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METRICK • YASUDA

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ANDREW METRICK • AYAKO YASUDA

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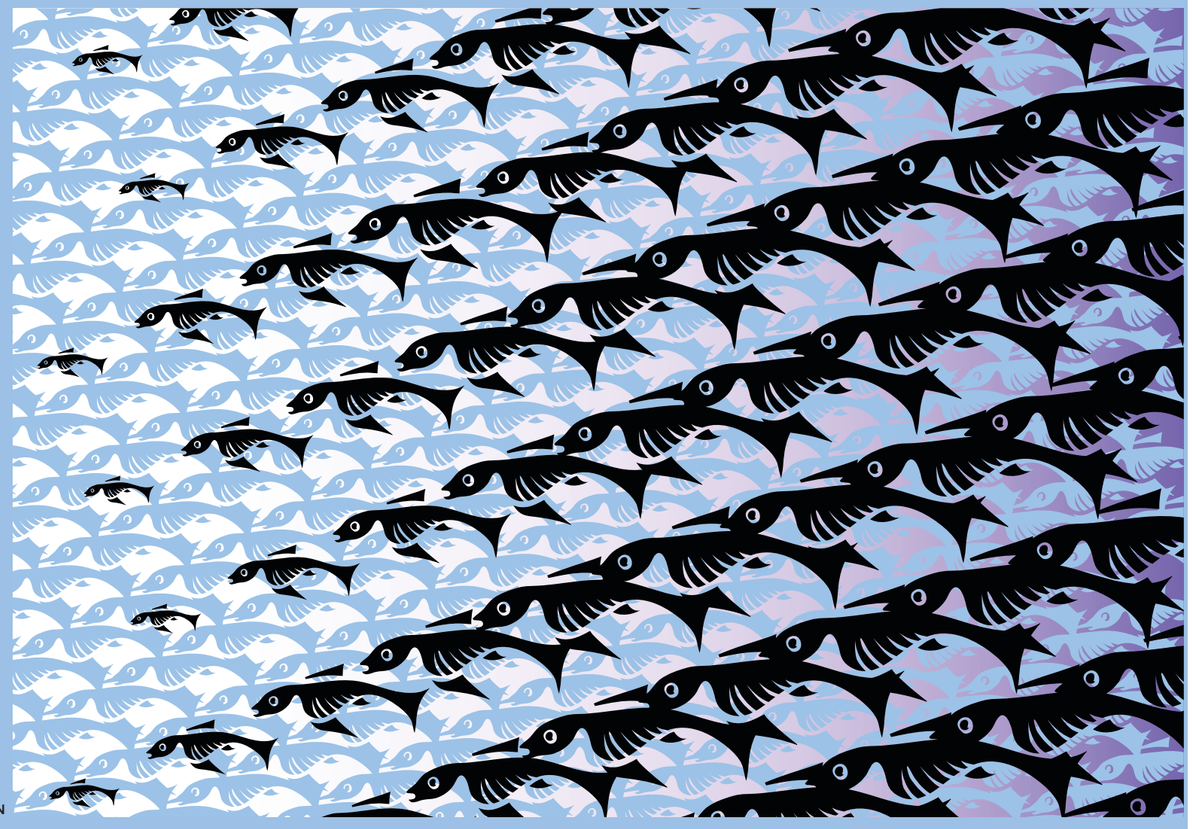

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THIRD EDITION

Andrew Metrick
Yale School of Management

and

Ayako Yasuda
Graduate School of Management, UC Davis

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About the Authors

Andrew Metrick is the Janet L. Yellen Professor of Finance and Management at the Yale School of Management (SOM) and the Director of the Yale Program on Financial Stability. He earned a Ph.D. in economics from Harvard in 1994, and a B.A. in economics and mathematics from Yale in 1989. Prior to joining the Yale faculty in 2008, he held positions in the finance department at Wharton and the economics department at Harvard. In academic year 2009–10, he was on leave at the Council of Economic Advisers in Washington. Upon returning to Yale, he served as the Deputy Dean of SOM from 2010 to 2016.

Ayako Yasuda is Professor of Finance at the Graduate School of Management, University of California, Davis, Fellow of the Muir Institute for the Environment, and Fellow of the Private Equity Research Consortium. She earned a Ph.D. in Economics from Stanford in 2001, and a B.A. in Quantitative Economics (*Dean's Distinction, Phi Beta Kappa*) from Stanford in 1993. She previously held academic positions at Wharton and UC Berkeley, an independent director position at the Japan Investment Corporation, and was an analyst at Goldman Sachs.

For Susie, David, and Amy
AM

For Garris, Miumi, and Gen
AY

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Preface to 3rd Edition—A Reader's Guide

In the decade since the publication of the second edition of this book in 2010, remarkable growth and development has taken place in the world of venture capital. In 2018 the U.S. VC investments reached a high that nearly matched the peak of the Internet Bubble in 2000. Meanwhile China is now the second largest VC market in the world. Across the globe VC-backed startups have grown in size and clout to an unprecedented level, dominating newly emerging markets at a rapid pace.

While the organization of the book remains unchanged, many of the chapters have been substantially rewritten to reflect these developments. For example, in Chapter 5, we re-rank top VC firms by re-vamping our selection criteria to include disclosed fund performance statistics as well as the number of seed-/early-stage unicorn investments and the percentage of IPOs among their investments. The modified criteria allowed us to evaluate recent records of some of the best-known VC firms whose financial performance has not been publicly available for the last two decades. In Chapter 6, we document the remarkable growth of VC markets in emerging Asia, especially China and India, and examine four factors that help explain the empirical patterns—exits, regulatory and legal infrastructure, country risk, and cultural attitudes. In Chapters 3, 4, and 7, we introduce two new data sources in this edition—Refinitiv's Venture Capital Research Index and Correlation Ventures' portfolio company-level VC investment database—to study VC performance. Refinitiv, formerly part of Thomson Reuters, has maintained a value-weighted monthly gross return index of U.S. VC investments since 1996. Correlation Ventures uses VentureSource as a foundation but also leverages other commercial data suppliers, public documents, and proprietary sources to build one of the most comprehensive VC investment databases today. We use these remarkable data sources in addition to the sources used in previous editions to compile the historic performance of VC investments, examine VC risk and returns, and update our estimate of the VC cost of capital. Other chapters are also thoroughly updated using the latest statistics available as of the writing of the book.

We also made improvements to the VCV model, used extensively in Part III of the book and available as a Web-based application at http://VCVtools.com. Other supplemental spreadsheets, including DCF.xlsx (used extensively in Chapters 11 and 12) are also updated.

The Organization of this Book

The book is divided into four parts, with six chapters each. Each of these four parts has a major finance theme: the theme of Part I is the relationship between risk and return; the theme of Part II is the valuation of high-growth companies; the theme of Part III is the analysis of capital structure; and the theme of Part IV is the relationship between strategy and finance. Overall, Parts I and II are heavy on data and definitions and are intended to provide students with the vocabulary of VC and knowledge of the key industry facts. Although these two parts contain some new definitions and approaches, most of the material should seem familiar to a VC practitioner. In contrast, Parts III and IV are more theory-based and provide a new perspective on the evaluation of VC and other high-technology investments. Some of the applications, for example, the concept of the implied-post valuation introduced in Chapter 17, are now gaining recognition among practitioners as

alternatives to post-money valuation and other industry conventions. This makes sense in the age of unicorns, where there is a rush to pass the $1B mark in company valuations for marketing purposes, and it is all the more important to point out that post-money valuation may inflate the true value of companies in some instances.

In Part I, "An Introduction to VC," we provide an overview of the VC industry, with discussions of history (Chapter 1), major players (Chapters 2 and 5), performance measurement (Chapters 3 and 4), and global patterns (Chapter 6). The discussion of risk and return in Chapters 3 and 4 provide a key translation between the language of VC and the language of financial economics—a translation that we rely on heavily throughout the book.

In Part II, "Total Valuation," we provide data and methods used to value a high-growth company. We first review the investment process used by VCs and provide data on their historical performance (Chapter 7). We next describe the structure of VC transactions (Chapters 8 and 9) and then demonstrate the industry-standard technique for the valuation of VC investments (Chapter 10). This technique, known loosely as "the venture capital method," requires that analysts estimate company values far into the future. Although such estimates will always contain a fair amount of guesswork, we show how to use a "reality-check" model to frame these estimates (Chapter 11) and how to use evidence from comparable companies to provide an additional input for the investment decision (Chapter 12).

In Part III, "Partial Valuation," we take the total valuation (Part II) as given and analyze the special features of VC transactions. In most VC transactions, the investors receive preferred stock with several special features. When there are many VC investors, the capital structure of the company grows quite complex, with each investor holding a unique place in the capital-structure hierarchy of the company. In Part III, we show how to divide the total valuation of the company into its component parts (partial valuation) for each investor. The key step in this analysis is the recognition that all flavors of preferred stock can be represented as a portfolio of options. In Chapter 13, we show how the classic option-pricing analysis of Black and Scholes can be extended to VC settings. We then apply this extended analysis to the valuation of preferred stock (Chapters 14, 15, and 16). The techniques used in these chapters can also be used to refine some industry-standard measures of company valuation (Chapter 17) and to estimate the partial valuation of complex nonstandard transaction structures (Chapter 18).

Parts II and III of the book take the perspective of a venture capitalist making an investment in a high-technology company. In Part IV, we take the perspective of the company deciding what to do with VC money or other capital. Specifically, we develop a framework for modeling investment in "research and development" (R&D). Since VC-backed companies typically spend a significant fraction of their capital on R&D, an understanding of R&D finance is crucial for both VCs and for financial decision-makers at technology companies of all sizes. After introducing typical kinds of R&D investment problems (Chapter 19), we study several of the most interesting and cutting-edge techniques in finance, including Monte Carlo analysis (Chapter 20), real options (Chapter 21), binomial trees (Chapter 22), and game theory (Chapter 23). In Chapter 24, we pull all of these tools together and solve the investment problems originally posed in Chapter 19.

Several appendices supplement the text. Appendix A provides an example "term sheet" VC contract developed by the National Venture Capital Association. Appendix B provides some basic documentation for the companion spreadsheets and the web-based valuation model used in the book. Appendix C is a brief primer on Oracle Crystal Ball software, a commercial product from Oracle that is useful for solving some of the models in Part IV. Finally, a glossary at the end of the book gives definitions for all key terms used in the book.

What this Book Covers . . . and What it Doesn't

To be successful, VCs must have a broad general knowledge of business and all its disciplines: marketing, management, finance, operations, accounting, and so on. In addition, most VCs must acquire specialized knowledge in one or more high-technology industries. It is not possible to cover all these areas in one textbook, nor is it advisable to even try. This book focuses almost exclusively on finance, specifically on the valuation of high-technology investments. The ideal reader is an MBA student or advanced undergraduate who is both interested in VC and intellectually curious about finance. We wrote the book for this prototypical reader; your distance from this prototype will likely predict your satisfaction with this book. In particular, readers looking for a "how to" guide for being a successful VC are sure to be disappointed. We doubt such a book is even possible, and we are sure that we could not write it.

For instructors, the 24 chapters of the book can provide for 24 class meetings with 75 minutes each (= 30 hours) for a course of the same name as the book. That is how we taught it at Wharton.[1] Alternatively, a finance course on "Venture Capital," could omit Part IV of the book and include six additional case-study classes to fill out a full semester course. For a quarter-length course that meets 20 times for 90 minutes each (= 30 hours), some chapters can be combined (for example, chapters 1 and 2, 3 and 4, and 11 and 12) or omitted (e.g., 18, 22–24). For a six-week course (= 15 class hours) on "Venture Capital," the first two parts of the book can provide a self-contained framework.

For any of these VC courses, many instructors may choose to combine this book with case studies. At Wharton, we used this book as the main text, with case studies from the books by Josh Lerner and Felda Hardymon of Harvard Business School used to illustrate the practical applications of the concepts. Alternatively, one could use the case studies as the main classroom topics, with this textbook as background.

For VC courses taught outside of a finance department, instructors will rightly want to emphasize different aspects of VC practice. At Yale and UC Davis, we have a highly successful entrepreneurship course taught by management faculty—a course that has virtually no overlap with this book. Furthermore, as one might expect, courses taught by VC practitioners are often much more "practical," with many class sessions dedicated to the nuts and bolts of working with young companies. While we believe that some chapters of this book could provide useful background for these practitioner courses, we are certain that most of the book would be useless. We have found that students can learn a tremendous amount from these practice-based courses, and have made no attempt to substitute for these valuable lessons.

There are several related topics for which this book has some imperfect overlap. For example, for courses in "entrepreneurial finance," students typically need some exposure to VC. For these students, Part I should be useful, while the other parts are likely to be overkill. This book takes the perspective of a venture capitalist—not the perspective of an entrepreneur. The latter perspective requires a careful study of non-VC sources of capital for young companies, a perspective that this book does not cover at all. Furthermore, the financial management of young growth companies is another important topic in entrepreneurial finance. While such a topic could conceivably have been included in this book, we chose instead to focus on the valuation aspects of VC finance.

Another topic of some overlap would be a general course on "private equity." As will be discussed in Chapter 1, private equity is a broad class of investing that includes VC as well as investments in leveraged buyouts, mezzanine structures, and distressed companies. (All these terms will be defined in Chapter 1.) For instructors of such classes, the usefulness of the book depends on the relative emphasis on VC. Six weeks (= 15 hours) of VC can be supported by Parts I and II, supplemented with (or supplementing) case studies. For private equity courses with less than six

[1] Both authors previously taught at Wharton, 1999–2008 for Metrick and 2001–2009 for Yasuda.

weeks of VC, the reductions can be accomplished in Parts I and II by omitting some combination of Chapters 5, 6, and 9, and combining Chapters 11 and 12 into a single class meeting.

