VALUATION SMOOTHING AND THE VALUE OF A DOLLAR

by

WILLIAM P. KIESER

(Under the Direction of Jeffry M. Netter and Annette B. Poulsen)

ABSTRACT

This dissertation is concerned with valuation smoothing and investor preferences for smoothed returns. I estimate the marginal value of cash to private equity funds and compare it to public firms. The equity of small capitalization and value firms is smoother than other public firms, consistent with the value premium, and displays a similar present value relationship to buyout funds. Better performing private equity partnerships tend to smooth more and have a higher likelihood of raising follow-on funds. These results suggest that investors like it smooth, which hints at a potential role for smoothed portfolios of publicly traded securities that feature delays in marking to market.

INDEX WORDS: Private Equity, Leveraged Buyouts, Valuation Smoothing, Fair Value, Value Premium

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DEDICATION

I dedicate this dissertation to all current and aspiring PhD students. Regardless of field, all of us travel a remarkably similar road in the pursuit of knowledge. This road is long, mostly uphill, and will challenge you in ways you have never been challenged before. For what it is worth, here are two helpful tips to keep in mind along the way. The first is that, as the famous saying goes, the drama is the highest when the stakes are the lowest. The second is that all papers are wrong; some tell us something. Good luck and do not quit!

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CHAPTER 1

INTRODUCTION

The major challenge in evaluating risk and return in private markets is the lack of transactions-based performance metrics. Reported valuations are known to be "smoothed," which means that they are only partially updated to reflect current economic conditions. Smoothing makes private or so-called "alternative" asset classes appear to be far less volatile than comparable liquid markets. Smoothed returns contain high levels of serial correlation, which means that they are persistent; an element of risk not captured by the second moment. Artificially smooth returns are not all bad though, as they offer investors a way around debt covenants and a cushioned blow during turbulent times.

Over the past decade, private markets — which include asset classes such as private equity, private credit, and real assets — have exhibited enormous growth. According to McKinsey's 2020 Private Markets Review, private market assets under management have grown by an astounding $4 trillion over the last ten years, which represents an increase of over 170%. The number of active private equity firms has more than doubled over this period as pensions, endowments, and sovereign-wealth funds flocked to these thinly traded, niche, and opaque markets.

High absolute returns and the expectation that these (real or perceived) high returns will continue is the traditional appeal to investing in private equity. Many researchers, however, now suggest that the performance advantage of private equity over public equity has narrowed in recent years (e.g., Phalippou 2020; Ilamen, Chandra, and McQuinn 2019). If performance is in fact the main driver of investor demand, it is puzzling, then, why investors continue to allocate capital to private equity funds given the substantial fees associated with such investment strategies. Another explanation is that investors are willing to pay a premium for smoothed returns, despite the inherent illiquidity, even if average net-of-fee returns do not exceed levered stock returns.

In this paper I compare the association between cash flows and equity returns across public and private markets, and I ask the following questions: What value do private equity funds place on the cash they call from investors, and how does this value compare to public equities? Further, what value do investors place on smoothed returns? I find that the value of a dollar is remarkably similar across public and private markets on average. Specifically, the marginal change in equity for a one dollar change in cash is similar for both public firms and private equity funds. The equity of small capitalization and value firms is smoother than other public firms, consistent with the value premium, and has a similar present value relationship to buyout funds.[1] Private equity partnerships that smooth more have a higher likelihood of raising follow-on funds and tend to have better ultimate performance.

[1] Value investors have taken quite the blow over the last decade and even more so in recent months for taking a bet on cheap stocks that has worked so well for so long. The world may have changed and value investors may go the way of the dinosaurs or it may simply be that one-size-fits-all accounting measures such as book-to-market ratios are just woefully inadequate in differentiating between the highly specialized and diverse firms of the 21st century (e.g., Israel, Laursen, and Richardson 2020).

The results in this paper suggest that investors prefer smoothed returns, even after controlling for performance, which hints at a potential role for smoothed portfolios of publicly traded securities that feature delays in marking to market.

Understanding smoothing and the marginal value of a dollar across equity investments is important for a variety of reasons. Investors face the choice between investing in public or private markets and in contrast to public markets, fees charged in private markets are no small sum. Allocators must balance the benefits and costs of committing capital to private equity and they must be able to live with their decisions for ten or more years (unless they sell their stakes in the secondary market). While there is an extensive literature that attempts to estimate the value of extra cash to public firms (e.g., Faulkender and Wang 2006), the marginal value of a dollar in private markets has received scant attention. This non-trivial oversight demands further research considering how important the trade-off between public and private markets is to investors, regulators, and academics alike.

In private equity, investors do not have the ability to withdraw invested capital at will, although there is a relatively small but burgeoning secondary market where partnership interests can be bought and sold using a wide variety of transaction structures (Nadauld, Sensoy, Vorkink, and Weisbach 2019). Private equity funds are typically structured as ten-year limited partnerships that often have actual lives in the 10–15-year range (and can sometimes be much longer). Limited partners pledge capital to private equity funds that can be called at any time during the investment period, which usually includes the first five years of a fund's life. The true return of a fund is only known once all investments have been exited and cash has been distributed back to investors.

General partners provide their limited partners with quarterly performance statements that are produced by valuing investments using discounted cash flows and public market comparables. These valuations, which are audited annually by accounting firms, are known to be smoothed relative to movements in public markets (Jenkinson, Sousa, and Stucke 2013). What this means is that valuations tend to be marked conservatively with respect to realized future cash flows (Jenkinson, Landsman, Rountree, and Soonawalla 2019) and are known to display a temporal lag compared to swings in public market valuations (Gompers and Lerner 1997; Woodward 2009).

One major benefit — if not *the* major benefit — of smoothing is that investors do not have to face the music during tough times, at least not right away. Many critics of private equity say that investors could do better with a low-cost levered portfolio of small capitalization and value stocks (Phalippou 2013, 2020; Stafford 2017). When public markets tank, however, investors holding publicly traded securities feel the pain right away and any who use leverage may find themselves on the receiving end of a margin call. Private equity investors, on the other hand, may see their positions marked down slightly, but to nowhere near the same degree. Private equity valuations also have the benefit of hindsight, which is to say that fund managers usually provide quarterly valuation estimates 30–90 days after quarter end, which allows for a greater resolution of uncertainty. While classic financial theory tells us that illiquid assets should offer higher expected returns, all things equal,[2] some have suggested that investors may be willing to pay a premium for the return-smoothing properties of illiquid asset classes such as private equity (Ilamen, Chandra, and McQuinn 2019).

