



Venture capital budgeting – Carry and correlation



Christian Riis Flor*, Kevin Berg Grell

Department of Business and Economics, University of Southern Denmark, Campusvej 55, 5230 Odense M, Denmark

ARTICLE INFO

Article history:

Received 25 May 2012

Received in revised form 13 February 2013

Accepted 14 February 2013

Available online 28 February 2013

JEL classification:

G24

D82

Keywords:

Venture capital

Carry

Staging

Moral hazard

Adverse selection

ABSTRACT

We analyze venture capital budgeting in a model with agency conflicts among entrepreneurs, venture capitalists, and investors. Our three-player setting is crucial for the analysis of compensation to venture capitalists. We focus on the venture capitalist's decision to invest in correlated enterprises, and we emphasize the importance of information and the venture capitalist's role in resolving adverse selection on the entrepreneurial side. The importance of information increases the minimum carried interest offered to the venture capitalist, whereas correlated projects decrease it. The carried interest is determined by the size and level of correlation in his portfolio. Our analysis provides predictions in line with a number of empirical observations, e.g. that venture capitalists typically receive a carried interest which is "sticky" around a 20% level.

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1. Introduction

Venture capital has received increasing attention over the past three decades, and it is recognized as an important source of innovative capital. Counting venture capital backed enterprises such as Apple Inc., eBay, Google, Intel Corp., Microsoft, and Starbucks Corp., the attention seems well-founded. From an academic point of view, the question is how a relatively small fraction of the total investment level can nurture high-flyers of such visibility. The literature investigates five main contributions of venture capitalists: screening, advising, monitoring, certification, and exercising control.¹ The present paper analyzes the importance of screening and monitoring taking certification and the exercising of control as given. The analysis provides a new rationale for venture capitalists' portfolio choices in terms of both the types and number of enterprises that receive funding. Our results are consistent with known empirical findings and provide several new predictions.

Further, we analyze the staging and budgeting of venture capital. Funding is provided by investors, projects are provided by entrepreneurs, and venture capitalists serve as information intermediaries. To this end, we develop a parsimonious two-period model with three types of agents. The total capital outlay is provided by an uninformed investor to an unendowed intermediary (the venture capitalist), who in turn allocates the outlay onto individual entrepreneurs. The entrepreneurs are endowed with an investment opportunity, and their ability to manage the enterprise is private information. To focus our analysis we take the

* Corresponding author. Tel.: +45 6550 3384; fax: +45 6550 3237.

E-mail addresses: crf@sam.sdu.dk (C.R. Flor), kgr@sam.sdu.dk (K.B. Grell).

¹ A non-exhaustive list of references for these topics is: Screening (Amit et al., 1998; MacMillan et al., 1987), advising (Casamatta, 2003; Kannianen and Keuschnigg, 2003, 2004), monitoring (Allen, 1990; Barry et al., 1990; Bengtsson and Sensoy, 2011; Bergemann and Hege, 2005; Gompers, 1995; Lerner, 1995), certification (Benzoni and Schenone, 2009; Meggison and Weiss, 1991), and exercising control (Berglöf, 1994; Cumming, 2008; Gompers, 1997; Hellmann, 1998). Further, Denis (2004) provides a thorough outline of the issues and literature related to agency conflicts in entrepreneurial finance.

predominant contracting environment for venture capital firms as given. Thus, the venture capital firm is structured as a limited partnership in which the venture capitalist is the general partner and the investor is the limited partner. The partnership is compensated with preferred stocks where seniority is given in case of liquidation. Within the partnership, the venture capitalist is compensated with carried interests of the total profits, which are given as the return on the preferred stock net of the initial outlay.²

One of our main results is to provide equilibrium conditions that emphasize the role of the venture capitalist as an information intermediary, namely resolving adverse selection on the entrepreneurial side via screening and monitoring. The venture capitalist can get informed about the quality of entrepreneurs in two ways. He can invest such that the bad entrepreneurial type reveals herself by shirking, or engage in a costly due diligence process that makes him better informed before the final funding round. In this respect, our model is related to the literature on information gathering; see e.g. [Lewis and Sappington \(1997\)](#) and [Bergemann and Välimäki \(2002\)](#). A key feature in our model is that information is cheaper with correlated projects. We consider two projects to be correlated if the venture capitalist becomes better informed about the likelihood of success of one project by observing signals from the other project as well. We show that the importance of information increases the minimum carried interest the investor offers the venture capitalist, which enables us to derive several predictions about the venture capitalist's carried interest. Further, we analyze the link between portfolio selection and the venture capitalist's compensation. We show that the preferences within the limited partnership can differ considerably. This provides us with several predictions, e.g. that young venture capitalists enter the industry by offering deals that are more favorable for the investor.

