. The creation of an interaction variable to test for early stage test/commercialisation ventures revenue was shown to be a statistically significant and positive determinant of venture investment. The effects on revenue on later stage investments could not be distinguished as all potential investments had produced revenue prior to approaching the venture capitalist.

7.2.2 Prior Government Grants

Hypothesis 2: Prior Government funding at all stages of development will increase the likelihood of accessing venture funding

As seen in Table 2, approximately sixty percent of all deals used for this study received a form of competitive government grant. Preference for companies with prior government investment evident even in late stage deals. The general statistics indicate a strong preference for grants, as seen in Table 3. As seen in Table 3, twenty-seven of the thirty-four investments were government backed.

At all stages of investment and in all models, government grants are a significant and statistically positive indicator for classifying venture investment. Prior government investment acts as an assurance that an independent third party has screened the investment. As Australia is a small venture market, early stage government grants are similar in nature to a previous venture investor. This represents a significant upside as it allows the entrepreneur to leverage opportunities for capital without having to dilute his holdings in the company.

Prior government investment is also statistically significant at later stage or expansion stage venture deals. This suggests that the positive signal that prior competitive government grants provides remains throughout the lifecycle of a firm and not just early stage start-ups who are the main recipients of the grants.

7.3 Internal Risk

Internal agency risk in venture investment flows from the fact the entrepreneur will *always* be more informed than the venture capitalist. As such, negotiations play a role in venture investment, and as Kaplan and Stromberg (2004) identify, internal risks are centred on the control the venture capitalist wishes to gain and contingent compensation the entrepreneur is willing to receive at a later date. This thesis proposes that an entrepreneur offering an amended investment configuration for capital, can act as a signal, indicating

the positive intentions of the entrepreneur toward their project. The two variables that are tested as proxies to this within this thesis are later investment and milestone payments; representing both upside and downside capture of future returns.

Hypothesis 3: More sophisticated approaches of accessing funding using structures such as later investment and milestone settings will increase the likelihood a particular entity receives venture funds.

7.3.1 Later Investment Opportunity

Later investment appears to have no impact on attracting investment as shown by the probit regressions reported in Table 5. Given that a large number of deals have anti-dilution clauses in the contract, the potential upside of returns are protected through negotiations. Therefore, within deal selection, the proposition of later investment potential for a venture capitalist is not likely to provide any additional incentive or act as a signal to attract investment.

7.3.2 Milestone Setting

Milestones are a significant and positive indicator of venture funding as shown in the Standard Model (Table 5). The differentiation from later investment is that it allows a protection of downside risk to the venture investment.

Overall later investment is not significant and in the main model negatively associated with deal selection, while milestone settings are positive and significant throughout all models. This suggests that venture firms appear to be more concerned with protecting their downside loss than boosting their upside potential. As venture deals are characterised by large deviations of potential returns, that is, the possibility for investments to lose money as well as produce high multiples, venture firms are more concerned with protecting downside risk.

7.3.3 Adequate Managerial Backing

Hypothesis 4: Potential early stage venture investments will have no preference towards companies that are adequately resourced with business skills. Later stage investments (i.e. commercialisation and expansion) will have a preference to firms with business skills.

A differentiation of this thesis is in its attempt to assess the business skills in a quantitative manner, as stated, the person having a CA, CFA, MBA, or similar qualification. The results of this thesis find no relationship between managerial backing and deal selection by venture capitalists. It is likely that skills the venture capitalist are interested in are much more qualitative and as such are observed through significant due diligence of the entrepreneur.

7.4 Exit & Timing

Jeng and Wells (1998) found that IPOs had no effect on seed or early stage venture investing but a significant effect on the later stages of investment. Similarly, this thesis found that there was no preference given to investments with exits intended by IPO, trade sale or both. Time to exit was also not a significant factor in attracting investment.

7.4.1 Multiple Exit Modes

Hypothesis 5: The use of multiple exit strategies will increase the likelihood of receiving venture funding.

Additionally, no preference is given for investment regardless of the exit mode intended by the entrepreneur. The potential of indicating multiple modes does not influence the decision of the venture capitalist. Notably, while venture firms state they are concerned with the exit of the potential investment; the variables used in this study were statistically insignificant. This appears to indicate that it is not directly relevant to an investment decision. Discussions with venture firms suggest that the idea of where an exit may occur at entry against how the exit actually takes place later can be very different.