Notes on Terminology, Style, and Mathematics

The text assumes that readers have familiarity, but not mastery, of the basic concepts from first-year MBA courses in finance, statistics, and accounting. (For example, the book assumes that readers know the definitions for "mean" and "standard deviation," but does not assume that readers have memorized formulas for the mean and standard deviation of any specific probability distributions.) Most of the mathematics in the book goes no further than simple algebra. In Parts III and IV of the book, we use some basic calculus in a few places, but even there it is more important that readers know what an integral "does" rather than know how to solve any specific integrals.

The book assumes *no prior knowledge of venture capital*. All key terms are given in **bold type** in their first appearance in the text. Because this book is attempting to provide a bridge between the language of VC and the language of finance, it is sometimes helpful to introduce new terminology in order to ease the translation. Such new terminology is given in ***bold italic*** type in its first appearance in the text. All key terms are listed at the end of the chapter of their first appearance. At the end of the textbook, a glossary provides definitions for all key terms. The text uses many acronyms to shorten the exposition. Each acronym is spelled out in its first appearance, followed by the acronym given in parenthesis: for example, **venture capital (VC)**. All acronyms are also listed in the glossary.

Contents

The VC Industry

1

In this chapter, we provide a definition of **venture capital** (Section 1.1), take a preliminary look at the activities of **venture capitalists** (Section 1.2), explore the history of venture capital (Section 1.3), and review a variety of statistics on the patterns of venture capital investment (Section 1.4). Throughout this text, we use the abbreviation **VC** to refer to both the venture capital industry and to an individual venture capitalist.

1.1 What Is Venture Capital?

A VC has five main characteristics:

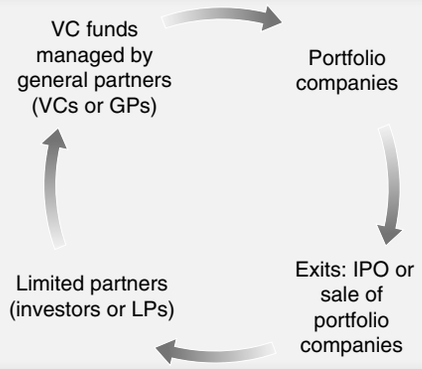
1. A VC is a **financial intermediary**, meaning that it takes the investors' capital and invests it directly in **portfolio companies**.
2. A VC invests only in private companies. This means that once the investments are made, the companies cannot be immediately traded on a public exchange.
3. A VC takes an active role in monitoring and helping the companies in its portfolio.
4. A VC's primary goal is to maximize its financial return by **exiting** investments through a sale or an **initial public offering (IPO)**.
5. A VC invests to fund the internal growth of companies.

Characteristic (1) defines VCs as financial intermediaries. This is similar to a bank, because just as a bank takes money from depositors and then loans it to businesses and individuals, a VC fund takes money from its investors and makes equity investments in portfolio companies. Typically, a VC fund is organized as a **limited partnership**, with the venture capitalist acting as the **general partner (GP)** of the fund and the investors acting as the **limited partners (LP)**.[1] If all goes well, the VC eventually sells its stake in the portfolio company, returns the money to its limited partners, and then starts the process all over again with a different company. Exhibit 1-1 illustrates the key players and the flow of funds in the VC industry.

VCs are often compared to—and confused with—**angel investors**. Angel investors, often just called **angels**, are similar to VCs in some ways but differ because angels use their own capital and, thus, do not satisfy characteristic (1). There are many types of angels. At one extreme are the wealthy individuals with no business background who are investing in the business of a friend or relative. At the other end are groups of angels with relevant business or technical backgrounds who have banded together to provide capital and advice to companies in a specific industry. In the latter case, the angel groups look very much like VCs, but the fact that they use their own capital changes the economics of their decisions: Since they can keep all the returns to on their labor, they

[1] The organization structure of VC funds will be discussed at length in Chapter 2.

Exhibit 1-1 The Flow of Funds in the Venture Capital Cycle



have a correspondingly lower cost of capital and can invest in deals that would not work for a VC. Although it is difficult to get reliable figures on angel investing, the best available survey evidence for recent years suggests that total angel investments are approximately $20 billion per year.[2] Compared to VCs, angels focus on younger companies and make a larger number of smaller investments.

Characteristic (2) defines VC as a type of **private equity**. Although the definitions of "private company" and "public company" have some nuances, the key distinction is that a public company's securities can be traded in a formal market, like the NYSE or the NASDAQ, whereas a private company's securities cannot. Any company that is publicly traded in the United States must also file regular reports with the Securities and Exchange Commission (SEC) detailing its financial position and material changes to its business. When combined with the activities of professional traders in public markets, this requirement to file creates significant amounts of information about public companies. In comparison, information about private companies is practically nonexistent. Private equity is considered to be a category of **alternative investing**, where "alternative" stands in contrast to "traditional" investing in stocks and bonds.

Characteristic (3) is central on our list—and central to the success of any VC. Without (3), a VC would only be providing capital, and his success (or failure) would be entirely due to his ability to choose investments. Although success can, of course, be entirely built on these choices, the comparative advantage of the VC would be greatly improved if the investor could also help the company directly.

This help takes many forms. Most notably, VCs typically take at least one position on the board of directors of their portfolio firms. Having board representation allows them to provide advice and support at the highest level of the company. (More than one VC has remarked that his job could be described as being "a professional board member".) In addition to board service, VCs often act as unofficial recruiters and matchmakers for their portfolio firms. Young companies often have a difficult time attracting high-quality talent to a fledgling operation, and VCs can significantly mitigate this problem by drawing on their reputation and industry contacts. A VC who performs these value-added services well has a sustainable form of competitive advantage over other investors.

Because VCs are financial intermediaries, they need some mechanism to give money back to their investors. Thus, a savvy VC will only make an investment if he can foresee a path to exit, with

[2] The most comprehensive data on the angel market is maintained by the Center for Venture Research at the University of New Hampshire: https://paulcollege.unh.edu/research/center-venture-research/cvr-analysis-reports. Their annual reports on the state of the angel market provide the evidence cited in this paragraph.

proceeds of this exit returning to the VC and his investors. Exits can occur through an IPO, with a subsequent sale of the VC stake in the open market, through a sale of the company to another investor, or through the sale of the company to a larger company. Because of the need to exit, VCs avoid investments in "lifestyle" businesses (companies that might provide a good income to the entrepreneurs, but have little opportunity for a sale or IPO).

Characteristic (4), the requirement to exit and the focus on financial return, is a key distinction between venture capital and **strategic investing** done by large corporations. As a perpetual entity, a corporation can afford to take stakes in other businesses with the intention of earning income, forming long-term alliances, and providing access to new capabilities. It is possible for the corporation to maintain this stake indefinitely.

A strategic investor may satisfy all the other characteristics, but without the need to exit, the strategic investor will choose and evaluate investments very differently from a VC. In some cases, a corporation may set up an internal venture capital division. In the industry, this is referred to as **corporate venture capital**. This label can be confusing, as only sometimes do such divisions satisfy characteristic (4). These corporate VC efforts will often have strategic objectives other than financial returns and will have neither dedicated supplies of capital nor an expectation that capital will be returned within a set time period. When (4) is not satisfied, the investment activity can take on a very different flavor than the type studied in this book.

The requirement to exit provides a clear focus for VC investing activities. There are nearly 28 million businesses in the United States; more than 99 percent of these businesses would meet the government definition of a "small business."[3] In general, small businesses are difficult to exit, and only "large businesses"—those in the top 1 percent of all businesses—have a realistic chance to go public or be sold in a liquid acquisition market. It is therefore typical for VCs to invest in small businesses—but they only do so when these small companies have a realistic chance to grow enough to become a large company within five to seven years after the initial investment. Such rapid growth is difficult to attain in most industries; therefore, VCs tend to focus on high-technology industries, where new products can potentially penetrate (or even create) large markets.

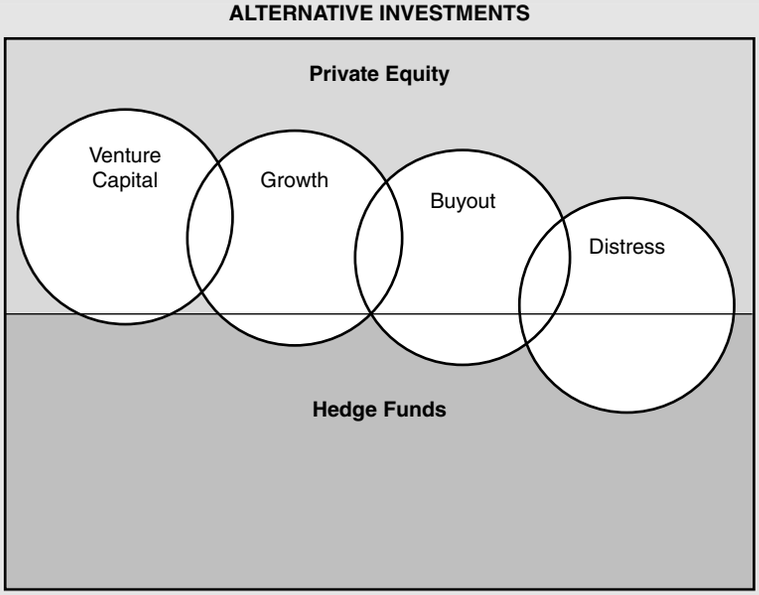
Characteristic (5) refers to "internal growth," by which we mean that the investment proceeds are used to build *new* businesses, not to acquire existing businesses. Although the legendary VC investments tend to be those adventurous VCs who backed "three guys in a garage," the reality of VC investing is much more varied. As a simple classification, we divide portfolio companies into three **stages**: **seed/startup, early-stage**, and **late-stage**. At one end of the spectrum, seed/startup companies are trying to produce a proof of concept. At the other end, late-stage companies are already shipping products, and in either the initial expansion stage or a more mature, stable growth stage. A late-stage VC portfolio company should be able to see a plausible exit on the horizon. This leaves early-stage companies, who represent the critical stage in the life of startups where they are trying to make a leap from a mere idea to commercialization of their product. VCs arguably play the most hands-on, day-to-day role in this stage of a startup's life. In Section 1.4.1, we give more precise definitions of these stages, along with evidence about the investment patterns by stage.

Characteristic (5) also allows us to distinguish VC from other types of private equity. Exhibit 1-2 illustrates the overlapping structure of the four main types of private equity investing and also shows the intersection of these types with **hedge funds,** another category of alternative investments. The relationship between private equity and hedge funds will be discussed.

The largest rectangle in the exhibit contains all of alternative investing, of which private equity and hedge funds are only two of many components. These components are represented by two smaller rectangles within alternative investing. The different types of private equity investing are represented by the overlapping circles within private equity, with some overlap with hedge

[3] See https://www.sba.gov/sites/default/files/FAQ_Sept_2012.pdf. Generally, businesses with fewer than 500 employees are considered "small businesses."

Exhibit 1-2 Private Equity and Hedge Funds



funds. The sizes of the circles and rectangles are not matched to the scale of the investing categories, but rather are intended to illustrate the relative scopes of overlap.

Venture capital sits on the far left of Exhibit 1-2 and intersects with the growth category. This category comprises two distinct investment styles with funds dedicated to each strategy. The first investment style is a form of late-stage (often very late-stage) venture capital called growth equity. Some VC funds do this kind of investing (hence the intersection), but the bulk is financed by specialized growth equity funds. Like venture capital, this financing is done as a minority equity investment, but the main difference is that it targets more mature companies with proven business models that are perceived to be market leaders within an industry/sector. These companies are more likely than typical VC portfolio companies to become profitable during their investment holding periods, and at or near critical inflection points where growth capital can fuel substantial revenue and profitability growth.[4] The second investment style is called mezzanine and is typically in the form of subordinated debt (junior to bank loans), with some additional equity participation in the form of options (warrants) to buy common stock. A variety of financial intermediaries engage in this type of financing, including hedge funds, banks, insurance companies, specialty finance corporations, and non-VC private equity funds. Mezzanine financing is often provided to fund corporate expansions, just as growth equity financing does. Alternatively, mezzanine financing is used to provide another layer of debt financing for highly leveraged buyout (LBO) transactions. This second meaning of "mezzanine" first arose in the mid-1980s during the first wave of LBO boom. Between the two subcategories of growth capital, growth equity has grown more rapidly in the last decade, and now raises nearly four times as much capital as mezzanine, according to Preqin data.[5]

[4] The description of growth equity here are nearly verbatim from Stewart (2012).
[5] 2018 Preqin Global Private Debt Report, 2018 Preqin Global Private Equity Report.

Because the subordinated debt in mezzanine investing will often be attached to some equity ownership, mezzanine investing can also intersect with the pure equity investing done in buyouts, the next category in Exhibit 1-2. Buyout investing is the largest category of private equity, with total funds under management about 2.5 times as great as for venture capital. Buyout investors pursue a variety of strategies, but a key feature of buyout investors is that they almost always take majority control of their portfolio companies. (In contrast, VCs usually take minority stakes in their portfolio companies.) Large buyouts of public companies typically garner the biggest headlines, and the most famous buyout of all time—the $25 billion purchase of RJR Nabisco by Kohlberg, Kravis, and Roberts (KKR) in 1989—was the largest transaction of its kind until 2007, when KKR, Texas Pacific Group, and Goldman Sachs bought TXU Corp. for $45 billion. In these large buyouts, the investors put up the equity stake (these days it is usually between 20 and 40 percent of the total purchase price) and then borrow the rest from banks, public markets (noninvestment grade or "junk bonds"), nonbank lenders, and mezzanine investors—hence the term **leveraged buyouts (LBOs)**.