Like anything else, though, smoothed returns are no free lunch. One specific issue that arises from smoothing is a phenomenon known as the "denominator effect." This is when the value of a public equity portfolio falls by a greater amount than the value of a private equity portfolio, at least initially, and this can become pronounced during financial market crises. Allocators facing strict capital requirements (e.g., pensions and endowments) may be forced to liquidate portions of their private equity portfolios, probably at discounts, because they are marked overweight relative to the value of their publicly traded portfolios. Over a period of several quarters, private markets tend to catch up, leaving some limited partners who sold off private equity to then become underweight.

Another issue with smoothed returns is that they are not comparable to liquid asset classes. If two assets are highly correlated in the long run, but one is smoothed, they may appear to be uncorrelated in the short run. Standard portfolio optimization techniques that use the average, volatility, and covariance of returns to determine optimal allocations will tend to overweight the smoothed asset due to the illusion of diversification benefits (e.g., Welch and Stubben 2018).

[2] See, e.g., Amihud and Mendelson (1986, 1991); Amihud (2002); Pastor and Stambaugh (2003); and Acharya and Pedersen (2005).

Research on valuation smoothing harks back to at least the early real estate literature (e.g., Firstenberg, Ross, and Zisler 1988; Geltner 1989) and has attracted more recent attention in the hedge fund and private equity literatures (e.g., Asness, Krail, and Liew 2001; Getmansky, Lo, and Makarov 2004). The early real estate papers assert that due to infrequent trading and asymmetric information, property appraisers partially anchor on past prices when updating valuations (Geltner 1991, 1993; Quan and Quigley 1991). Researchers then attempt to recover "true" returns by either taking the reported returns as given, and "de-smoothing" them, or by ignoring the reported valuations altogether, and focusing solely on properties that have been both bought and sold (i.e., experienced the full-cash cycle) to impute a return.

What the former approaches do in a nutshell is inject additional volatility into the returns while preserving the mean and reducing the realized serial correlation (typically eliminating it entirely).[3] The issue with these methods is that they rely on unknowable parameters and often require data that are not easily attainable (Pagliari, Scherer, and Monopoli 2005; Pagliari 2017). The latter techniques that utilize repeat sales to create transactions-based indices suffer from having too few observations and this lack of transactions can become acute during major market downturns (Bailey, Muth, and Nourse 1963; Boyer, Nadauld, Vorkink, and Weisbach 2018).

[3] See Couts, Goncalves, and Rossi (2020) for a recent 3-step de-smoothing procedure that builds on earlier 1-step de-smoothers such as Geltner (1991, 1993) and Getmansky, Lo, and Makarov (2004).

Many of the more recent approaches that span real estate, private equity, and other alternative asset classes treat the "true" sequence of returns as a missing or state variable and then derive the latent de-smoothed series of returns using a filtering process (e.g., the Kalman (1960) filter) that links the unobservable return sequence to sequences of observable economic variables, which are often measured at higher frequencies (e.g., Brown, Ghysels, and Gredil 2020). Despite the econometric elegance of these methods, the core issue is that the smoothing function is a non-invertible transformation. What this means is that one can always take a series of returns and make it smooth, but one cannot de-smooth a series of returns without losing information. The key to minimizing information loss when "reverse engineering" smoothed returns is to specify an appropriate linking process and loss function; both of which require a solid grounding in economic theory.

Optimizing a de-smoother by simply minimizing serial correlation is short-sighted because it is not clear what level or direction of serial correlation one should expect. It has been known for quite some time that realized serial correlation is not zero in public markets (Fisher 1966; LeRoy 1973; Dimson 1979). Furthermore, both positive and negative serial correlation may exist simultaneously over different horizons and sample periods (Campbell 2018; Martin 2018). What complicates matters of expected serial correlation even further in private markets is the fact that assets held within private funds are not valued synchronously. Because each asset within a fund is not valued at the same point in time, a private equity portfolio is almost certainly out of date to some degree at every point in time. Nonsynchronous sampling just by itself can lead to serious differences between the statistical properties of the sample data and the underlying stochastic processes from which the data are sampled from (Lo and MacKinlay 1990). So, does it really make sense for there to be zero serial correlation in private markets?

Rather than taking a stand on what level (and sign) of serial correlation should exist in the absence of smoothing, I attempt to measure smoothing by estimating the association between quarterly private equity fund valuation changes and contemporaneous investor cash flows, an approach first applied to private equity funds by Jenkinson, Sousa, and Stucke (2013). I then conduct a horse race between public and private markets to see just how smooth private equity valuations are vis-à-vis the equity valuations of public firms. I find that private equity valuations do indeed display significant smoothing and conservatism, but so do the equity valuations of public firms, and especially firms that are small capitalization and value.[4] The implementation of fair value accounting in the U.S. around 2008 has made private equity valuations less smooth, but valuations are still held conservatively, understating distributions by about 20 cents on the dollar. Further, reported valuations tend to behave more similarly to the book equity of public firms, which is known to be backward looking, even though the objective of fair value accounting is marking to market. Alternatively, both private equity funds and public firms may simply time distributions to coincide with periods of high asset

[4] Here, small capitalization includes firms with market values between $330M–$2B and value includes firms with book-to-market ratios that are less than or equal to one. The results are robust to alternative ranges and accounting definitions.

appreciation and this could at least partially explain the results. Regardless, these findings contribute not just to the literature on valuation smoothing, but also to understanding the value of a dollar across public and private markets.

Return smoothing in private equity is a phenomenon that is arguably incentivized by the fundraising and financial contracting environment. Private equity fund managers are primarily compensated through management fees (Metrick and Yasuda 2010; Chung, Sensoy, Stern, and Weisbach 2012; Robinson and Sensoy 2013), which are not performance sensitive per se, but are to a large extent contingent upon the successful raising of future funds (which is performance sensitive). Private equity houses typically market the next fund 3–6 years into the life of the current fund. Because the true return of a fund is only known once all investments have been exited, managers have the ability to behave opportunistically during fundraising. So far the evidence suggests that little manipulation goes unnoticed and that better performing managers actually tend to understate their returns, possibly for fear of being labeled performance manipulators should they find themselves in a spate of bad luck after raising capital (Brown, Gredil, and Kaplan 2019).