Within the Australian context, the data suggest that there is no preference for a deal that has been earmarked for an IPO or Trade Sale or the potential of both options.

7.4.2 Expected time to realisation

Hypothesis 6: Shorter expected time to realisation will factor positively in attracting venture funds.

Expected time of realisation is not a significant factor in the classification of investment potential. It is likely that the practicalities of investing and exiting within the ten-year fund cycle are screened out at the initial stages, and there is no preference given between investing with a two or eight year target. This supported by the results (Table 3), whereby average expected realisation for both invested and rejected deals, at all stages of investment, does not significantly vary.

CHAPTER 8: Summary

The thesis developed a venture capital investment model using prior contracting theories as a guide to select variables to mimic characteristics in deal selection. The key results suggest that regardless of the stage of investment, prior government grants and/or the investment being proposed through milestone structures, provide a significant, if not vital, role in attracting venture investment in Australia. Further, the results show revenue generation at an early stage of commercialisation is also an important determinant for drawing venture investment.

While unofficial industry assumption, is that venture capitalists invest primarily on the characteristics of the founder, the underlying data shows a range of factors that can offset the agency issues within a particular investment, therefore increasing the likelihood a venture receives capital. This thesis will add to the body of knowledge that will improve our understanding of the selection process in the venture capital market. The examination of the determinants of deal funding success may provide insights as to the extent which market inefficiency exists within the Australian venture capital industry. The three key statistically significant variables in our models indicate that after initial screening by the venture capitalist, they do a reasonable job, in the order of seventy-five to eighty percent accuracy of estimating deal selection behaviour.

The findings of this research have important factors for several parties associated within the industry. The impact to venture capitalists is that further studies can aid in both screening potential investments at a quicker rate, as well as acting as a final stage investment check. This method of screening creates the ability to apply a general screening of all potential investments. The ten to fifteen percent of deals that are not identified may be offset to a satisfactory degree by other attributes not included within this model.

The impact to an entrepreneur, is that the general output demonstrates a proposal to a venture capitalist needs to cover as much detail as possible,

ideally addressing areas that can offset potential concerns. For the entrepreneurs, it is crucial that they pitch an investment-ready proposition; one that has met the basic requirements of the venture firm.

To investors in venture capital (i.e. Limited Partners) this method of study presents an opportunity to investigate whether a particular venture capitalist sticks to an investor pattern and whether this pattern is unique or the same to that of the rest of the industry.

In a similar manner, further research building on the findings of this thesis has the potential to allow government and policy regulators to review what types of firms are attracting investment and, where applicable, develop and tailor competitive grant-based programs. Given the strong correlation between government grants to start-up entities and the investment of Australian venture capitalists into these organisations, it is critical that the efficiency of the government process is reviewed.

8.1 Identified Importance of Government Investment

Further research into the area of government investment is critical to unveil whether the market is maturing. While it is suggested by this thesis that those companies, which are successful in attracting government grants, are more likely to gain additional capital from venture capitalists, the results did not show if they go on to become successful entities.

The removal of the Commercial Ready program by the Federal Government in 2008 not only reduced the amount of funds available to start-up companies but also has the potential to reduce dramatically the ability to attract venture investment. Future research investigating the impact of such a change in government policy on firms in start-up could inform the debate about the benefits to the Australian economy of government funded assistance programs.

8.2 Further Study Potential

The opportunity to access additional data could provide the framework for researchers to undertake significant investigations within this field of study

The potential clearly exists to replicate the research undertaken in this thesis within different sectors of the broader private equity market, from buyouts through to angel investment. It is possible that investment attitudes will vary remarkably across markets and geographical jurisdictions. Time differences and the impact of future government policy proposals could be modelled with such an approach.

A range of potential areas of study that may can be expanded on with the same focus include:

- Are firms successful in their selection? (i.e. the next link to Ivanov et al., working paper, 2009)
- Are investment-specific criteria related to the industry of venture investment?
- Are the criteria different for industry specific venture capitalists against that of generalist venture investors?
- Does government do a credible job, by providing grants to the “correct” entities?
- Is milestone/later investment a realistic assumption and aligned with the success of the firm or is it deception?
- Is there a shift in important criteria over time, i.e. do particular variables lose or gain significance over time?
- Do entrepreneurs amend their approaches for:
 - o different firms?
 - o time periods?
 - o jurisdictions?
- Do deals change from the initial time of pitching to the time of investment?