Despite the publicity generated by these large buyouts, most buyout firms are engaged in more everyday deals involving the purchase of "middle-market" companies. Although some of these so-called middle-market companies may qualify among the largest 1 percent, many of them still lack the growth potential to generate much interest from public markets. This is typically because the company is in an older industry that has more stable cash flows and limited potential for internal growth. In this case, private equity investors can create liquidity for the current owners through a buyout. Such buyouts do not always include leverage. A related strategy is "buy-and-build", where a buyout investor will acquire a series of firms in a fragmented industry for the purpose of taking advantage of changes in the optimal industrial scale. Although buy-and-build is a growth investment strategy, the growth comes *externally* from the purchase of existing businesses.

The final category of private equity is **distress investing**, also called **special situations**. As the name suggests, distress investors focus on troubled companies. Because many distress investments are buyouts, this category intersects with the previous one. Some private equity investors do both traditional leveraged buyouts and distress buyouts, but most investors specialize in either one or the other.

A separate category of alternative investing, hedge funds, is also included in Exhibit 1-2. Hedge funds are flexible investing vehicles that share many characteristics of private equity funds, including the limited partnership structure and the forms of GP compensation. The main difference, however, is that hedge funds tend to invest in public securities. A good example of this distinction can be seen in the area of distress investing, the area with the greatest overlap for private equity and hedge fund investors. The private equity funds that engage in distress investing usually do so with the intention of gaining control of the distressed company (or some subset of the company). These investors then operate and restructure the company before reselling it to another investor or to the public markets. Hedge funds also engage in distress investing, but their main strategy is to trade in the public securities of distressed companies with the intention of making a trading profit by quickly reselling these securities. That said, recent research shows that hedge funds have participated in late-stage venture capital with pro-cyclical patterns, with greater participation during market peaks (e.g., the bubble of 2000, eve of the 2008 Financial Crisis, and the current tech boom) compared to other periods.[6]

Although there are exceptions to this pattern, the basic distinction is that while private equity funds are long-term investors, hedge funds are short-term traders. Both strategies have the potential for outstanding returns, but the skill sets and investment approaches are different enough that it is rare that a single individual can excel at both. However, because their investments are more liquid than those for private equity investors, hedge funds can offer their investors faster access to

[6] Aragon, Li, and Lindsey (2018).

their money, with withdrawals usually allowed on a quarterly or annual basis. This is a case of form following function: if you have an investment strategy in illiquid assets, then you need to lock up your investors for a long period of time (private equity); if you have an investment strategy in liquid assets, then you can allow for quicker withdrawals (hedge funds). Although hedge funds have occasionally crossed over to private equity, any large-scale crossover would require a change of contractual form toward a longer lockup. At that point, they would become private equity funds.

1.2 What Do Venture Capitalists Do?

VC activities can be broken into three main groups: **investing, monitoring**, and **exiting**. In later chapters, we will describe these activities in more detail. For now, we will give brief summaries of each group and use these summaries to define the scope of this book.

Investing begins with VCs prospecting for new opportunities and does not end until a contract has been signed. For every investment made, a VC may **screen** hundreds of possibilities. Out of these hundreds, perhaps a few dozen will be worthy of detailed attention, and fewer still will merit a preliminary offer. Preliminary offers are made with a **term sheet**, which outlines the proposed valuation, type of security, and proposed control rights for the investors. If this term sheet is accepted by the company, then the VC performs extensive **due diligence** by analyzing every aspect of the company. If the VC is satisfied, then all parties negotiate the final set of terms to be included in the formal set of contracts to be signed in the final **closing**. These investing activities—especially the term sheet valuation and structure—are ideal topics for financial analysis and are the main subjects of this book.

Once an investment is made, the VC begins working with the company through board meetings, recruiting, and regular advice. Together, these activities comprise the **monitoring** group. Many VCs argue that these activities provide the best opportunity to add value and are the main source of comparative advantage for a successful VC. This argument may indeed be correct, but monitoring activities do not lend themselves well to quantitative analysis. Thus, aside from a discussion of the academic literature in Chapter 5, we will not go into monitoring in this text.

The final group of activities is **exiting**. As discussed earlier, VCs are financial intermediaries with a contractual obligation to return capital to their investors. However, the exit process itself requires knowledge and skills that are somewhat distinct from the earlier investment and monitoring activities. VCs plan their exit strategies carefully, usually in consultation with investment bankers. A typical IPO underwritten by a top investment bank will sell at least $100 million of new stock and have a total equity value of at least $500 million. Historically, the IPO has been the source of the most lucrative exits. The main alternative to the IPO is a sale to a strategic buyer, usually a large corporation. Sometimes these sales can be very profitable for the VC, but only if there is significant competition for the deal, which often includes the possibility of an IPO. Financial analysis is crucial for the valuation of IPO firms and acquisition candidates, and this analysis is discussed at length in the rest of this book.

1.3 The History of Venture Capital

Equity investments in risky new ventures are as old as commerce itself. The modern organizational form of venture capital, however, dates back only to 1946. Bank lending rules then (and now) looked for evidence that borrowers had collateral and could make timely payments of interest and principal. Most entrepreneurial firms, however, didn't meet these standards, so they required risk capital in the form of equity. There was usually no regular source of such capital, meaning that entrepreneurs without wealthy friends or family had little opportunity to fund their ventures. Along came George Doriot to solve this problem. General Doriot, so called for his rank

in the U.S. Army quartermaster's office during World War II, recognized the need for risk capital and created a firm to supply it. His firm, American Research and Development Corporation (ARD), began operations in 1946 as the first true VC firm. Unlike modern funds, it was organized as a corporation and was publicly traded. In its 25-year existence as a public company, ARD earned annualized returns for its investors of 15.8 percent.[7] ARD also set a standard for generating these returns that has persisted to the present day. Excluding the $70,000 investment in their biggest "home run", the Digital Equipment Corporation, ARD's 25-year annualized performance drops to 7.4 percent. Many modern venture capitalists spend their days searching for their own home runs, now with more fanciful names like Facebook, Uber, and Twitter—all firms that started as venture capital investments and made legendary reputations for their investors.

Today, venture capital is a well-established business throughout the developed world, but remains quite geographically concentrated both across and within countries, with the United States still comprising nearly half the VC activity in the world.[8] Because the United States represents so much of the worldwide VC industry, the data providers have followed the money, and we now know much more about American VCs than we do about those of the rest of the world. In this chapter, we focus on the history and statistics from the well-studied U.S. market, and most of this book will refer to U.S. data and legal structures. This focus on the United States does not limit the applicability of the analysis, because most global VCs follow U.S. practices. Most importantly for our purposes, the financial concepts of VC investing are universal, and all the quantitative analysis in this book can be applied to VC investments anywhere in the world. In Chapter 6, we provide statistics on the world distribution of VC and discuss some reasons for the observed patterns.

General Doriot's innovation in 1946 did not change the world overnight, and even ten years later the VC landscape remained barren. In recognition of this problem faced by small-growth businesses, the U.S. government began its own VC efforts as part of the Small Business Act of 1958, which was legislation that created the Small Business Administration and allowed the creation of **Small Business Investment Companies (SBICs)**. Perhaps the greatest success of the SBIC program was to provide a vehicle to train a pool of professional VCs for the later decades. SBICs still exist today and share many characteristics of modern VC firms; however, regulatory restrictions affiliated with SBICs keep it from becoming the dominant institutional form.

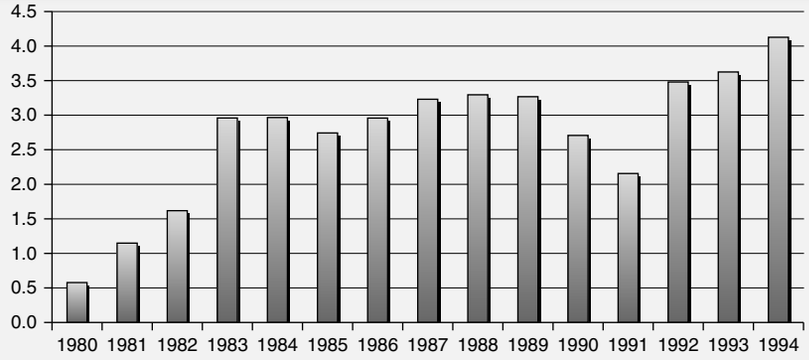
An important milestone for the VC industry came in the 1960s with the development of the limited partnerships for VC investments. In this arrangement, limited partners put up the capital, with a few percentage points of this capital paid every year for the **management fees** of the fund. The remaining capital is then invested by the general partner in private companies. Successful investments are exited, either through a private sale or a public offering, before the ten-year life of the partnership expires. The most common profit-sharing arrangement is an 80–20 split: after returning all the original investment to the limited partners, the general partner keeps 20 percent of everything else.

This profit sharing, known as **carried interest**, is the incentive that makes private equity investing so enticing for investment professionals. In recent years, the most successful general partners have demanded—and received—as much as 30 percent carried interest on new partnerships. Limited partnerships are by far the most common form of organization in the VC industry, and in Chapter 2 we will discuss these partnerships in detail.

Despite inroads made by SBICs and the new limited partnerships, total VC fundraising in the United States was still less than $1 billion a year throughout the 1970s. The next big change for VC came in 1979, when the relaxation of investment rules for U.S. pension funds led to historically large inflows from these investors to the asset class. To this day, pension funds continue to supply nearly half of all the money for VC in the United States.

[7] Fenn, Liang, and Prowse (1998).
[8] PricewaterhouseCoopers, Global Private Equity Report 2008, p. 44.

Exhibit 1-3 VC Investment, Pre-Internet Bubble (IN $B)



Source: National Venture Capital Association Yearbooks.

The participation by pension funds hastened the participation by other institutional investors, and the modern era of venture capital began. Exhibit 1-3 displays the total amount of venture capital invested by year from 1980 to 1994.

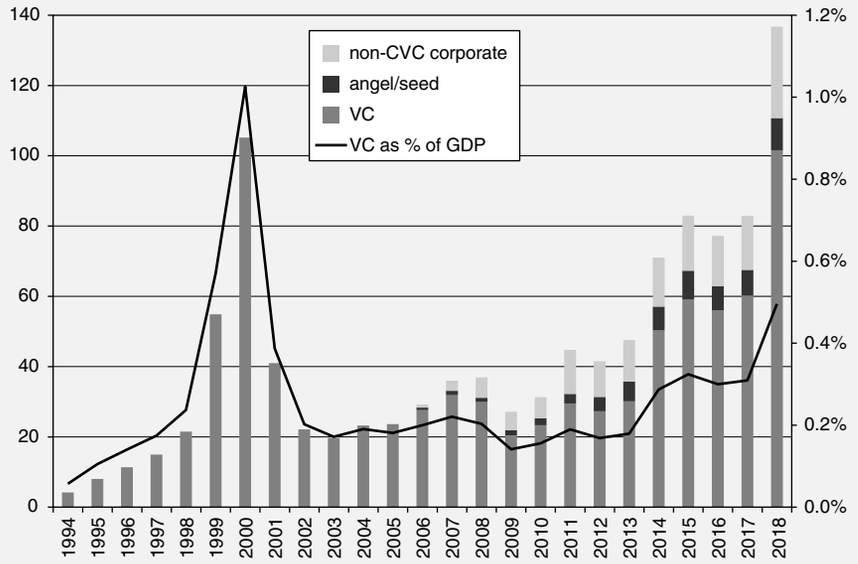
Investing activity rose sharply to $3B in 1983 and remained remarkably stable through the 1980s. After a slight drop in 1990–1991, VC investment began a steady climb; from $2.2B in 1991, it rose gradually to $4.1B in 1994. We refer to these first 15 years of the modern VC industry as the **pre-bubble period** (we will use "pre-bubble" as a shorthand for "pre-Internet bubble"). As shown in Exhibits 1-4 and 1-5, it was in 1995 that investment really began to grow quickly.

Exhibits 1-4 and 1-5 show changes in VC investments between 1994 and 2018. Since these charts cover a long period, nominal amounts that do not adjust for inflation can be misleading. Thus, we report (i) the base VC investment as % of GDP in Exhibit 1-4, and (ii) VC investment that is adjusted for inflation by using 2000 as the base year (2000 Consumer Price Index is set to 100) in Exhibit 1-5. As you see, there has been three distinct phases in this time period—the bubble and post-bubble of 1994–2001, then the steady period of 2002–2012, and finally the current tech boom that started around 2013 and continues to today. We will quickly review each of these phases below.

The bubble was remarkable even by today's standards in its sharp growth trajectory. Investment doubled to $8.0B in 1995 (from $4.2B in 1994), and some of the VC investments made in 1995 and 1996 had spectacular returns. This caused institutional investors to rush in for a piece of the asset class, and investments rose to $11.3B in 1996, $15.0B in 1997, and $21.5B in 1998—before exploding to the previously unimaginable levels of $54.9B in 1999 and $105.2B in 2000.