I test investor preferences empirically by estimating the extent to which an individual fund's smoothness is associated with the same general partnership's ability to raise a future fund. I find that partnerships that smooth more have a significantly higher likelihood of raising new funds and this result holds even when controlling for fund performance. Despite the clear preference for distribution smoothing, I did not find any statistically meaningful relationship between fundraising success and the marginal value that private equity fund managers initially place on each dollar they call from investors. This latter result may be explained by managers holding investments at cost for at least the first quarter, which would indicate that there is little information content to be gleaned from initial valuation markups.

The remainder of this paper proceeds as follows. Chapter 2 includes a review of the literature and a discussion of relevant institutional details. I measure the association between cash flows and equity returns across public and private markets in Chapter 3 and I show that valuation smoothing is not unique to private equity. In Chapter 4 I measure the extent to which private equity investors prefer smoothed returns and I find that private equity partnerships that smooth more have a higher likelihood of raising follow-on funds. Chapter 5 includes robustness tests on the effects of dividend announcements and shareholder concentration. Finally, I conclude the paper in Chapter 6.

CHAPTER 2

INSTITUTIONAL BACKGROUND AND RELATED LITERATURE

Private Equity Literature

The intent of this section is to inform the reader of some of the most notable contributions to the literature on private equity over the last fifteen years. Of course, many papers are omitted, and my sincerest apologies go to all those who are left out. This review will begin with the seminal paper by Kaplan and Schoar (2005; "K&S" hereafter). While there are papers on private equity (PE) before this, the more recent stream of literature begins with K&S. These authors find that average net-of-fee returns to PE funds are approximately equal to public markets using a sample of buyout and venture funds with 1980–1997 vintages. However, they note that there is substantial heterogeneity across the asset class. Furthermore, K&S find persistence in fund performance across funds of the same general partnership. Successful partnerships tend to raise larger funds, but fund size increases at a decreasing rate.

The K&S findings suggest that PE may not outperform public markets on average, however, one can do very well (and continue doing very well) if investing in top quartile managers given performance persistence. Indeed, it is not unreasonable to think that access to proprietary deal flow, favorable credit terms, specialized consulting services, etc., allow some managers to consistently appropriate alpha. The observed decreasing marginal growth rates in fund size lends credence to the claim that the human capital required to earn above-market returns scales only so far. Some researchers, such as Stafford (2017) and Phalippou (2020), posit that PE returns can be replicated using publicly traded equities. Others, such as Ang, Chen, Goetzmann, and Phalippou (2018), find a component of PE returns that is orthogonal to public markets. Whether this premium not spanned by publicly traded factors is a PE-specific premium or managerial alpha (or a mixture) is an open question.

In contrast to K&S (2005), Phalippou and Gottschalg (2008) argue average net-of-fee fund performance is 3% below that of the S&P 500. These authors claim that risk adjustment increases this underperformance to 6% per annum. The main difference between the Phalippou and Gottschalg (2008) paper vis-à-vis K&S is the writing off of the final net asset value (NAV) of non-liquidated funds. These conflicting results motivated researchers to better understand performance in private capital markets.

As research progressed into the second decade of the millennium there were still a litany of questions about sample biases and data reliability. Stucke (2011) finds the Thomson VentureXpert database, which had been one of the most widely used databases at the time, rife with error. These errors caused a downward bias in reported performance and called into question the previous claims that PE had underperformed public markets. Harris, Jenkinson, and Kaplan (2014) compare the major datasets — Burgiss, Venture Economics, Preqin, and Cambridge Associates — to determine what these frequently used datasets say about private equity returns.

These authors show that PE has consistently outperformed the S&P 500 by 20-27% over the average fund's life, which amounts to about 3% per year.

In addition to the advances in understanding performance, progress began to emerge in other contexts within the field of private equity. Metrick and Yasuda (2010) build a model of expected revenue and show that two-thirds of general partner (GP) income is not performance sensitive. They further show that buyout fund managers tend to grow their funds faster than venture managers and suggest that the buyout business is more scalable than the venture business.

Contracts that govern the relationships between investors and managers are also put under the microscope. Robinson and Sensoy (2013) study the association between contract terms and performance and find higher fees and lower general partner (GP) ownership are not associated with lower net-of-fee performance. These authors find that during fundraising booms, times when many partnerships are seeking capital commitments from new and existing limited partners (LPs), the performance-insensitive portion of general partner compensation tends to increase.

On the financing front, Axelson, Jenkinson, Stromberg, and Weisbach (2013) find an association between cheap credit, high purchase prices, and lower subsequent returns. Because buyout partnerships tend to fund acquisitions with substantial debt, these legal entities provide an interesting empirical setting to study the classic capital structure theories. These authors find that deal leverage is not related to the same cross-sectional factors that appear to drive public firm leverage. Instead, they claim that it is the variation in market-wide credit conditions that determines buyout leverage. What is more the authors show that deal-level leverage is associated with higher purchase prices, which suggests that GPs tend to overpay when debt is cheap. More recently, Haddad, Loualiche, and Plosser (2017) find that buyout activity is largely determined by the aggregate risk premium, rather than credit-specific conditions. They argue that buyout booms form in response to a low aggregate risk premium, which increases the present value of performance gains and decreases the cost of holding illiquid investments.

Evidence of such cyclical variation (i.e., booms and busts) in private equity returns may give the impression that a shrewd investor could time the market by going against the herd and increasing investment when capital costs are high and valuation multiples are low and then reducing exposure as the costs of financing become cheap and prices rise. Despite this seemingly predictable variation in the private equity market (e.g., Kaplan and Stromberg 2009; Robinson and Sensoy 2016), investors cannot easily time the market with realistic investable strategies (Brown, Harris, Hu, Jenkinson, Kaplan, and Robinson 2020). This is due to the fact that private equity investors can only time commitments to funds and therefore have no control over the speed at which capital is deployed or investments exited. Thus, even though there is evidence that periods of high fundraising and cheap credit are followed by periods of low absolute performance, there is no easy way to take advantage of this by timing capital commitments to the asset class. Furthermore, because the private equity market is not complete, there is no direct way to short the market.