8.3 Conclusion

This thesis examines which aspects of an entrepreneur’s potential investment are implicitly viewed as crucial, analysed by the characteristics of the companies themselves. This is different to the characteristics that the venture capitalist state that they analyse. While, this may vary between venture

capitalists, and between entrepreneurs, this thesis attempts to identify what factors a venture capitalist will examine at and hence be willing to negotiate, and those that might cause them to walk away from the deal. The differentiation between this approach and the studies mentioned above is that prior papers relate to the aspect of deal construction, how they control a particular factor within a deal, and what a venture capitalist identifies as concerns.

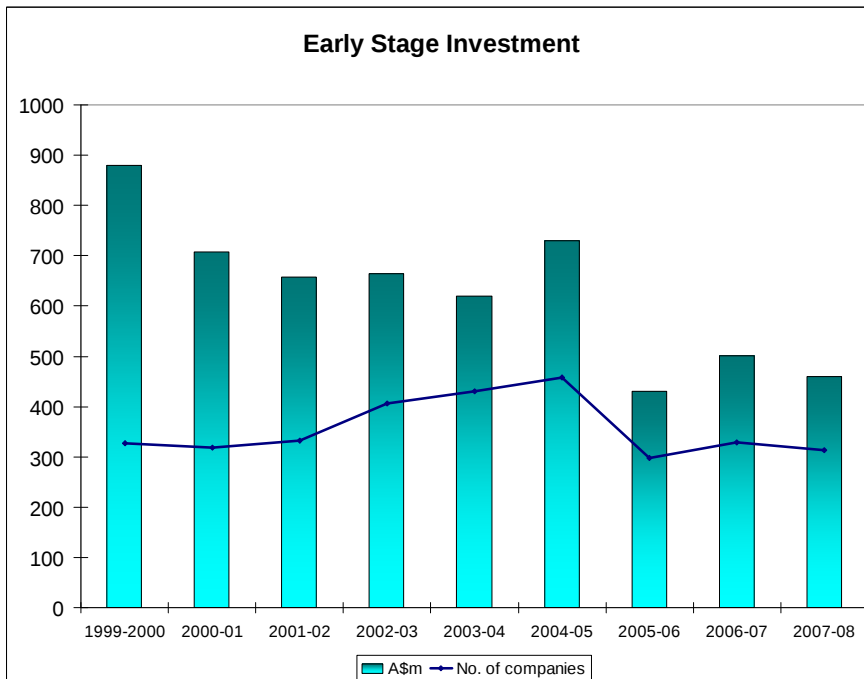
The field of venture investing is still a rather immature industry, particularly within Australia. Investors are increasingly requiring strategic investment criteria and pipelines. Investment into venture firms within Australia has been largely 'hit and miss' and often, highly dependent on the past-history of raising capital. Further critique into the industry, particularly from an Australian perspective can only enhance the characteristics of the industry.

The outcome of this thesis shows that Australian venture capitalists do invest with a degree of consistency, based upon the asymmetric information they are faced with. The ability to repeat this research with access to detailed and robust information, which enables the researcher to analyse actual quantitative statistics could provide an important insights to the industry. Australian venture investment has been very broad and not specific to the procedures used by a manager. Generalist approaches are likely to decline, given the easier access to top tier US venture firms, particularly in the recent economic downturn. While a hindrance for individual managers, in theory this should present a greater opportunity for the industry as a whole as access to more data and well-structured managers becomes commonplace.