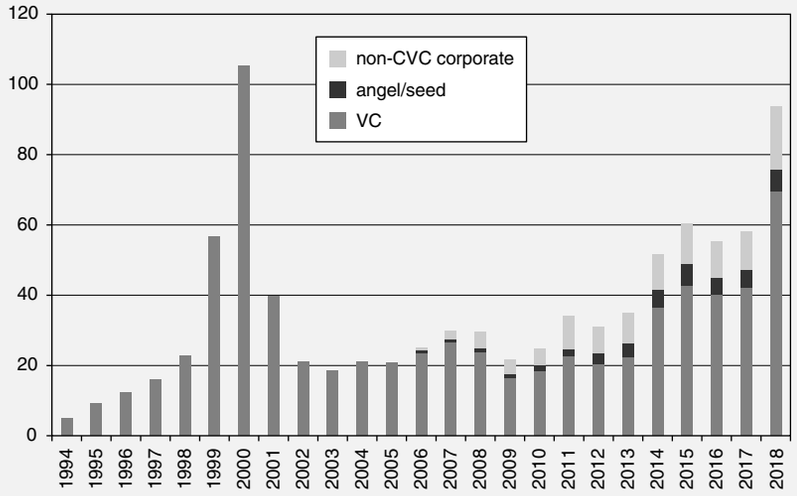
As the euphoria faded in the early 21st century, VCs still had large commitments from their investors, and many portfolio companies—funded in the late 1990s and 2000—were hungry for follow-on investments. Still, spending fell to $41.0B in 2001 before leveling off at between $20B and $30B in the next decade or so. Note that the U.S. economy as a whole had a big credit-fueled expansion in housing and stock markets from 2003 to 2007 and then experienced the Great Recession of 2008–2009. You can detect the same boom and bust pattern in Exhibit 1-4 if you try, but unlike the 1994–2000 bubble in which the VC industry was leading the rest of the economy, here the VC industry rose and fell proportionately with the economy and its share of GDP held steady around 0.20%.

Exhibit 1-4 VC Investment in $B and as % of GDP, 1994–2018



Note: NVCA switched its data source in 2016 and as a result, the total amounts reported for years 2006–2018 include two categories—seed/startup and non-corporate VC corporate investments—that were not part of NVCA data in pre-2006 years. See Chapter 1 Appendix for the assumptions we made to show the breakdown of the 2006–2018 amounts.
Source: 2016 NVCA Yearbook, 2019 2Q PitchBook-NVCA Venture Monitor, authors' calculations.

Exhibit 1-5 VC Investment in Real $B, 1994–2018



Note: Inflation adjusted with 2000 CPI =100.
Source: 2016 NVCA Yearbook, 2019 2Q PitchBook-NVCA Venture Monitor, authors' calculations.

A major change started happening around 2014, when the VC investment climbed to the 1999 level of $50.3B, followed by 3 years of near $60B in 2015–2017, and jumped to break the $100B mark for the first time since 2000 in 2018. This period is marked by the birth and proliferation of so-called unicorns, or VC-backed private startups with valuation of $1B or more (we will revisit how these valuations are determined starting in Chapter 8). It is also notable for increased participation in VC rounds by non-traditional VC investors including, not only corporations but also sovereign wealth funds, mutual funds, hedge funds, and private equity (i.e., buyout) funds.

To put this this period in perspective, first take a look at the VC investment as % of GDP. Between 2000 and 2018 the U.S. economy roughly doubled in nominal terms, from $10 trillion to $20 trillion. Thus, $100B in 2000 accounted for 1% of the economy, whereas in 2018 the same nominal amount represents about 0.5% of the economy. Still, this is the third highest on record, after only 2000 and 1999, so that is significant. You can reach a similar conclusion if you look at Exhibit 1-5, where the numbers are expressed in 2000 dollars for comparability across time. Though the VC investment in 2018 is approximately $70B in 2000 dollars compared to $105.2B in 2000, this still surpasses all other years on record.

It is difficult to put these investment levels in perspective without some model of VC's place in the economy. How can we tell if the new levels of investment ($100B, or 0.5 percent of GDP) is too low, too high, or just right? One way to approach this question is to start with the definition of VC at the beginning of this chapter. There, we discussed how VCs invest in small companies that have the potential to become large quickly through internal growth. To qualify, a company usually needs some sort of product innovation, usually a novel item that can penetrate a large market. Sometimes the proposed innovation is high tech, such as a new drug or a new type of software. Alternatively, the innovation might be in a business process, where an early mover could erect barriers to entry by competitors. Some of the most well-known unicorns took this route (think Uber, Pinterest, or Airbnb), and have had enormous growth and success in their respective markets.

With this framework, we can see that it is not just an innovation that is necessary, but rather an innovation that should be made by a small company. Tremendous innovation goes on all the time in large companies, and large companies are the optimal place for the majority of high-tech innovations. With nearly unlimited research budgets, a stockpile of trade secrets, and decades of organizational learning, companies like Microsoft, Apple, Pfizer, and Merck are factories of innovation. If a small company proposed to develop, build, and sell a new microprocessor for personal computers, it would face almost certain failure in the face of the industry giants. If, however, a small company proposed to develop a small piece of the technology for such microprocessors—a piece that could be patented and potentially licensed across a wide range of products—then this might be (and has been) accomplished.

So how much innovation should occur in small companies? In general, this will depend on the factors that drive the optimal scale of an innovative enterprise. According to the theory of the firm first introduced by Ronald Coase in 1937, a universal reduction in transaction costs should reduce the optimal scale of firms and allow for greater levels of innovation by small companies. We saw an instance of this in the 1990s, when communications technology changed radically, with development of the Internet occurring alongside large price decreases for telecommunications. Lower costs of communication opened up new opportunities for market transactions, with lower transaction costs than traditional methods. Prior to the Internet era, national retail brands required massive infrastructure and logistics support. With the Internet, retailers could operate from a single location, and consumers could find them from anywhere in the world. The organizational constraints of large enterprises seemed to prevent the rapid competitive reactions that could have stifled some of these innovations. For example, large booksellers such as Barnes and Noble already possessed the brand name, the infrastructure, and the inventory to compete effectively as online booksellers. Nevertheless, Amazon.com, a venture-backed startup, managed to

out-innovate and out-compete them, to the point that Amazon's business became far more valuable than that of its older competitor. Amazon, although among the most successful, is one of many examples of successful entrants that relied on the new communications technology.

More recently, we saw the advent of cloud computing, again drastically reducing the startup cost of founding new businesses. At the same time, multiple breakthrough technological frontiers opened up such as AI, robotics, and blockchain on the IT side, and gene therapy, immuno-oncology, and CRISPR on the biotech side. By this reasoning, the higher levels of VC investment that we see today may indeed represent an optimal reaction to structural changes in the economy.

1.4 Patterns of VC Investment in The United States

In this section, we provide evidence about VC investing by stage, industry, and region.

1.4.1 Investments by Stage

There are many steps, or stages, to building a new VC-backed business. In Section 1.1, we introduced the terminology for the three broad stages: Angel & seed, early-stage, and late-stage. A more complete description of these stages, along with some sub-categories, is found in Exhibit 1-6.

Exhibit 1-6 Stages of Growth[9]

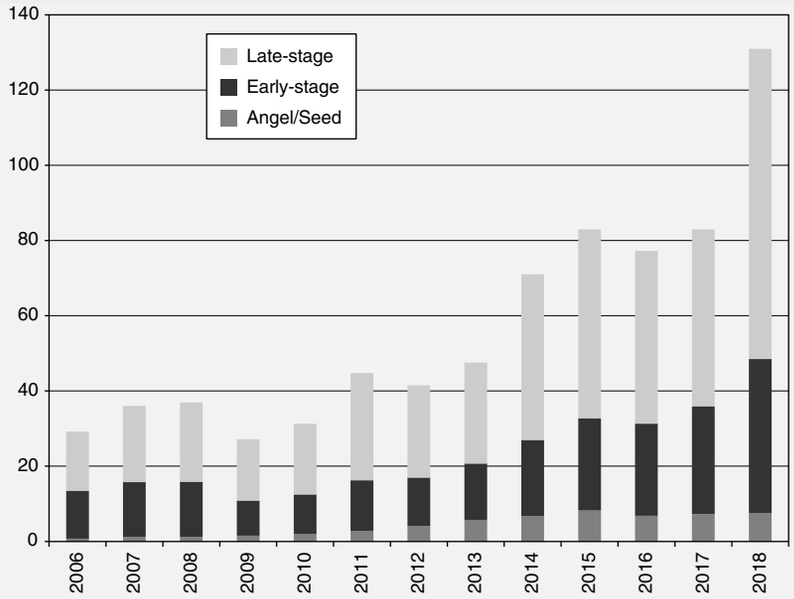
Seed/Startup Stage Financing: This stage is a relatively small amount of capital provided to an inventor or entrepreneur to prove a concept. If the initial steps are successful, this may involve product development, market research, building a management team, and developing a business plan. This is a pre-marketing stage. Seed and startup financing tend to involve angel investors more than institutional investors.

Early-stage: This stage provides financing to companies completing development where products are mostly in testing or pilot production. In some cases, products may have just been made commercially available. Companies may be in the process of organizing, or they may already be in business for three years or less. Usually such firms will have made market studies, assembled the key management, developed a business plan, and are ready to or have already started conducting business. Rounds are generally classified as Series A or B and includes an institutional venture capital fund. The networking capabilities of the venture capitalists are used more here than in more advanced stages.

Late-stage: This stage involves both applying working capital to the initial expansion of a company (the expansion stage) and providing capital to companies in a more mature, stable growth stage. The company is now producing and shipping and has growing accounts receivable and inventories. It may or may not be showing a profit. Some of the uses of capital may include further plant expansion, marketing, or development of an improved product. More institutional investors are likely to be included along with initial investors from previous rounds. The VC's role in this stage involves a switch from a support role to a more strategic role. Rounds are generally classified as Series C or D or later.

[9] These descriptions are taken from the 2016 NVCA Yearbook, p. 104, and 2018 NVCA Yearbook, p. 57.

Exhibit 1-7 VC Investment By Stage ($B)



Source: 2018 NVCA-PitchBook Venture Monitor.

VC's focus in the early days of 1980's was on true start-ups, with over 50% of overall VC investments devoted to seed/startup and early-stage investments. Gradually, new VC firms were created to focus on later stages, and some of the original firms grew so large from their successes that they needed to find larger investments to put all their capital to work. Consequently, the share of late-stage investments as % of total VC investments grew sharply, and by the late 1990s angel investors had largely replaced VCs at the seed/startup stage. As seen in Exhibit 1-7, in the last decade or so the share of late-stage VC is hovering around 60%, with the early stage VC and seed/startup taking up about 33% and 7%, respectively.

The definition of the company stage should not be confused with the definition of the **financing round**. The negotiation of a VC investment is a time-consuming and economically costly process for all parties. Because of these costs, neither the VCs nor the portfolio firms want to repeat the process very often. Typically, a VC will try to provide sufficient financing for a company to reach some natural milestone, such as the development of a prototype product, the acquisition of a major customer, or a cash-flow breakeven point. Each financing event is known as a **round**, so the first time a company receives financing is known as the **first round** (or **Series A**), the next time is the **second round** (or **Series B**), and so on. With each well-defined milestone, the parties can return to the negotiating table with some new information. These milestones differ across industries and depend on market conditions; a company might receive several rounds of investment at any stage, or it might receive sufficient investment in one round to bypass multiple stages.

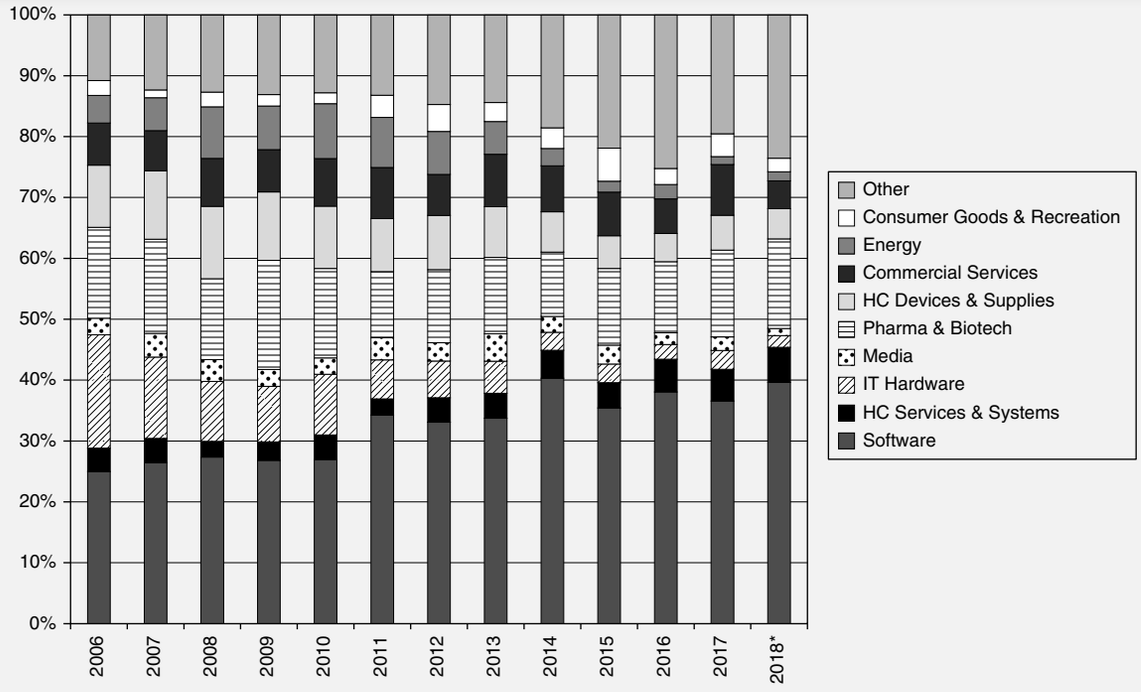
1.4.2 Investments by Industry

Traditionally, VC investments have been concentrated in two broad sectors: health care and information technology (IT), where the latter sector is defined to include the software, IT hardware (including both semiconductors and communications/networking), and media (including social media) industries. This concentration is no accident: because VCs invest in small companies with

the potential to quickly grow large, they need to look for businesses with large, addressable markets. To make headway in such markets, a business usually needs a technological advantage of some kind—hence the VC focus on the high-tech industries of health care and IT. Of course, other industries can also provide these opportunities, particularly during times of disruptive economic change. The communications revolution of the late 1990s provided such an opportunity for Internet-based retail businesses, and periodic oil shocks have provided the impetus for energy investments.