Another popular area of inquiry in private equity research is the reliability of net asset values (NAVs), which are the equity valuations that GPs provide LPs every quarter. Jenkinson, Sousa, and Stucke (2013); Barber and Yasuda (2017); and Brown, Gredil, and Kaplan (2019) study the behavior of these quarterly valuations and ask, among other things, whether managers tend to inflate returns during fundraising periods. The jury is still out on whether NAV inflation occurs as the evidence is somewhat mixed. Interestingly though, Brown et al. (2019) find evidence that low-performing GPs do inflate valuations when fundraising, but they also find that LPs are largely able to see through this bias. A critical element that has escaped any heretofore discussions on NAV inflation during fundraising is the mechanical relationship between returns, leverage, and fund duration. Fundraising for the next fund typically occurs at the end of the investment period of the current fund. This is precisely the time that leverage is at its peak because many portfolio companies have been purchased (with substantial leverage), but few have been exited. Thus, the fact that returns come down as funds enter a period of de-levering post fundraising is not necessarily indicative of valuation management.[5]

The world, at least according to researchers, has changed quite a lot over the last fifteen or so years since Kaplan and Schoar (2005). The finding that private equity outperforms public markets, on average, has been overturned, although arguments remain. In contrast to K&S who find persistence in performance across

[5] "Valuation management" in private markets is analogous to "earnings management" in public markets (e.g., Dechow and Sloan 1995). The slight difference is that earnings management refers to selective reporting by corporate managers while valuation management refers to selective reporting by private capital fund managers.

funds of the same general partnership, Braun, Jenkinson, and Stoff (2017) find little persistence in performance at the partnership level using transaction data from 865 buyout funds with 1974–2010 vintages. There had also been a belief that endowments were particularly shrewd PE investors. Sensoy, Wang, and Weisbach (2014) argue that the maturing of the PE industry caused the end of limited partner persistence. Braun, Jenkinson, and Schemmerl (2020) show that co-investments do not suffer from adverse selection, which is in contrast to Fang, Ivashina, and Lerner (2015) who argue the opposite. The fees that GPs charge their underlying portfolio companies for monitoring were also thought to be insignificant, but Phalippou, Rauch, and Umber (2018) show that this too is not the case.

While the last fifteen years has proved to be quite fruitful for research in private equity, the major limiting factor is still a lack of good quality data. Much debate exists, for example, about the employment impact of private equity buyouts. Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda (2014) study the Longitudinal Business Database from the U.S. Census Bureau and find that buyouts lead to modest job losses at shrinking establishments but higher job creation at expanding establishments. Ayash and Rastad (2017) argue that the research design used in Davis et al. (2014) is flawed in that it only measures employment changes immediately following buyouts and therefore ignores the longer-term effects that remain controversial. Davis, Haltiwanger, Handley, Lipsius, Lerner, and Miranda (2019) use an improved version of the dataset in Davis et al. (2014) and find that employment levels decrease 13% in public-to-private transactions but increase by

13% in private-to-private transactions. This is just one economically important (and highly controversial) topic that demonstrates how there is still so much left to uncover in private equity.

Valuation Smoothing

Research on valuation smoothing begins in at least the early real estate literature (e.g., Firstenberg, Ross, and Zisler 1988; Geltner 1989). The advantage that real estate has over other alternative asset classes with respect to research on valuation smoothing is data. Three types of broad real estate benchmarks exist: stock returns of publicly traded real estate management companies, appraisal- or transactions-based returns from private properties, and the returns from investing in private real estate investments funds. The returns of public Real Estate Investment Trusts (REITs), which are management companies that own and manage real estate, are a commonly used public real estate benchmark. Private real estate returns can be measured directly from property sales or by using the returns from investing in open- or closed-end real estate funds as a proxy. Additionally, databases such as NCREIF's National Property Index (NPI) provide appraisal-based indices that are based on valuation changes alone, and therefore exclude the effects of leverage (but still include the effects of smoothing).

The early real estate papers assert that due to infrequent trading and asymmetric information, property appraisers partially anchor on past prices when updating valuations (Geltner 1991, 1993; Quan and Quigley 1991). Researchers then attempt to recover "true" returns by either taking the reported returns as given, and "de-smoothing" them, or by ignoring the reported valuations altogether, and focusing solely on properties that have been both bought and sold (i.e., experienced the full-cash cycle). What the former approaches do in a nutshell is inject additional volatility into the returns while preserving the mean and reducing the realized serial correlation (typically eliminating it entirely). The issue with these methods is that they rely on unknowable parameters and often require data that are not easily attainable (Pagliari, Scherer, and Monopoli 2005; Pagliari 2017). The latter techniques that utilize repeat sales to create transactions-based indices suffer from having too few observations and this lack of transactions can become acute during major market downturns (Bailey, Muth, and Nourse 1963; Boyer, Nadauld, Vorkink, and Weisbach 2018).

Smoothing has attracted more recent attention in the hedge fund and private equity literatures. Asness, Krail, and Liew (2001) find evidence that many hedge funds that purport to be market neutral are in fact exposed to considerable systematic risk. They argue that because hedge funds often hold illiquid securities that are not marked-to-market, standard measures of risk adjustment, such as measuring market betas, fail to accurately quantify the correlation between hedge fund returns and public market returns. By applying classic techniques such as the lagged beta model (Dimson 1979), which is where excess returns are projected onto contemporaneous and lagged market returns and the regression coefficients are summed to estimate a beta, these authors find a much greater proportion of hedge fund returns can be explained by systematic risk exposure.