Appendices

Appendix A

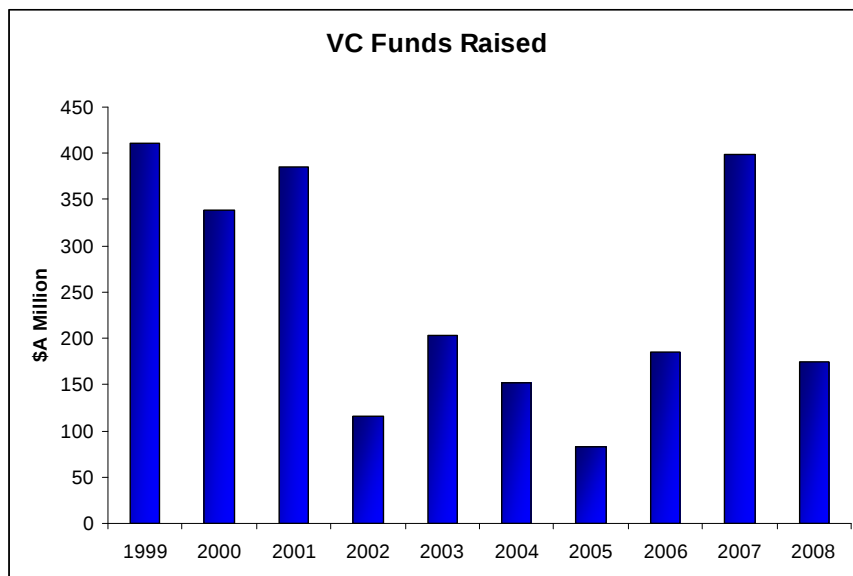
Figure 1A - Early Stage Venture Investment



Source: Venture Capital and Later Stage Private Equity 2007-08, ABS

Figure 2A - Venture Funds Raised

Thomson stats



Source: AVCAL Thomson Financial Yearbook 2008

Table 1A – Commitment Levels

\$A million

2006-2007

	Earlier stages(a)	Expansion	Later stages(a)
Commitments by Investors	1812	5551	7839
Drawdowns from Investors	1381	3583	4530
Unused Commitment	431	1968	3309
Percentage Breakdown	23.8%	35.4%	42.2%

Source: Venture Capital and Later Stage Private Equity 2006-07, ABS

2007-2008

	Earlier stages(a)	Expansion	Later stages(a)
Commitments by Investors	3018	6122	7993
Drawdowns from Investors	1811	4021	4782
Unused Commitment	1208	2101	3212
Percentage Breakdown	40.0%	34.3%	40.2%

Source: Venture Capital and Later Stage Private Equity 2007-08, ABS

Table 2A - Cumulative Annualized IRR since Inception**As at June 30, 2008 - Funds Formed 1985-2007**

Stage	Upper	Median	Lower
Venture Capital	3.3	-0.6	-14.8
Private Equity	14.4	5.4	-2.5

Source: AVCAL Thomson Financial Yearbook 2008

Appendix B

Questionnaire sent to Venture Capital Firms

Topic | Venture Capital Deal Selection
 Researcher | Timothy Peters
 University | University of New South Wales

THE UNIVERSITY OF
NEW SOUTH WALES



Note	Deal Acceptance Did you take on the deal (yes/no)	What is the investment looking to do?			Revenue Stage Is revenue being produced before investment?	Later investment Option Does the original investment have an option for later investment?	Milestone setting Does the proposed investment call for funding in tranches?
		Test What is the purpose of the capital raising from the investment? Test - test an idea Commercialise - turn a tested product into a commercial Expand - expand the operations of an existing entity NOTE: Can answer for more than one section, i.e. test and comm	Commercialise	Expand			
Example	Yes	Yes	Yes	No	No	No	No
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

[illegible]

Appendix C

Standard and Reduced Models

Classification tables shown below demonstrate the area under the ROC curve increases with more variables that may or may not be significant. This is comparable to R^2 increases with additional variables in least squares estimation. The 'remove stages' model produces the same final level of classification of 75.81 percent when the probability is set to half. For each of the three models, the generated ROC curve is created, and the detailed classification table at a standard cut-off of 0.5. The curve does not alter greatly as variables are removed.