Exhibit 1-8 illustrates the industry concentration of VC investment in the recent period. The data show the dominance of IT (including software, health care services & systems, IT hardware, and media) and health care (including pharma & biotech and health care devices & supplies) for VC investment; together, these two sectors comprise about 70 percent of all investments. Within IT, software continues its surge in dominance during the period, comprising nearly 40% of all VC investment in the last 5 years or so. In contrast, semiconductors and other IT hardware were nearly 25% of VC total as of 2006, but its % share has dwindled down to mere 2–3% in the last 5 years. In the meantime, it is notable that the healthcare services & systems has become the second-largest category within the IT sector, with its growth fueled by the demand to digitize vast healthcare-related data and utilize them for new products and services encompassing consumers, hospitals, insurance, drug discovery, and diagnostics, among others. Within health care, biotechnology emerged as the dominant industry in the 2000s, and maintains its position to this day, followed by drug discovery and surgical/therapeutic devices.

Exhibit 1-8 VC Investment By Industry

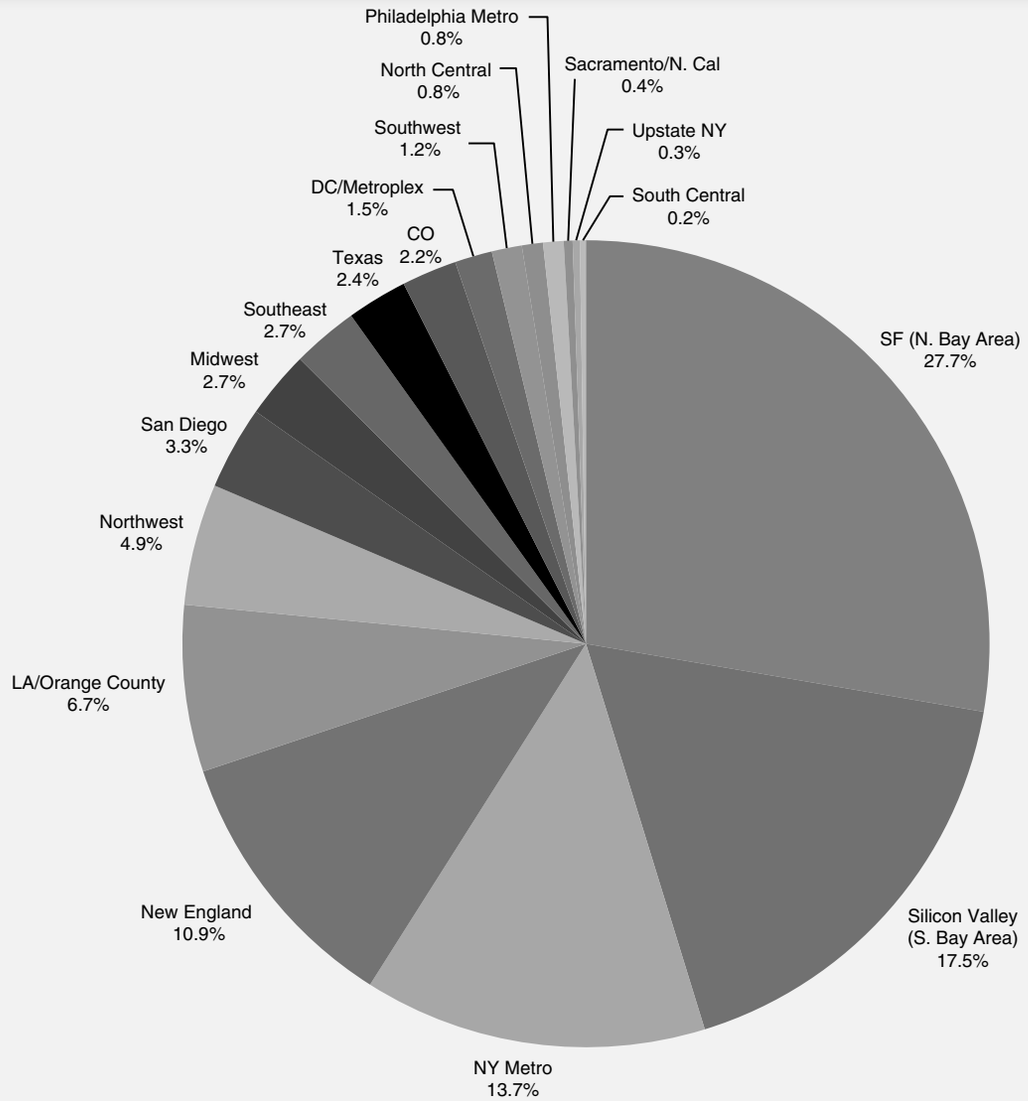


Source: 2018 Q4 NVCA-Pitchbook Venture Monitor.
* The tobacco conglomerate Altria's $12.8B investment in e-cigarette maker Juul is excluded from the 2018 total.

1.4.3 Investments by U.S. Region

With all the evidence of globalization in manufacturing and IT services, the U.S. regional concentration of VC investment is particularly striking. Since the beginnings of the industry, the San Francisco Bay Area has remained the epicenter of VC activity, with its share even increasing from about one-third to 45% of total U.S. VC investments in recent years. Within the Bay Area, San Francisco and its adjacent North and East Bay (the Northern Bay Area) has replaced the Silicon Valley (the Southern half of the Bay Area) as the metro area with the highest amount of VC investment. Meanwhile, on the East Coast, New York has replaced Boston as the number two U.S. metro area, with each receiving about 10–13% of total per year. Exhibit 1-9 illustrates the distribution of VC investment for these centers and other U.S. regions for 2018.

Exhibit 1-9 Regional Distribution of VC Investment



Source: PwC MoneyTree Report 2018, Q1–Q4.

The dominance of SF/Silicon Valley, New York, and New England (mainly Boston) hides some important globalizing forces. Although companies headquartered in these three U.S. regions receive almost 70% of all VC funding in the United States, the funding source of these investments are increasingly global, including Softbank's $100B Vision Fund, which was principally backed by sovereign wealth funds of Saudi Arabia and Abu Dhabi (UAE). The sudden and huge ramp up in inflow of foreign money has taken the industry by storm. Although it is difficult to find hard numbers to document this trend, implications of this new phenomenon for the VC ecosystem is a common topic of conversation among VCs.

SUMMARY

Venture capitalists (VCs) primarily invest in young, high-technology companies that have a capacity for rapid growth. VCs are a type of financial intermediary that perform three main functions, which are (1) screening potential investments and deciding on companies to invest in, (2) monitoring these companies and providing value-added services for them, and (3) exiting their investments in these companies by selling their stake to public markets or to another buyer. Venture capital is a form of private equity, which is an investment that cannot be traded in public markets. Without the information flow and liquidity of public markets, VC investing offers greater opportunities for both huge gains and terrible losses.

The modern VC industry effectively began in 1946 and grew slowly for its first 35 years. Beginning in the early 1980s, new sources of capital from pension funds led to rapid growth. This period of rapid growth leveled off in the mid-1980s and resumed in the mid-1990s, culminating in a bubble and crash at the turn of the century. The recent wave of tech boom started in the early 2010s and continues to date. The United States is the world leader in VC, with about 50 percent of the worldwide investment and industry leading practices. Within the United States, information technology and health care are the dominant sectors for VC investment, and San Francisco/SiliconValley, New York Metro area, and the area around Boston, Massachusetts, garner roughly 70% of all the domestic venture capital.

KEY TERMS

Venture capital (VC) and venture capitalists (VCs)
Screen
Monitor
Exit
Financial intermediary
Limited partnership, limited partner, general partner
Portfolio companies
Small Business Investment Companies (SBICs)
Initial public offering (IPO)
Angel investors = angels
Alternative investments
Private equity
Strategic investing
Corporate venture capital
Pre-bubble, bubble, post-bubble periods
Early-stage, late-stage
Mezzanine
Growth capital
Leveraged buyouts (LBOs)
Distress investing = special situations
Hedge funds
Term sheet
Due diligence
Management fees
Carried interest
Seed stage, Startup stage
Financing Round, First round (Series A), Second round (Series B)

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APPENDIX: NOTE ON AUTHORS' CALCULATIONS MADE FOR EXHIBITS 1-4 AND 1-5

NVCA, our source of data, changed its data source in 2016. Prior to 2016, NVCA relied on Thomson Reuters' MoneyTree Report; starting in 2016, NVCA instead reports U.S. investment data in its PitchBook-NVCA Venture Monitor. Since the two vendors' methodologies differ substantively on at least two fronts, we need to be careful in comparing the numbers from early vs. late years. The first difference is that PitchBook data includes pure angel rounds in which no institutional VC participated, whereas seed/startup rounds are included in MoneyTree Report only when at least one institutional VC participated. The second difference is that PitchBook also includes direct corporate investments in private companies that are not through their corporate VC arms, whereas MoneyTree Report only includes bona fide corporate VC investments.[10] These differences explain why the PitchBook figures are significantly larger than the MoneyTree figures. The angel/seed round amounts are reported in the Pitchbook-NVCA Venture Monitor, so we separate out this amount consistently in Exhibit 1-4 (the earliest year reported is 2006). In contrast, non-corporate-VC corporate investment amounts are not separately reported, so we infer this amount by taking the difference between (i) the MoneyTree Report amount and (ii) PitchBook amount minus the angel/seed round amount for years between 2006 and 2015 when data are available from both sources. On average, this amounts to 26% of the MoneyTree Report amount. Assuming that this ratio of overall VC to non-corporate-VC corporate investment stays constant, we impute the non-corporate-VC corporate investment amount in 2016–2018 and separate this out from the VC investment (including corporate VC investment). This way, we have a continuous time series of the VC investment that includes corporate VC but excludes seed/angel as well as non-corporate-VC corporate from 1994 to 2018 (reported as "VC" in Exhibit 1-4). We focus on this number when discussing the time series variation in Section 1.3.

[10] As an example of non-corporate-VC corporate investments, in 2018 Altria, a tobacco conglomerate, invested $12.8B in Juul, an e-cigarette startup, making it one of the largest investments in VC-backed companies of all time. Softbank is another active player in VC markets that sometimes makes non-corporate-VC corporate investments, as it did when it invested in Didi Chuxing, an Uber of China, though its VC arm also operates SoftBank Vision Fund, a $99B juggernaut.

VC Players

2

This chapter introduces the key players in the VC industry. In Section 2.1, we discuss the relationships among VC firms, VC funds, and the VCs who work at them. In Section 2.2, we provide statistics on the investors in VC funds and discuss the importance of various investor types. Section 2.3 analyzes the contractual structure and compensation arrangements between VCs and their investors.

2.1 Firms and Funds

About 90 percent of the organized VC market is controlled by independent **VC firms**. VC firms are small organizations, averaging about 10 professionals, who serve as the **general partner (GP)** for **VC funds**. A VC fund is a limited partnership with a finite lifetime (usually 10 years plus optional extensions of a few years). The **limited partners (LPs)** of VC funds are mostly institutional investors, such as pension funds, university endowments, and large corporations. When a fund is first **raised**, the LPs promise to provide a certain amount of capital, which will be provided either on a set schedule or at the discretion of the GP. These periodic capital provisions are known as **capital calls**, **drawdowns**, or **takedowns**. The total amount of capital promised by the LPs over the lifetime of the fund is called the **committed capital** of the fund.[1] Once the GP has raised the full amount of committed capital and is ready to start investing, we say that the fund has been **closed**. The typical fund will invest in portfolio companies and draw down capital over its first five years. These years are known as the **investment period** or **commitment period**. After the investment period is over, the VC can only make **follow-on investments** in current portfolio companies. A successful VC firm will raise a new fund every few years so that there is always at least one fund in the investment period at all times.

Most VC firms specialize their funds by stage, industry, and/or geography. For example, an **early-stage fund** would make initial investments in early-stage companies, with some capital reserved to make follow-on investments in these companies in their later stages. A **late-stage fund** would typically avoid all early-stage companies, focusing on expansion and later-stage investments. Most VC firms keep the same stage focus for all their funds, but some will change focus over time or mix the two strategies at once in a **multistage fund**. A few firms raise separate early-stage funds as well as late-stage/growth funds for overlapping periods and assign different professionals to each fund.

There is a wide dispersion in the levels of industry focus, with many generalists (a fund that is willing to invest in both IT and health care is effectively a generalist) and others with a relatively narrow focus on sectors like energy or financial services. As for geographic focus, it is important to recognize that much of the activity experienced by VCs is local, and as a result the location of the

[1] Typically, about 1% of the committed capital is provided by the GP itself. Throughout this textbook, we will ignore this small GP contribution and pretend as if all committed capital is coming from the LPs.

VC's office will usually be highly correlated with the location of most of their portfolio companies. Not surprisingly, the geography of VC offices is very similar to the geography of VC investment shown in Exhibit 1-8. Because funds tend to be geographically focused wherever their offices are, the main way to attain reliable geographic diversity is to have multiple offices.

Throughout this book, we will use a few prototype VC funds as example investors. Because the compensation structures and partnership agreements of VCs are an important driver of their investment incentives, it is useful to write down some key terms from these agreements for our prototype funds. We do this in the appendices to this chapter: Appendix 2.A shows some key terms for EarlyBird Ventures Fund I, which is a $100M initial fund raised for an early-stage investor; Appendix 2.B shows some key terms for Talltree Ventures IV, the $250M fourth fund raised by a multistage firm; and Appendix 2.C shows some key terms for Owl Ventures IX, a $500M ninth fund raised by a late-stage firm with a stellar reputation and excellent track record. We will refer to these appendices several times in this chapter and later on in the text.