Getmansky, Lo, and Makarov (2004) argue that common evaluative statistics such as Sharpe and information ratios have to be treated in a more sophisticated fashion when they are used to describe returns that are not independent and identically distributed (IID). Because hedge funds contain significant illiquidity exposure, their returns are far from IID. Similar to the early real estate papers, these authors assert that reported hedge fund returns are a weighted average of current and past true returns and they provide methods to adjust return statistics to be more comparable to those used to describe assets that are presumed to have roughly IID returns. For example, the off-diagonal elements in the variance-covariance are non-zero when returns are not IID, which means that one cannot annualize monthly volatility by multiplying by the square root of twelve. Thus, "naïve" Sharpe and information ratios will tend to be biased upwards due to positive autocorrelation. Unsurprisingly, these authors find that after properly factoring in serial correlation into volatility estimates, many hedge funds are not the star performers that they claim to be.

In private equity, Jenkinson, Sousa, and Stucke (2013) ask whether quarterly valuations are fair, whether they are biased in one direction, and at what stage interim performance predicts ultimate performance. They find that buyout and venture valuations understate subsequent distributions by 35% on average. The one exception to this general conservatism is during fundraising. They find that the internal rates of return provided by general partners during fundraising have little predictive power over ultimate performance. However, they find that using the Public

Market Equivalent method of Kaplan and Schoar (2005) improves this predictability substantially.

Recognizing that discounted cash flow (DCF) analysis is difficult to apply in practice, Jenkinson, Landsman, Rountree, and Soonawalla (2019) look at realized cash flows from an ex ante perspective and compare them to reported net asset values (NAVs). In other words, they utilize the benefit of hindsight and ask how NAVs differ from the DCF value of realized future cash flows. The data in this study come from 437 venture funds and 208 buyout funds over 1998–2014 in the Burgiss Manager Universe. The main finding of this paper is that NAVs converge to the DCF value early in the life of the average fund.

Crain and Law (2018) use quarterly reports from a large fund-of-funds manager over the 2004–2015 period to study how valuation practices have changed with the adoption of fair value accounting. Specifically, they perform a difference-in-difference analysis that exploits the staggered adoption of fair value accounting standards in the U.S. and Europe. Prior to 2005, there was little consensus over how to value portfolio investments and many managers simply held companies at cost. Then in 2005, the International Private Equity and Venture Capital Valuation (IPEV) Guidelines introduced valuation standards that advocated the use of fair value accounting. These guidelines were quickly adopted by at least 37 different private equity associations throughout Europe. Similar changes did not occur in the U.S. until the introduction of FAS 157 in 2008. Under FAS 157, managers have to report the expected market value of investments. The language, which is now codified under ASC Topic 820, states that investments shall be reported at "the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date."

The main findings of the Crain and Law (2018) study are as follows. Valuation bias, defined as the second moment of valuation accuracy, is 18% lower after fair value implementation (FVI). This 18% decrease has an economic effect of $8.6 million. Valuation accuracy, defined as the difference between the reported valuation and the sum of future discounted cash flows, is 37% higher. Furthermore, valuations are more frequently updated; the chance of a NAV being updated between quarters increases by 13% after FVI. This effect is asymmetric, however, as managers are more likely to revise valuations downward. The takeaway of this paper is that fair value accounting standards improve the usefulness of private company valuations, even in opaque and subjective settings like private equity. What has yet to be uncovered in the literature is by how much NAVs are smoothed compared to comparable publicly traded equity securities.

Investing in Private Equity

In its simplest form, the term "private equity" can be used to describe any equity ownership interest that is not publicly traded. Private equity is often described as an "alternative" asset class, which suggests that it is something new or unique. In reality the vast majority of all equity transactions have always been, and continue to be, completed outside public markets. The main difference between public and private equity is how investors gain exposure to the asset class and how returns are reported.

The most straightforward way to invest in private equity is by simply purchasing the equity of a non-public firm. Most investors, however, gain exposure by committing capital to private equity funds, which are limited liability partnerships that invest in private companies. These funds are usually structured as closed-end vehicles with 10–15 year lives and operate under the commitment model of investing. This means that investors, i.e., the limited partners (LPs), can only commit capital. General partners (GPs) have complete autonomy over when to call capital to fund acquisitions and when to exit investments and distribute capital back to investors. Thus, unlike liquid asset classes, even achieving and maintaining a certain percentage allocation to PE is a non-trivial task.

Public markets feature continuous transactions which makes the valuation of securities relatively simple. Private markets, on the other hand, do not have the luxury of readily available clearing prices. In private equity, the true return of a fund is only known after all investments have been exited and cash returned to investors, which usually takes at least a decade. GPs typically provide quarterly statements to LPs that include the fund's Net Asset Value (NAV), which is the combined equity value of all of the investments, as well as an Income and Cash Flow Statement. NAVs are known to be smoothed, which means that they tend to be held conservatively and are only partially updated to reflect current economic conditions. The consequence of this is that time-weighted rates of return — like the ones commonly used in public markets — understate the true volatility of the assets and this can lead to biased estimates of risk when using traditional regression-based models.

LPs provide the majority of equity capital to fund transactions and GPs raise debt on a deal-by-deal basis. Theory suggests that this financial structure minimizes agency conflicts between investors and managers (Axelson, Stromberg, and Weisbach 2009). Limited Partner Agreements (LPAs) typically allow a fund's life to be extended by three or more years and extensions are quite common due to the inherent illiquidity of the asset class. The cash flow profile of a PE fund is often referred to as the "J-curve" because funds are usually heavily investing in early years, and hence calling a good portion of committed capital, and then selling investments in later years and returning capital to investors. Only in recent decades has a secondary market for stakes in PE funds developed in earnest. This market allows existing LPs to exit positions and other investors to buy directly into PE. The benefit of liquidity is no free lunch, however, as these stakes will often trade at discounts to stated NAV.

Valuation smoothing, which is a key feature of asset classes like private equity (and the subject of this paper), may seem at odds with market efficiency. Fama (1970) states that a market is efficient if "prices 'fully reflect' all available information." This statement, while powerful, is quite ambiguous. Malkiel (1989) expands on this definition and states:

"Formally, a market is said to be efficient with respect to some information set, ϕ, if security prices would be unaffected by revealing that information to all participants. Moreover, efficiency with respect to an information set, ϕ, implies that it is impossible to make economic profits by trading on the basis of ϕ."