The stability of the carried interest (carry) of venture capitalists puzzles practitioners as well as academics. In a recent study, [Metrick and Yasuda \(2010a, p. 2311\)](#) elegantly point out the lack of fluctuation:

“The exact origin of the 20% focal point [for carry] is unknown, but previous authors have pointed to Venetian merchants in the Middle Ages, speculative sea voyages in the age of exploration, and even the book of Genesis as sources.”

Our model provides an incentives-based rationale that might shed new light on and contribute to our understanding of the carry. Not surprisingly the carry reflects the relative bargaining positions in the limited partnership, but our model enables us to derive a lower bound on the carry. This bound is not determined by the venture capitalist's participation constraint, but by the investor's incentives to resolve any entrepreneurial adverse selection problems via screening and monitoring—rather than detecting entrepreneurial shirking in the later-stage funding rounds.³ [Sahlman \(1990, p. 495\)](#) points out that compensating the general partner (the venture capitalist) with a carry, provides incentives for him “to engage in activities that increase the value of the carry, which is precisely what benefits the limited partners.” In our model these activities mainly involve the due diligence, early stage monitoring, and intermediate funding or restructuring decisions. Thus, the venture capitalist's carry provides incentives for him to get as informed as possible before providing later-stage funding.

Besides the relation to the venture capital and information gathering literature, our model is related to preproject planning. The engineering aspects of preproject planning deal with the identification and timing of individual tasks before a manager considers whether a project should be initiated; see [Carrillo \(2006\)](#) and [Gibson et al. \(2006\)](#). Since this task by and large is made on the discretion of a manager, it is natural to expect moral hazard in the process, as analyzed by [Lin and Sappington \(2010\)](#). Our model allows for more flexibility than the aforementioned papers, since we seek to analyze how a given compensation scheme changes with the shape of venture capitalists' portfolios. For a thorough analysis of the shape of optimal compensation schemes we refer to the aforementioned models on information gathering ([Lin and Sappington, 2010](#)) and auditing/screening literature (e.g. [Crémer et al., 1998](#); [Kim, 2006](#)).

The paper is organized as follows: [Section 2](#) presents our model in the simple case with one entrepreneur, while [Section 3](#) extends the model to include funding of two entrepreneurs. [Section 4](#) derives several empirical predictions and discusses some of the assumptions of our model. [Section 5](#) concludes. Proofs are postponed to an [Appendix A](#).

2. Funding one entrepreneur

We first set up our basic model in which the venture capitalist funds a single entrepreneur.⁴ This allows us to focus on the fundamental structure of the model and to focus on how the venture capitalist's adverse selection problem induces a moral hazard problem for the entrepreneur. Subsequently, we consider the duopoly case with two entrepreneurs and analyze the implications for the venture capitalist's investment decision.

We consider a two-period model with three players: an entrepreneur, a venture capitalist, and an investor. All players are assumed risk neutral and the risk free rate of interest is 0. The entrepreneur, who is chosen among a pool of entrepreneurs, is unendowed, but she has access to a two-stage investment project: \mathcal{F} is invested in the first period and \mathcal{I} is invested in the second period. For a given investment $(\mathcal{F}, \mathcal{I})$ the investment opportunity returns

$$V(k, \mathcal{F}, \mathcal{I}) = k\mathcal{F}^\gamma \mathcal{I}^{1-\gamma}. \quad (1)$$

² See [von Thadden \(2009\)](#) for a review of the links between financial contracting and various agency conflicts. [Wang and Zhou \(2004\)](#) analyze how agency problems can be resolved, when sharing contracts are used in combination with staged financing.

³ See [Wang \(2008\)](#) for a private information rationale for the use of staged financing.

⁴ For notational convenience, we refer to this case as the monopoly case, although we do not assume that the entrepreneur holds complete bargaining power over the venture capitalist and the investor. Similarly, we refer to the case with two entrepreneurs as the duopoly case.

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