Exhibit 2-1 gives a timeline for several funds for one of our prototype VC firms, EarlyBird Ventures (EBV).[2] A firm will usually number its successive funds, so EarlyBird Ventures I is known to be the first fund raised by EBV, EarlyBird Ventures II was the second fund, and so on. In this example, EBV raises its first fund, EBV I, in 1994 with $100M in committed capital. (Think of EBV I as the fund described in Appendix 2.A.) In future years, the performance of EBV I will be compared to other funds raised in 1994; in industry parlance, all such funds will have 1994 as their **vintage year**. This borrowed terminology from the wine industry is appropriate: just as the weather conditions of certain years are better for growing grapes, the economic conditions of certain years are better for growing companies. By comparing the performance of EBV I with other funds of the same vintage year, future investors can make a fair evaluation of EBV's performance as a GP.[3]

By 1998, most of EBV I has been invested. We assume here that EBV I looked good relative to other funds with a 1994 vintage year, so it is able to raise a larger fund, EBV II, in 1998. It invests this fund rapidly in the bubble years of 1999 and 2000 and returns to raise an even larger fund, EBV III, of $1 billion in 2000. By 2000, in addition to EBV III, it has two funds, EBVs I and II, which are no longer making any new investments but still have some investments outstanding.

Exhibit 2-1 Earlybird Ventures Timeline

Fund Name	Vintage Year	Committed Capital
EarlyBird Ventures I	1994	$100 M
EarlyBird Ventures II	1998	$250 M
EarlyBird Ventures III	2000	$1B
EarlyBird Ventures IV	2005	$300 M
EarlyBird Ventures V	2009	$300 M
EarlyBird Ventures VI	2013	$325 M
EarlyBird Ventures VII	2017	$400 M

[2] All of our prototype funds are fictitious. Any resemblance to real funds, living or dead, are purely coincidental. In case some readers are wondering, we were not aware at the time of writing this textbook that there exists an actual early technology investment firm called Earlybird in Germany.

[3] However, please note that some firms keep us on our toes by giving their funds a completely different name from their firm name.

When the market loses steam, it invests this fund slowly and with much less success than its earlier funds. Nevertheless, its earlier reputation allows the firm to return to the market, somewhat chastened, and raise a $300M fund, EBV IV, in 2005. By this point, it has closed out all its investments from EBV I and is still trying to exit a few investments from EBV II. As for EBV III, most of the portfolio companies have gone out of business, but it still has modest hopes for some of the survivors. Four years later, in 2009, EBV raises another $300M fund, EBV V, which is a respectable size given the generally difficult fundraising conditions in the market. EBV I and II are fully liquidated by then; EBV III is almost mature, but many of its portfolio companies are still illiquid. Since then, it has raised two more funds, EBV VI and EBV VII, with modest increase in fund size over time.

The experience of EBV is typical for top VC firms since the mid-1990s. Great success for investments at the beginning of the bubble, combined with seemingly endless opportunities, led many firms to raise "megafunds" in 1999 and 2000. Whereas billion dollar funds were unheard of before, they became almost commonplace during this time period. With few exceptions, these funds performed terribly, and the surviving firms have returned to raise much smaller funds in recent years.

We can gain a more detailed picture of these trends by looking at some data from the National Venture Capital Association. Exhibit 2-2 gives its estimates on the total number of firms and funds since 1980.[4]

This data echoes the industry cycles discussed in Chapter 1. Between 1997 and 2001, there was a doubling or near doubling of the total number of VC funds, the total number of VC firms, and the size of these VC funds and VC firms. The size of the industry hit a plateau in 2001 and stayed steady between 2002 and 2006, but declined significantly in 2007–2009. The contraction occurred because large funds raised in 2000 were largely rolled out of the industry's managed capital and were replaced by much smaller funds raised in more recent years. Many firms that raised funds at the height of the dot.com bubble wound down their portfolios and exited the industry, which also contributed to the decline in the number of firms and funds. Also, the VC industry was not immune to the Financial Crisis of 2008–2009, and fundraising dropped to a mere $11.9B in 2009, further contributing to the contraction. After hitting a bottom in 2009, the industry started growing again, with fundraising steadily increasing year on year.

As of 2018, the number of funds and firms are back to the peak level of 2001 with 1,884 funds and 1,047 firms. To compare the AUM, average fund and firm size on an inflation-adjusted basis, we note that CPI (Consumer Price Index) increases by 46 percent from 2000 to 2018. Thus, inflation-adjusted AUM in 2018 in 2000 dollars is $403.5/1.46 = $276.7B, which is approximately equal to the peak level of $262B in 2000. Similarly, the average fund size in 2018 in 2000 dollars is $209.4/1.46 = $143.6M, similar to the fund size of $129.4M in 2000. These statistics suggest that the scale of the VC industry in the United States has returned to the 2000–2001 peak level as of 2018.

In contrast, the average firm size in 2018 in 2000 dollars is $242.4/1.46 = $166.2M, which is only two-thirds of $255.2M in 2000. Indeed, the median firm size as reported by PitchBook is only $38.6M in 2018, and 57% of firms manage less than $100M. Meanwhile, there are 86 firms that manage $1B or more. This bifurcation of the industry, with ultra-large firms on one end and an influx of new, small firms on the other end of the spectrum is a new and interesting development. Another interesting difference between 2000 and 2018 is that, while the VC fundraising amount in Exhibit 2-2 and the VC investment amount in Exhibit 1-4 match quite closely in years 1998–2001, the VC investments are much larger than VC fundraising in the last five years

[4] As described in Chapter 1 Appendix, NVCA changed their data source from Thomson Reuters to PitchBook recently. Since the two vendors use somewhat different methodologies, the two data series are not identical. For example, while Thomson Reuters excludes corporate captive VC funds in the fundraising total, PitchBook includes them. When a fund is raised over 2 years, Thomson Reuters attributes the amount raised in each year towards respective year's new committed capital, while PitchBook attributes the entire fund size to the final year of fundraising (= vintage year). We use Thomson Reuters data until 2007, and switch to PitchBook data starting in 2008.

Exhibit 2-2 VC Industry Size Since 1980

Year	New Funds	New Committed Capital ($B)	Total Funds	Total Firms	AUM ($B)*	Avg Fund Size ($M)	Avg Firm Size ($M)
1980	52	2.0	129	92	4.1	31.8	44.6
1981	75	1.5	188	127	6.1	32.4	48.0
1982	87	1.7	248	162	7.8	31.5	48.1
1983	143	3.9	355	208	11.4	32.1	54.8
1984	116	3.0	459	260	14.6	31.8	56.2
1985	121	4.0	541	297	17.9	33.1	60.3
1986	103	3.8	603	332	21.5	35.7	64.8
1987	116	4.4	681	362	24.2	35.5	66.9
1988	104	4.4	715	377	25.5	35.7	67.6
1989	105	4.9	746	392	28.6	38.3	73.0
1990	87	3.2	734	393	29.2	39.8	74.3
1991	42	2.0	660	373	27.8	42.1	74.5
1992	80	5.2	620	365	28.4	45.8	77.8
1993	88	3.9	625	376	29.8	47.7	79.3
1994	140	8.9	651	389	34.7	53.3	89.2
1995	172	9.9	707	429	38.9	55.0	90.7
1996	162	11.8	773	469	47.9	62.0	102.1
1997	244	19.8	903	548	62.2	68.9	113.5
1998	288	29.7	1085	624	91.1	84.0	146.0
1999	451	55.8	1394	752	143.7	103.1	191.1
2000	653	105.0	1737	881	224.8	129.4	255.2
2001	321	39.1	1883	943	262	139.1	277.8
2002	206	9.3	1852	938	262.3	141.6	279.6
2003	163	11.6	1800	968	263.9	146.6	272.6
2004	219	19.8	1823	1003	271.1	148.7	270.3
2005	235	28.7	1778	1024	278.2	156.5	271.7
2006	241	31.8	1722	1027	288.9	167.8	281.3
2007	247	35.4	1593	1019	264.3	165.9	259.4
2008	188	31.5	1094	765	231.3	167.4	221.9
2009	119	11.9	1016	726	232.7	100.1	208.9
2010	150	19.9	1055	720	241.3	132.9	205.1
2011	155	26.3	1125	746	258.9	169.8	212.4
2012	203	24.4	1187	765	253.8	120.4	201.3
2013	216	20.6	1255	794	260.5	95.4	207.0
2014	286	35.3	1361	818	290.6	123.3	213.9
2015	289	36.0	1480	866	320.7	124.6	221.0
2016	310	41.1	1617	906	335.1	132.6	218.7
2017	255	34.4	1762	982	354.2	134.7	217.6
2018	257	53.8	1884	1047	403.5	209.4	242.4

Sources: NVCA Yearbook 2008, 2016, and 2019. Data source is Thomson till 2007, and Pitchbook in 2008 and thereafter.

*AUM is calculated differently in 1980–2007 and 2008–2018 (see Chapter 1 Appendix for the NVCA data source switch). In 1980–2007 (with Thomson Reuters data) this is the amount of capital committed to the VC firm in the last 8 years, aggregated for all the VC firms that have raised at least 1 fund in the last 8 years. In contrast, in 2008–2018 (with PitchBook data) this is sum of the remaining value of investments and dry powder (un-called commitments) of all the funds managed by VC firms that have raised at least 1 fund in the last 8 years. Note that Thomson figures are based on committed capital, while PitchBook figures include unrealized capital gains/losses on the remaining investments and exclude realized investments.

(2014–2018), with investments exceeding $60B in each year, while fundraising is only in the $30–50B range per year. How can such a large discrepancy between fundraising and investments be sustainable? One answer is that non-traditional investors' participation in VC funding rounds have dramatically increased in these years. These include hedge funds, mutual funds, sovereign wealth funds, as well as non-CVC corporations and even some pension funds directly participating as investors in some of the (typically) late-stage funding rounds. Their motivations for participation in VC investments vary, from strategic and competitive (industry corporations) to fostering innovation in home regions (sovereign wealth funds), but one common factor is that promising startups in recent years have chosen to stay private for much longer than in the dot.com bubble years, while raising enormous amounts of private capital in ***mega rounds*** (with round size of $100M or more). To put this in perspective, Amazon and Google raised $108M and $36M in total VC funding before going public, respectively, while Uber raised $24.5B (227 times as much as Amazon!) before going public in 2019, and Airbnb, which was founded in 2008 and as of this writing is still private, had raised $4.4B as of July 2019. These large, late-stage startups could rival large public competitors in size and clout, and yet still private and thus beyond the reach of traditional public investors. So rather than waiting until IPOs to buy their stock, traditional public investors such as mutual funds now routinely participate in late-stage VC deals, sometimes even as lead investors.[5] These investors in 2018 co-invested in nearly 2,000 deals in which the startups collectively received $88.3B or two-thirds of the total.[6] While the exact amount of capital contribution by these non-traditional investors is difficult to assess, it is clear that their capital supplement traditional VC's capital to a significant degree in today's VC ecosystem, especially for late-stage VC.

Relative to other investment and professional service firms, VC firms are quite top-heavy and rarely show much of a pyramid structure. Although some VCs entered the industry directly out of school, most came to VC as a second career and entered the profession at a fairly senior level, so there are not as many junior people floating around. Although many people would like to know the best way to prepare for a VC career, there is no "typical" path. Nevertheless, the analysis of hand-collected data on 125 partners from 15 VC firms in Wieland (2009) offers some interesting insights.

In this sample, 60 percent of VC partners hold a bachelor's, master's, or doctorate degree in science or engineering. Particularly common is a bachelor's degree in engineering, which 44 percent of the VCs hold. While 25 percent of VCs hold a master's degree and 9 percent hold a Ph.D. in engineering or science, the most common postgraduate degree held by VCs are MBA degrees—62 percent hold them. A significant minority—16 percent—also hold a bachelor's degree in business or economics. As for their professional experience, most of the work experience of individual VCs comes in the form of having worked in the IT or health care sector (78%), having startup experience as either entrepreneur (37%) or managing executive at a startup firm (32%), holding experience as line manager at a listed firm (38%), having worked as industrial engineer (31%) or professional scientist (5%), having worked for another VC firm as investment professional (32%), and holding experience working as strategy consultant (23%) or in finance (14%).[7] Indeed, most VCs are in their second career because few jobs are available to new graduates. These first careers might be decades long and consist of top management experience, or they might be just a few years long, consisting of a few years of experience at a consulting firm or at an investment

[5] Agarwal, Barber, Cheng, Hameed, and Yasuda (2020).
[6] NVCA-PitchBook Venture Monitor, 2Q 2019.
[7] Zarutskie (2009) studies educational and professional backgrounds of first-time VC funds and report similar educational backgrounds: 39% of individual VCs hold a degree in either engineering or science and 58% hold an MBA.

bank. Consulting and investment banking are not particularly good ways to prepare for a VC career; it is just that many top MBA graduates start there, so that is where the talent is. Many VCs will say that the best preparation for a VC career is to combine technical expertise with industry experience, particularly if that experience is at a startup firm. Many VC hopefuls are understandably reluctant to follow this advice, because the VC industry has cyclical and somewhat fickle preferences about exactly what kind of technical experience is useful, and an unlucky choice of specialization can render a candidate's expertise to be superfluous.