If nearly all market participants know that valuations are smoothed, it is not clear if expected returns would change in the revelation of the smoothing function. Sure, such a disclosure may change the outcomes of individual transactions, but it does not follow with certainty that there would actually be a change in average expected returns across the asset class. Valuations are typically provided to investors 30–90 days after quarter end, which means that with or without smoothing, investors already have to make real-time adjustments to out-of-date valuations when evaluating potential transactions. The market still clears. And everyone is happy relative to alternative choices. Thus, despite the added information asymmetries from valuation smoothing, it is not clear whether smoothing actually represents a capital market inefficiency.

Risk Adjustment in Private Equity

The average return from investing in private equity (PE) is far from a settled science and there is no clear consensus on the best way to risk-adjust PE returns. Results differ markedly by time, methodology, and sample. The term "private equity" throughout this section will include discussions of both buyout and venture strategies and I will delineate between the two as needed.

Calculating returns in public markets is simple: new price minus old price scaled by the old price and adjusted for dividends. Regression models can then be used to project excess returns on any number of the zoo of factors that we now have to see what, if anything, was added by active management (Jensen 1968). Such a calculation is most often meaningless in private capital markets due to stale and lagged valuations, which cause estimates of systematic risk to be biased downwards (Scholes and Williams 1977; Dimson 1979; Woodward 2009).

Returns to PE investments are based on cash flows, and sometimes net asset values (NAVs), which are the valuation estimates that general partners (GPs) provide to their limited partners (LPs) on a quarterly basis. Practitioners tend to gravitate towards cash multiples (e.g., total-value to paid-in-capital), the internal rate of return (IRR), and variations of the Public Market Equivalent (PME) when evaluating the performance of PE investments.

The benefit of cash multiples, such as total-value to paid-in capital (TVPI), is that they are intuitively simple; however, there is no consideration for risk or time value. IRR is a money-weighted return, which means that it is not comparable to the time-weighted returns commonly used in liquid asset classes. The benefit of IRR, though, is that it does not rely on interim valuations. And while TVPI and IRR are still widely used throughout the industry today, PME methods have become the benchmark of choice among many institutional investors.

The first widely-used risk adjustment method for private equity came from Long and Nickels (1996), which they referred to at the time as an Index Comparison Method (ICM). The idea was to calculate the spread, expressed as an annualized percentage, between the IRR of a PE portfolio and a replicating portfolio that invested equivalent cash flows in a public index. The issue with the Long-Nickels ICM, as well as with later variants such as the "PME+" and "mPME" extensions of Rouvinez (2003) and Cambridge Associates (2013), respectively, is that they are heuristic in nature, and therefore do not represent exact solutions for alpha.

Kaplan and Schoar (2005) introduce the first PME technique ("K-S PME") that can actually be derived from the standard linear beta model and represents an exact solution to alpha, rather than a heuristic. The K-S PME is a ratio of wealth that is equal to the present value of distributions divided by the present value of contributions. If there is identical performance between a PE investment and the public index used to discount the PE cash flows, this ratio will equal unity. One weakness to the K-S PME is that it measures the overall wealth generated by a PE investment with no concern for the rate at which the excess wealth accrued (or was destroyed). Thus, it is not a return, although it does provide a measure of risk-adjusted performance. Additionally, there is no precise way to compare multiple K-S PMEs beyond ranking them. For example, if Fund A has a PME of 1.2 and Fund B has a PME of 1.0, Fund A did not (necessarily) do 20% better than Fund B.

Griffiths (2009) makes a key step by introducing a methodology to calculate the discrete-time analog of alpha, expressed as an annualized percentage. This method, known as Direct Alpha, is calculated by discounting all contributions and distributions to a single point in time, and then finding the IRR of the sequence of discounted cash flows. Direct Alpha, like the K-S PME, represents an exact solution for alpha and not a heuristic. For the Direct Alpha result to be the "true" alpha, however, the reference benchmark must contain all components of systematic risk that the PE investment is exposed to (see Gredil, Griffiths, and Stucke 2014).

It may help to point out an equivalence between the methods just discussed: TVPI is to K-S PME, as IRR is to Direct Alpha. TVPI is the undiscounted ratio of cash received (plus the NAV or liquidating cash flow) to cash provided. K-S PME is the same ratio with each cash flow discounted at the market return. Analogously, Direct Alpha can be calculated using the same algorithm to solve for IRR. The only difference is that to calculate Direct Alpha, the cash flows are discounted first, and then a discount rate is solved for. This discount rate represents the discrete-time analog of alpha. It does not tell you exactly when alpha is created or destroyed, but it does tell you the average annual excess return over (or under) a reference benchmark.

Performance can be measured at multiple levels in private equity: investment, fund, fund family, and firm (i.e., GP). Each level has advantages and disadvantages for studying risk-adjusted performance, managerial skill, performance persistence, and the many information agency issues between owners and managers.

Deal Level Data: Venture Capital

The advantage to deal-level data is that these data are the most granular. The cash flows exchanged at the deal level are between GPs and portfolio companies. In the case of venture, there may be interim valuations from multiple funding rounds, which provide considerable additional information content. Survivorship bias is a major concern at the investment level because successful investments are more likely to be observed. Researchers are, however, able to classify investments by detailed characteristics such as geography, industry, investment stage, strategy, etc.; all of which become blended within funds.

Risk-adjusted returns using deal-level data are calculated either by constructing an index and using standard regression techniques or by using deal-level transactions directly. Methods in the venture capital literature that utilize the former begin with Peng (2001) who uses a sample of 5,643 start-up valuations from 1987–1999 to construct an index based on repeat sales (e.g., Bailey, Muth, and Nourse 1963; Case and Shiller 1987). Peng finds a monthly alpha of –0.2% and a beta of 1.3 against the S&P 500. When using annual returns, the yearly alpha estimate is –0.9% per year with a beta of 2.4. Peng also estimates the monthly (annual) alpha and beta using the NASDAQ and finds 0.3% (–3.8%) and 0.8 (4.7), respectively. It is not clear why these results change so drastically between market indices and why alpha and beta do not appear to scale with consistency as the horizon is increased. Hwang, Quigley, and Woodward (2005) construct a repeat-sales index using an updated version of the dataset from Peng (2001). These authors treat selection bias as an omitted variable problem and employ a two-step Heckman estimator. Using the S&P 500 (NASDAQ), they find an insignificant quarterly alpha of 0.9% (1.0%) and a beta of 0.6 (0.4).