Table 1C – Standard Model and Reduced Model Classification

	Model 1			Reduced 1			Reduced 2		
Classified	D	~D	Total	D	~D	Total	D	~D	Total
+	27	8	35	27	10	37	27	10	37
-	7	20	27	7	18	25	7	18	25
Total	34	28	62	34	28	62	34	28	62
Sensitivity	79.41%			79.41%			79.41%		
Specificity	71.43%			64.29%			64.29%		
Positive predictive	77.14%			72.97%			72.97%		
Negative predictive	74.07%			72.00%			72.00%		
False + rate for true ~D	28.57%			35.71%			35.71%		
False – rate for true D	20.59%			20.59%			20.59%		
False + rate for classified +	22.86%			27.03%			27.03%		
False - rate for classified -	25.93%			28.00%			28.00%		
Correctly classified	75.81%			72.58%			72.58%		

Table 2C – Stage Dependent Model Classification

	Test			Commercialise			Expand		
Classified	D	~D	Total	D	~D	Total	D	~D	Total
+	11	2	13	22	8	30	17	4	21
-	1	5	6	3	11	14	2	7	9
Total	12	7	19	25	19	44	19	11	30
Sensitivity	91.67%			88.00%			89.47%		
Specificity	71.43%			57.89%			63.64%		
Positive predictive	84.62%			73.33%			80.95%		
Negative predictive	83.33%			78.57%			77.78%		
False + rate for true ~D	28.57%			42.11%			36.36%		
False – rate for true D	8.33%			12.00%			10.53%		
False + rate for classified +	15.38%			26.67%			19.05%		
False - rate for classified -	16.67%			21.43%			22.22%		
Correctly classified	84.21%			75.00%			80.00%		

Stage dependent models had a significantly larger degree of correct classification. However, there was a tendency to falsely classify positive (deal accepted) more frequently than false classification of a negative (rejected deal). All models were able to correctly classify in excess of 70 percent. Reduced model 2, using just two variables was able to do so at 72 percent. Removing 'extreme' stages and the interaction variable of revenue increased this even further to over 80 percent. However, all models have a tendency to over predict a positive response. The false successful rate for a true unsuccessful negative was over triple the false negative for true positive. The only model in which this was not the case was the final model, using the revenue interaction based variable.

Commercialisation Based Model: No Test only/No Expand Only Investment Opportunities

Table 3C – Model Variable Correlation

	Deal	Test-Stage-Revenue	Government	Milestone
Deal	1.0000			
Test-Comm, Stage-Revenue	0.1676	1.0000		
Government	0.4878***	0.0066	1.0000	
Milestone	0.4390**	-0.3042**	0.2891*	1.0000

Asterisks indicate significant correlation coefficients at the: 10 %(), 5 %(**) and 1 %(***) confidence levels*

Table 4C – Variance Inflation Factors (VIF)

Variable	VIF	1/VIF
Milestone	2.25	0.444891
Prior Government	2.11	0.474441
Test Comm Stage Revenue	1.10	0.909091
Mean VIF	1.82	

Table 5C - Commercialisation and Interaction Variable Model

	Dependent Variable – Deal Selection N = 44
Constant	-1.64 (0.56)***
Test stage revenue	1.52 (0.77)**
Milestone	1.47 (0.54)***
Government	1.18 (0.47)**
Log Likelihood	-19.71
Pseudo R²	0.3450
Area under ROC Curve	0.8295

Table 6C – Early Stage Revenue Model

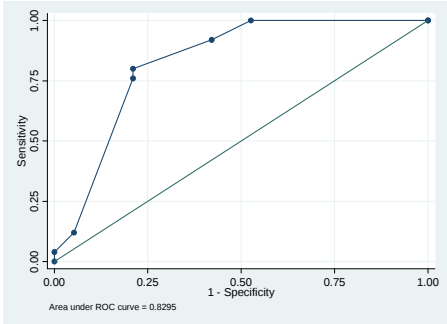
ROC Curve			
			
Early Stage Revenue Model			
Classified	D	~D	Total
+	19	4	23
-	6	15	21
Total	25	19	44
Sensitivity	76.00%		
Specificity	78.95%		
Positive predictive	82.61%		
Negative predictive	71.43%		
False + rate for true ~D	21.05%		
False – rate for true D	24.00%		
False + rate for classified +	17.39%		
False - rate for classified -	28.57%		
Correctly classified	82.95%		

Table 7C – All Variables Interaction Model

	Dependent Variable – Deal Selection N = 62
Constant	-1.01 (0.40)**
Test	0.22 (0.46)
Comm	-0.49 (0.42)
Test-comm stage revenue	1.26 (0.81)
Milestone	0.76 (0.39)*
Government	1.18 (0.38)***
Log Likelihood	-32.56
Pseudo R²	0.2372
Area under ROC Curve	0.8057

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