As for the career progression, it does not have many levels. The top level is "partner," with modifiers in front of that title to indicate experience, past success, and compensation level (e.g., "Managing General Partner" or "Senior Partner"). Although some professionals begin their VC careers as partners—either by raising their own fund or by joining another fund after a very successful first career—most VCs have to work their way up. There are essentially two tracks to make partner. One track, typically followed by younger professionals with a few years of pre-VC experience, is to start as a junior VC with a title like associate, senior associate, or principal. These professionals are not expected to lead transactions or sit on boards in their first few years, but rather spend most of their time screening investments, performing due diligence, and generally helping out the partners. They are expected to learn the business as apprentices, and if they are successful, their responsibilities will be gradually increased. Depending on their past experience, the time path to partnership can vary tremendously. With good timing and good performance, some junior professionals can make partner in as little as two years. At the other extreme, some firms do not treat these junior positions as being on the partner track, sending even their most talented associates back out into the world to gain more experience. Similarly, some firms employ recent college graduates as analysts, with tasks similar to other junior VCs. Although these positions are generally not considered to be on the partner track, analysts who go on to get advanced degrees have great positioning to land a partner-track job in the future.

The second track, typically followed by successful entrepreneurs or senior managers with many years of experience, is to enter with the title of venture partner. This title does not mean that the new VC is a partner in the sense of sharing the profits, but rather it is a way to bring in someone trying out VC as a second career without subjecting them to the same grind or title as a junior professional. Venture partners would typically be expected to take a lead role on investments and to use their industry contacts to bring in new business right from the beginning. In this respect, venture partner is very much a provisional position, with many candidates finding out that the business is not really for them. With one or two successful investments, a venture partner can expect to be admitted into a true partner role. Indeed, venture partners are often paid only small salaries—the idea being that if they are successful, they will quickly earn a partnership.

GPs receive their income from two sources—management fees and carried interest—and these sources must supply all the compensation for the VCs. Base salaries can be paid from management fees, and the biggest slice of variable pay comes from the carry. Exhibit 2-3 shows compensation levels for salary, bonus, and carried interest for several different job titles. These figures are from the annual, *The 2018 Preqin Private Capital Compensation and Employment Review*, which in 2017 received data from seven independent venture capital firms. Note that salaries are the current salary for 2017, and bonus and carry are earned the year before. Thus, these compensation levels reflect fund performance in the year prior to payment.

In most funds, the total carry percentage will be divided in advance, with partners knowing what share of the overall carry they are due to receive. As can be seen in Exhibit 2-3, senior partners with titles like Managing Director receive the lion's share of the carry, whereas amounts allocated to junior partners with titles like Principals are much more modest and in some cases even zero. Senior partners also receive disproportionate fractions of the cash bonus.

Exhibit 2-3 VC Compensation ($)

Title	Typical Years of Experience	Salary	Salary + Bonus	Carry	Total			
			median		25%	median	average	75%
Managing Director/ Partner	12–15+	273,214	417,500	597,189	706,250	987,604	1,646,095	1,784,102
Director/Principal	8–12+	172,960	217,584	125,780	241,964	313,502	474,467	542,611
Vice President	4–10	158,000	230,000	N/A	214,448	259,203	283,925	355,513
Senior Associate/ Associate/Analyst	0–6	80,000	90,000	N/A	66,130	114,353	130,955	193,491

Note: Base salary represents the 2017 base salary. Bonus value represents cash bonuses paid for calendar/fiscal year 2016. Carry value represents those earned in calendar year/fiscal year 2016.
Source: *The 2018 Preqin Private Capital Compensation and Employment Review*.

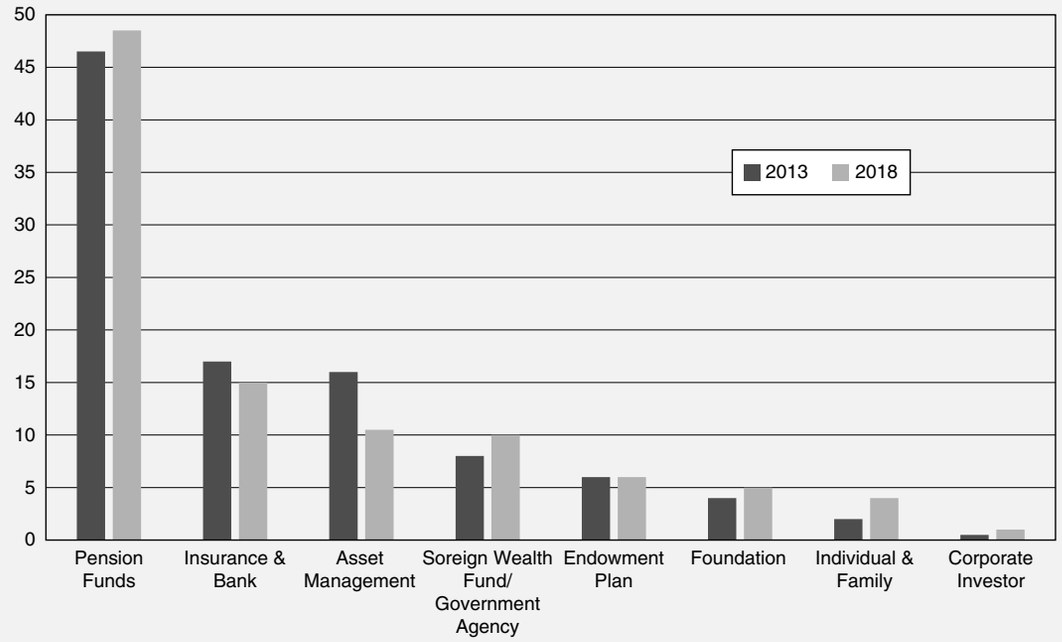
2.2 The Limited Partners

As mentioned in Chapter 1, the first major burst of VC activity was driven by the entry of pension funds as limited partners. Today, pension funds—including those of government entities, private companies, and nonprofit organizations—are still the largest source of capital commitments for the VC industry. In addition to pension funds, several other investor groups have played an important role in the development of VC. Exhibit 2-4 shows the fraction of invested capital (portion of committed capital that is currently deployed in investments) from these groups in 2013 and 2018. Note that these statistics pool investors' commitments to different types of private equity (as described in Exhibit 1-2).[8]

After pension funds—which collectively contribute nearly 50% of the total invested capital—the next largest investor class is financial institutions, which includes commercial banks, investment banks, and insurance companies. Taken together, this group contributed about 15 percent of the total invested capital. Asset managers are next with 10–15 percent of the total, followed by sovereign wealth funds and government agencies, which provide another 10 percent. Sovereign wealth funds are state-owned investment funds that invest in various financial and real assets. Among the largest sovereign wealth funds, those owned by countries like China, Saudi Arabia, Canada, and Singapore are particularly active in VC and are increasing their exposure to alternative assets overall in recent years. Endowments and foundations are next with about 10 percent of the total. This group is dominated by large private universities and charitable foundations. Among these organizations are some of the most sophisticated LPs, with returns that appear to persistently exceed those of the other investors.[9] Part of the reason for their success is that they have been active and consistent investors since the earliest partnerships were formed in the late 1960s and early 1970s. However, evidence also shows that access to these older funds explains only part of their superior returns, and that the endowments have in fact also done very well with their recent partnerships.

[8] Unfortunately, recent year data is not available for contribution to VC alone. Compared to the PE data shown in Exhibit 2-4, endowments, foundations, individuals & family are likely to contribute somewhat larger percent of the total to VC industry.
[9] See Cavagnaro, Sensoy, Wang, and Weisbach (2019) and Lerner, Schoar, Mao, and Zhang (2019).

Exhibit 2-4 Invested Capital in Private Equity by LP Type (%)



Note: Excludes Fund-of-funds managers.
Source: 2018 Preqin Global Private Equity & Venture Capital Report.

Individuals and families contributed between 2 and 4 percent of total invested capital to private equity. This category includes both high-net-worth individual accounts with wealth managers and family offices. Since portfolio sizes of these accounts are on average much smaller compared to the assets under management of, say, pension funds, the small percentage is not surprising. However, this low number masks the prominence of private equity (and VC) in the portfolio of family offices. According to the same Preqin survey that Exhibit 2-4 is based on, family offices had a target allocation of 30% of their total portfolios to private equity in 2018, compared to the sample average target allocation of merely 10%, and 6–7% for pension funds.

Corporations have played a relatively small role as limited partners as compared to the important role of their corporate pension plans. This type of indirect corporate investment as an LP should not be confused with direct corporate investment in portfolio companies, a practice that is known as corporate VC. Direct corporate investment is not included in Exhibit 2-4, unless the corporation is included as an LP in its own finite-life corporate VC fund. Because most corporate VC funds are not organized as finite-life limited partnerships, the majority of direct corporate investment is not included in this exhibit.

Exhibit 2-4 defines the fund flow by the ultimate source of capital, but in some cases additional intermediaries stand between the capital provider and the VC. One group of intermediaries deserves special mention: the **fund-of-funds (FOF)**. An FOF is typically organized as a limited partnership, with many of the same rules as other private-equity funds, except that, instead of investing directly in companies, the FOF invests in other private-equity funds. FOFs appeal

mostly to wealthy individuals and small institutions that are not large enough to support a diversified portfolio of LP commitments. By pooling their resources in a FOF, a group of smaller investors can gain access to a diversified portfolio of funds and take advantage of the contacts and skills of the specialized FOF intermediary. Indeed, Harris et al. (2018) report that FOFs in venture capital (but not in buyouts) are able to identify and access superior performing funds. FOF firms act as both a GP (to their investors) and an LP (to the funds they invest in). As a GP, they also charge management fees and (sometimes) carried interest, although these charges are always considerably lower than those charged by direct investment firms.

It is important to note that LPs are not just investors, but also really are partners in the fund. Although the day-to-day involvement of LPs is limited by law (otherwise they can lose their limited-liability status), certain LPs are prized as long-run partners, because they have the industry experience and patience to ride out industry cycles and stick with their GPs. Such LPs make the fundraising task much easier for GPs, yielding time savings that can be used to help portfolio companies and to find new investments. Some of the more sophisticated LPs also co-invest with GPs in larger deals as syndicate members.

For this reason, it is no accident that endowments and foundations held their positions in the top VC funds even as other LPs were beating down the door. It is true that during the bubble many top GPs did raise their compensation; but it should be noted that they did not raise it to market-clearing levels, instead choosing to keep the same long-term LPs and exclude some newer money. In particular, families and corporations are seen—perhaps justly—as fickle investors and are often shunned by top GPs. In recent years, there has also been pressure on public pension funds and public universities to reveal information about the performance of VCs in their portfolio. Many of these LPs have been forced to reveal performance information, and this disclosure is the source of some of the data analyzed in later chapters. For a variety of reasons, most VCs abhor any kind of public disclosure, so quite a few of the top GPs have barred public LPs from their funds.

2.3 VC Partnership Agreements

Before we are able to understand VC investment decisions, we must first have a working knowledge of VC partnerships. The VC firm serves as the GP of the partnership and is compensated by management fees (discussed in Section 2.3.1) and carried interest (discussed in Section 2.3.2). This compensation structure creates some differences between the incentives of the GP and the LPs, and many partnership agreements include several restrictive covenants to mitigate these differences (discussed in Section 2.3.3). Metrick and Yasuda (2010) analyze terms of fund partnership agreements for 94 VC funds and 144 buyout funds, which they obtained from a large, anonymous LP (the "Investor"); all statistics in Sections 2.3.1 and 2.3.2 are derived from this paper, and we will refer to this data as the "Investor" data. We supplement this data with Preqin's Fund Term data for more recent vintage year (2003–2019) funds and we will refer to this supplement data as "Preqin" data.

2.3.1 Management Fees

VC investing is a long-run business, and investors must often wait many years before enjoying any return of capital. Nevertheless, the expenses of VC investing start immediately: salaries must be paid, the lights must stay on, and due diligence must be performed. Thus, a baseline **management fee** is necessary. The typical arrangement is for limited partners to start paying a set percentage of committed capital every year, most commonly 2.0 percent. Sometimes this fee remains constant for the full 10-year life of the fund, but in most cases the fee drops somewhat after the five-year investment period is over.

For any given VC fund, we define the ***lifetime fees*** as the sum of the annual management fees for the life of that fund. We define the ***investment capital*** of the fund as being equal to the committed capital of the fund minus the lifetime fees. For example, Appendix 2.A shows that EBV is a \$100M fund with a 10-year life and an annual management fee of 2 percent for all 10 years. Thus, the fund has lifetime fees of \$20M (= 2% ∗ \$100M ∗ 10 years) and investment capital of \$80M (= \$100M − \$20M). As is typical, in this case the lifetime fees are a nontrivial fraction of committed capital. EBV will need to earn a 25 percent lifetime return on its investments (\$20M on \$80M investment capital) just to earn back the fees and get to breakeven for its investors.

Our next example uses a more complex fee schedule.

EXAMPLE 2.1

Owl Ventures has raised their \$500M fund, Owl Ventures IX, with terms as given in Appendix 2.C. The management fees given in this appendix are as follows.

Management Fees All management fees are computed based on committed capital. These fees are 2 percent in years 1 and 2, 2.25 percent in years 3 and 4, 2 percent in year 5, 1.75 percent in year 6, 1.50 percent in year 7, 1.25 percent in year 8, 1 percent in year 9, and 0.75 percent in year 10. These fees will be paid quarterly, with equal installments within each year.

PROBLEM

Given this description, what are the lifetime fees and investment capital for this fund?