Cochrane (2005) circumvents index construction and uses the returns between financing rounds and from the last financing round to exit. This has become the predominant approach in the recent literature. Cochrane assumes that returns follow a CAPM model in logs and specifies a selection correction model that is estimated using maximum likelihood. Using a sample of 16,638 round-to-exit returns, he finds a beta of 1.9 (1.4) and a yearly alpha of 32% (39%) against the S&P 500 (NASDAQ).

Korteweg and Sorensen (2010) call attention to the fact that the selection issue does not conform to the Heckman assumption that unobserved values (i.e., unobserved outcomes) are uncorrelated with observed outcomes. In order to handle the dynamic selection problem, these authors specify a state space model where the latent variable is the start-up value. Using Bayesian Markov chain Monte Carlo (MCMC) methods, they find a monthly alpha of 3.3% and a beta of 2.8.

Korteweg and Nagel (2016) introduce a generalized version of the K-S PME measure, which will be discussed in more detail below. They find that a $1 investment in venture yields an NPV of $0.50–0.60, which corresponds to an annualized return of 50–60%. This result is in the neighborhood of Cochrane (2005).

Deal Level Data: Buyout Funds

Shifting gears to research on buyout funds using deal-level data, Kaplan (1989) finds a market-adjusted return of 42% on total capital using a sample of 25 management buyouts from 1980–1986. He estimates a staggering 130% median return to equity holders. More recently Franzoni, Nowak, and Phalippou (2012) investigate liquidity risk in PE and find an illiquidity premium of 3%. These authors use a sample of 4,403 buyout investments from 1975–2006 and regress the log modified internal rate of return (MIRR) from portfolios of buyout deals on MIRRs of publicly-traded factor portfolios over the same time period. They find a log-CAPM beta of 0.9 and an annual alpha of 9.3%. Axelson, Sorensen, and Stromberg (2014) find a log-CAPM beta of 2.4 and an annual alpha of 8.6% using a sample of 2,075 buyout deals from 1994–2007. When jumps are included in their model, the alpha increases to 16.3% annually. Braun, Jenkinson, and Stoff (2017) use the K-S PME to measure deal-level returns, a technique more commonly used with fund-level cash flows, and find a median PME of 1.3.

Most researchers that find such large betas in buyout tend to justify their results using a Modigliani-Miller leverage calculation. While many buyout funds do in fact use large amounts of debt to fund acquisitions, which would imply a high beta all things equal (e.g., Axelson, Jenkinson, Stromberg, and Weisbach 2013; Groh and Gottschalg 2011), leverage is paid down quickly assuming the portfolio company survives. Contrary to some of the findings of high betas, the general industry consensus is that private equity has a beta between 1.0–1.5.

Fund Level Data

Now let us turn to the articles that utilize fund level cash flows to calculate risk and return. Cash flows at the fund level are between GPs and LPs and are net of fees and carried interest. Thus, these returns resemble the actual investor experience. The downside of net-of-fee cash flows is that they say little about GP skill, how rents are shared, and may even induce negative serial correlation in returns (Getmansky, Lo, and Makarov 2004).

This literature begins with Gompers and Lerner (1997) who use cash flows and reported quarterly valuations to create a time series of PE returns. With the issues of smoothing in mind, these authors update final NAVs using the returns on an equally-weighted NASDAQ-based index of firms in the same three-digit SIC industry group. Using a regression model they find a quarterly alpha of 2% and a beta of 1.4.

More recently Boyer, Nadauld, Vorkink, and Weisbach (2018) construct private equity indices based on transaction prices from the secondary market. Their buyout indices have a massive beta of 2.4 with a negative 2% annual alpha and their venture indices have a beta of 1.0 with a negative 6% annual alpha.

Due to smoothing, the opportunity for manipulation, and the general subjective nature of PE NAVs, another strand of research at the fund level ignores NAVs altogether or uses only the NAV at the performance measurement date. Ljungqvist and Richardson (2003) take the approach of comparing fund IRRs to the IRRs of mimicking portfolios. They find that private equity outperforms public markets by 5–8% per year using a sample of 19 venture and 54 buyout funds. K&S (2005) use cross-sectional regressions of fund-level IRRs on realized public market returns over the first five years of a fund's life and find a beta of 0.4 for buyout and 1.2 for venture. Regression models like these must be taken with a grain of salt because the econometric relationship between IRRs and time-weighted factor returns is not fully understood (Korteweg 2019). Axelson, Sorensen, and Stromberg (2014) use simulated data to show that beta estimates from IRR-based regressions tend to be biased downwards.

The recent literature has favored the use of stochastic discount factors (SDFs), and namely the PME and its generalizations such as the Generalized Public Market Equivalent (GPME). Sorensen and Jagannathan (2015) and Korteweg and Nagel (2016) are among the first to point out that the PME is an SDF valuation. The benefit of using an SDF approach to discount PE cash flows is that, in contrast to most factor models, no distributional assumptions are made. This is an important feature for asset classes like PE that feature skewed option-like payoffs.

PME estimates, like all risk-adjusted performance estimates in PE, vary substantially across papers. Kaplan and Schoar (2005) find PMEs of about one for both venture and buyout. Note here that the 577 venture funds and 169 buyout funds in the K&S sample are from Venture Economics, which is the dataset that Stucke (2011) found to have a downward bias. Phalippou and Gottschalg (2009) find a combined private equity PME of 0.9. Higson and Stucke (2012) find a PME of 1.36 using a sample of 1,169 buyout funds. Harris, Jenkinson, and Kaplan (2014) use the Burgiss dataset and find a PME of 1.22 (1.36) for buyout (venture) funds. All in all, the evidence suggests that buyout funds outperform public markets, but venture has underperformed since the turn of the millennium.

Korteweg and Nagel (2016) introduce the Generalized Public Market Equivalent (GPME) method. Unlike the K-S PME that equals 1.0 if the PE portfolio breaks even, the GPME equals 0.0. The first benefit of the GPME method is that it properly accounts for the extent to which a high-beta asset outperforms a public index in times of rising markets. Second, in contrast to the K-S PME which is just a point estimate, the GPME has a standard error which allows for statistical inference. In this way, the GPME is more similar to methods used in the hedge fund and mutual fund literatures.