SOLUTION

This example uses a fee schedule that starts at 2 percent, and then increases to 2.25 percent in years 3 and 4 before falling by 0.25 percent in each subsequent year. Such "increasing then decreasing" schedules are not unusual, with the logic that fund expenses often reach their maximum in the middle years of the investment period. To compute the lifetime fees, we just add up the fees in each year. Thus,

$$\begin{aligned}\text{Lifetime fees} &= \text{committed capital} * (0.02 + 0.02 + 0.0225 + 0.0225 + 0.02 + 0.0175 \\ &\quad + 0.015 + 0.0125 + 0.01 + 0.0075) \\ &= \text{committed capital} * 0.1675 = \$500\text{M} * 0.1675 = \$83.75\text{M}\end{aligned} \tag{2.1}$$

Then,

$$\begin{aligned}\text{Investment capital} &= \text{committed capital} - \text{lifetime fees} = \$500\text{M} - \$83.75\text{M} \\ &= \$416.25\text{M}\end{aligned} \tag{2.2}$$

This example follows the industry's standard practice of computing management fees on committed capital. At first glance, this method might seem strange, because other parts of the money management industry have management fees that are computed based on the market value of the portfolio. Why are VC funds different?

There are several reasons. First, if management fees were to be based on portfolio values, then these fees would be low in the first few years (before all the capital was invested), and the VCs might be unable to cover their fixed costs. Second, management fees based on portfolio value would create an incentive for VCs to invest quickly—and this would result in an inevitable

sacrifice in quality. Third, because "market" values for the portfolio are hard to calculate for nontraded companies, the level of fees would be somewhat arbitrary.

Although the computation of management fees on committed capital is the most standard arrangement, there are other methods. To understand these other methods, we introduce a few new definitions. First, **realized investments** are those investments that have been exited or those in companies that have been shut down, and **unrealized investments** are those investments that have not yet been exited in companies that still exist. Next, we define the **cost basis** of an investment as being equal to the dollar amount of the original investment. Finally, we define **invested capital** as the cost basis for the investment capital of the fund that has already been deployed, and **net invested capital** is equal to invested capital minus the cost basis of realized and written-off investments. It is this final definition that is most important for alternative fee structures, for it is common to see the management fee base change from committed to net invested capital *after* the five-year investment period is over.[10] This hybrid system minimizes the incentive for firms to overinvest in early years, because the fee is still fixed for that time period. Also, because it relies on the cost basis of the investments, it does not require the estimation of market values. In Exercise 2.2, at the end of this chapter, you are asked to solve for the lifetime fees for a fund that uses this hybrid system.

There are two other points worth mentioning. First, although management fees cover most operating expenses, they do not usually cover all of them, and the LPs will still find that some of their investment capital is going to uses other than investments. These other operating expenses charged to the fund might include the organizational costs of setting up the fund, costs of unconsummated transactions, and certain kinds of professional service expenses. Second, our calculations assumed that exit proceeds cannot be reinvested into new portfolio companies. In theory, however, most contracts allow GPs limited reinvestment rights, subject to certain requirements being met. (The most common requirement would be that the original investment was exited quickly, such as within one year.) In practice, these requirements are stringent enough that significant reinvestment is rare. When reinvestment does occur, the sum of investment capital and lifetime fees would be greater than committed capital. However, because reinvestment does not incur any additional management fees, the economics of the reinvestment decision are a bit different from the economics of the original investment. We will address this possibility in Exercise 10.1 in Chapter 10.

2.3.2 Carried Interest

The other form of VC compensation is the **carried interest**, often referred to simply as the **carry**. Carried interest enables GPs to participate in the profits of the fund, and historically it has provided the largest portion of GP compensation. The basic idea is simple: if the investors commit \$100 million to the fund, and total exit proceeds are \$200 million, then the total profit is \$200M − \$100M = \$100M. If such is the case, then a GP with 20 percent carried interest would receive \$20 million of this profit. Indeed, this simple example tells a lot of what we need to know about carried interest. Nevertheless, there are many variations of this basic story, and these variations are often important and contentious points of negotiation. Variations occur in the percentage level of the carried interest, the **carried interest basis (= carry basis)**, the timing of the carried interest, **priority returns**, and **clawbacks**. These terms are defined in the following paragraphs.

The most important variation concerns the percentage level of carried interest. The vast majority of all VC firms receive a 20 percent carry. The Investor data (Preqin data) indicates that

[10] About 43% of VC funds in the Investor data, and 40% of funds in the Preqin data that reduce management fees in the post-investment period employ this rule.

95 percent (85%) of VC funds had a 20 percent carry. Indeed, 20 percent is the focal point for the entire private equity industry and for many other partnership structures in the investment industry. There is no consensus on the origins of 20 percent as the focal point for risk-capital profit sharing; some industry analysts point to practices in the oil and gas industry earlier in the 20th century, and others trace the roots back to Venetian merchants in the late Middle Ages.[11] An 80_20 split even appears in the book of Genesis.[12]

Despite these historical ties, a few successful VCs have managed to buck the trend, starting with partnerships raised during the bubble period of the late 1990s. The Private Equity Analyst reports that over two dozen GPs of VC funds receive carried interest of 25 or 30 percent.[13] In the last decade, about 9 percent of North America VC funds (26 out of 288) in the Preqin data have carried interest of 25 percent or above. Since these data are subject to selection bias, the actual percent of above-20% carry funds in the universe of VC funds is likely to be much lower. Some of these high-charging VCs will be discussed in Chapter 5, along with some of their famous investments and the astronomical returns they have earned.

There is also variation in the carried interest basis, which is the threshold that must be exceeded before the GPs can claim a profit. The majority of firms compute profits as the difference between exit proceeds and committed capital. Committed capital is used as the basis by 94 percent of VC funds (and 83% of the buyout funds) in the Investor data, and this has become more of an industry standard over time. The other 6 percent of funds have the more GP-friendly basis of investment capital, which enables profits to be defined without consideration for fees. For a profitable fund with 20 percent carried interest, \$100M in committed capital, \$20M in lifetime fees, and \$80 million in investment capital, the \$20M basis difference between committed and investment capital would yield a difference in $\$20M * 0.20 = \$4M$ in carried interest over the life of the fund.

EXAMPLE 2.2

A VC firm is considering two different structures for its new \$100M fund. Both structures would have management fees of 2.5 percent per year (on committed capital) for all 10 years. Under Structure I, the fund would receive a 25 percent carry with a basis of all committed capital. Under Structure II, the fund would receive a 20 percent carry with a basis of all investment capital.

PROBLEM

a. Suppose that total exit proceeds from all investments are \$150M over the entire life of the fund. How much carried interest would be earned under each of these two structures?

b. For what amount of exit proceeds would these two structures yield the same amount of carried interest?

SOLUTION

a. Under Structure I, the GPs would receive 25 percent of the profits, where profits are defined as the proceeds above committed capital. Therefore, the carried interest under Structure I would be $0.25 * (150 - 100) = \$12.5M$. Under Structure II, the GPs would receive 20 percent of the profits,

[11] See Metrick and Yasuda (2010) and also Kaplan (1999).
[12] Gen. 47: 23–24: "Joseph said to the people, 'Now that I have bought you and your land today for Pharaoh, here is seed for you so you can plant the ground. But when the crop comes in, give a fifth of it to Pharaoh. The other four-fifths you may keep as seed for the fields and as food for yourselves and your households and your children.' " If you read the rest of this Genesis chapter, you will see that Joseph was acting more as a distress investor than as a VC.
[13] Private Equity Analyst, September 1999.

where profits are defined as the proceeds above investment capital. Given a 2.5 percent management fee for all 10 years, the lifetime fees are 2.5% ∗ 100M ∗ 10 years = $25M, so investment capital is $100M − $25M = $75M. Therefore, the carried interest under Structure II would be 0.20 ∗ (150 − 75) = $15M.

b. Let Z be defined as the total proceeds from all investments. Then, using the solution to part (a), we can see that the formulas for carried interest under Structures I and II are

$$\text{Total carried interest under Structure I} = 0.25 * (Z - 100) \tag{2.3}$$

and

$$\text{Total carried interest under Structure II} = 0.20 * (Z - 75) \tag{2.4}$$

We next solve for the Z that equates the carried interest under both structures:

$$0.25 * (Z - 100) = 0.20 * (Z - 75) \rightarrow 0.05 * Z = 10 \rightarrow Z = 200 \tag{2.5}$$

When total exit proceeds = Z = 200, then both structures would provide 0.25 ∗ (200 − 100) = 0.20 ∗ (200 − 75) = $25 M in carried interest.

The level and basis of carried interest are the main determinants for the total dollar amount of GP carried interest. These terms determine how the "pie" of proceeds is split between the GPs and the LPs. In addition, there are also several possible methods for the *timing* of carried interest. Although these methods do not usually affect the share of the total pie earned by the GP, they do affect how quickly that pie can be eaten. Because a basic tenet of finance is that money now is worth more than money later, GPs prefer methods that enable them to receive their carried interest portion as soon as possible.

The most LP-friendly method is to require that the whole basis be returned to LPs before any carried interest is paid. This method is used by about 25 percent of the funds in the Investor data. To see how timing matters, imagine that this method was in place for Example 2.2. In that example, we considered two possible structures for carried interest: Structure I with 25 percent carry and a basis of committed capital, and Structure II with 20 percent carry and a basis of investment capital. In part (b) of that example, we found that total exit proceeds of $200M would lead to $25M of carried interest under both of the proposed structures, with the remaining $175M going to LPs. Although the $200M pie is shared the same in both cases, the timing is not. Under structure I, the LPs receive their whole basis of $100M before all proceeds above $100M are split 75/25. Under structure II, the LPs also receive their whole basis (only $75M in this case) before all proceeds above $75M are split 80/20. Thus, GPs get their first dollar more quickly under structure II, and at any time in the distribution of $200M of total proceeds, structure II will always have paid at least as much carried interest as structure I.

To understand the alternative methods of carry timing, we make use of the definition of invested capital (introduced in Section 2.3.1) and the related concept of **contributed capital**, with the latter being defined as the portion of committed capital that has already been transferred from the LPs to the GPs. Thus, contributed capital is equal to invested capital plus any management fees paid to date. Analogous to net invested capital, **net contributed capital** is equal to contributed capital minus the cost basis of any realized and written-off investments. According to the Investor data, another 75 percent of VC funds allow some form of early carry distribution. One such method only requires the return of either invested capital or contributed capital before

any carried interest can be earned. Clearly, this timing method is more GP-friendly than requiring the return of the whole basis. Another method, which lies somewhere between the "return the whole basis" and "return only the invested/contributed capital" methods, requires the return of invested or contributed capital plus priority returns. This is fairly common and is found in about 45 percent of VC funds in the Investor data.

Priority returns—also called **preferred returns** or **hurdle returns**—are another factor affecting the timing of carried interest. With a priority return, the GP promises some preset rate of return to the LPs before the GPs can collect any carry. The Investor data indicates that 45 percent of VCs promise some kind of priority return. Among these funds, 8 percent (per year) return is the most common, with 71 percent of all funds with priority returns choosing 8 percent; others range from 5 to 10 percent. The Preqin data suggests that priority return terms for recent funds are similar, with 50% of North America funds having some kind of priority return, with 8 percent being the most common. Priority returns are relatively rare in funds that focus on early-stage investing, and relatively common in funds that focus on late-stage investing. It is important to note, however, that the priority return usually affects the timing and not the total amount of carried interest. Most priority returns also have a **catch-up provision**, which provides the GPs with a greater share of the profits once the priority return has been paid. With a catch-up, the GP receives this greater share until the preset carry percentage has been reached.

As an illustration of priority returns with a catch-up, consider a $100M fund with a carry percentage of 20 percent, a carry basis of all committed capital, a priority return of 8 percent, and a 100 percent catch-up. We'll keep things simple and imagine that all committed capital is drawn down on the first day of the fund, and that there are total exit proceeds of $120M, with $108M of these proceeds coming exactly one year after the first investment, $2M coming one year later, and $10M coming the year after that. Under these rules, all $108M of the original proceeds would go to the LPs. This distribution satisfies the 8 percent hurdle rate requirement for the $100M in committed capital. One year later, the catch-up provision implies that the whole $2M would go to the GPs; after that distribution they would have received 20 percent ($2M) out of the total $10M in profits. For the final distribution, the $10M would be split $8M for the LPs and $2M for the GPs.

Beyond this simple example, the calculations quickly become unwieldy to handle without a spreadsheet. The key takeaway is that even with a priority return, the GPs still receive the same fraction of the profits as long as the fund is sufficiently profitable. In this example, the fund made $20M of profits ($120M of proceeds on $100M of committed capital), and the GPs received 20 percent ($4M) of these profits. If, however, the fund had only earned $8M or less of profits over this time period, then all these profits would have gone to the LPs.

In all but two of all funds with a priority return, there is some catch-up provision for the GPs. In the two exceptions, there is no catch-up, and thus the GP only earns carried interest on the portion of profits *above* the priority return. The absence of a catch-up affects the share of the pie for the GP, not just the timing of that share. In the preceding example, having no catch-up would have meant that the GP would have received only $0.20 * (\$120M - \$108M) = \$2.4M$ of total carried interest.

Finally, some funds require the return of only a portion of contributed (or invested) capital. For example, one common method is to require the return of the cost basis of all realized investments, plus all management fees to date and any **write downs** (partial losses) known to exist among the unrealized investments. In most cases, this method is combined with a so-called fair-value test. This test requires that the estimated values of remaining portfolio investments exceed a preset percent (e.g., 120%) of the cost basis of these investments. The fair-value test is found in 14 percent of the Investor data.

The early payment of carried interest can cause complications if the fund starts off strong but weakens later in life. For example, suppose that a $100M fund has a 20 percent carried interest with a basis of all committed capital, but allows carried interest to be paid as long as contributed capital has been returned. Then, consider what happens if the fund is three years into its life,