To summarize, a wide variety of methods exists to evaluate private equity performance. In the beginning, risk-adjustment was based on CAPM and three-factor models. Then, exploration into other risk factors such as liquidity and idiosyncratic volatility began. The use of stochastic discount factors now dominates due to the advantages that these methods have in dealing with returns that are heavily skewed and primarily based on cash flows. Nascent research includes the examination of term structure features (Gupta and van Nieuwerburgh 2019) as well as whether or not PE has an asset class-specific premium (e.g., Korteweg and Sorensen 2010; Ang, Chen, Goetzmann, Phalippou 2018). Other questions, such as style and performance at the partner level, still require more attention (Ewens and Rhodes-Kropf 2015). If I am to sum up private equity performance in a nutshell, I would say that investors can outperform public markets only by consistently investing in positive net-alpha producing managers.

CHAPTER 3

WHAT IS THE MARGINAL VALUE OF CASH?

Empirical Methodology

Overview

The intuition behind the regressions in this paper is incredibly simple (at least at first glance). I regress quarterly changes in equity valuations on quarterly cash flows and I do this using a sample of private equity funds and a sample of public firms. Private equity cash flows are the contributions and distributions that represent the cash that investors provide and receive, respectively, from investing in closed-end private equity funds. In the public equity context, the analogous cash flows are the payments that shareholders receive, either in the form of dividends or share buybacks, as well as the capital that shareholders provide by purchasing newly issued equity. The goal of this regression framework is to measure the association between cash flows and equity returns and to estimate what the value of a dollar is to both private equity funds and public firms.

It has long been claimed that private market valuations are marked conservatively and smoothed relative to movements in public markets. Measuring the marginal value of a dollar invested private equity is one way to capture smoothness and conservatism in these valuations. Publicly traded securities provide an ample “control” group to compare to private equity funds. The marginal value of a dollar means that for every dollar contributed to a fund or firm, the value of equity should increase by about a dollar, all things equal. Similarly, for every dollar distributed by a fund or firm, the value of equity should decrease by about a dollar.

A closely related article that examines how shareholders value extra cash in public firms is Faulkender and Wang (2006). These authors study the relationship between corporate financial policy and the value of cash and they find that the marginal value of cash is decreasing in cash holdings, financial flexibility, and leverage. Additionally, they find that the value of cash is lower for firms that tend to distribute capital back through dividends vis-à-vis repurchases. Another related paper that utilizes data from private markets is Jenkinson, Sousa, and Stucke (2013) who use a sample of private equity funds to test whether valuations are conservative on average. These authors find that valuations understate subsequent distributions by about 35% on average. I replicate the Jenkinson, Sousa, and Stucke (2013) study and find similar results: private equity valuations do appear to be marked conservatively relative to future cash flows. I then repeat this regression analysis on public firms and find nearly identical results. In other words, both public firms and private equity funds place a similar value on extra cash. It is important to point out that this does not imply that public firms are undervalued, just that extra cash is valued similarly — i.e., conservatively — in both firms and funds.

Private Equity

Net asset values (NAVs) are the quarterly valuations that private equity (PE) general partners (GPs) provide to their limited partners (LPs) on a quarterly basis.

The NAV of a fund represents the value of equity (i.e., enterprise value less debt) of all the portfolio companies in the fund. A fund's NAV will only change if there is a cash flow in to or out of the fund, or an investment is either marked up or down. The idea behind regressing NAV changes on cash flows is that in a world without fees or smoothing, for every one dollar that a private equity fund calls from investors, the fund's NAV should increase by one dollar; and for every dollar that the fund distributes back to investors, the fund's NAV should fall by about one dollar. This relationship can be formalized into the following baseline regression model:

$$\Delta NAV_{it} = \beta_0 + \beta_1 * Contributions_{it} + \beta_2 * Distributions_{it} + \epsilon_{it} \qquad (1)$$

The dependent variable in this regression, ΔNAV_{it}, is the change in NAV (i.e., change in the value of equity) for fund i in quarter t. The independent variables are the quarterly cash flows that investors contribute to funds, $Contributions_{it}$, and receive from funds, $Distributions_{it}$. In order to strip out the effects of unobserved heterogeneity across funds and time, quarter and fund fixed effects are included. Standard errors are clustered by fund and time. The effects of the implementation of fair value accounting in the U.S. in 2008, originally codified in FAS 157 and now classified under ASC Topic 820, are estimated by interacting a dummy variable that is equal to one if the cash flow occurred during or after 2008 with the independent variables, $Contributions_{it}$ and $Distributions_{it}$.

If NAVs are unbiased predictors of future cash flows, then one might expect the coefficients on $Contributions_{it}$ and $Distributions_{it}$ to be positive one and negative one, respectively. If NAVs are marked conservatively, however, then one might expect the coefficient on $Distributions_{it}$ to be something greater than negative one (i.e., not as negative). In other words, the NAV will fall by some amount less than the actual cash flow because the NAV understated the value of the investment(s) being sold. The coefficient on $Contributions_{it}$ provides an estimate of the average value of a dollar to a private equity fund in the quarter that it is called. If private equity funds are expected to add value on average, then one might expect this coefficient to be at least one, if not greater than one. On the other hand, if newly acquired companies are held at cost and a portion of the cash flow goes to pay fees, then this coefficient would likely be less than one.

One massive weakness of this analysis is that the data are at the fund level. Because buyout funds typically hold around 10–14 portfolio companies, there is no way to know the movements in valuations of each portfolio company individually without company level data. Thus, evidence of a smoothed association between NAV changes and distributions at the fund level may be explained by PE funds choosing to distribute capital back to investors during quarters in which most investments have appreciated in value. If the covariance between exit probability and NAV appreciation is strongly positive, then one might expect distributions to appear smoothed relative to NAV changes even if NAVs are not biased one way or the other. The same can be said for the relationship between NAV changes and contributions.

If each fund held only one investment at a time, then this specification could more purely measure the marginal value placed on cash called from investors. However, given that valuations are at the fund level, estimating the value of extra cash to PE funds is clouded by fees and contemporaneous movements in other investments.

Public Equity

I now turn to the sample of public firms to study the value of cash raised by common stock issuers and to see if distributions are smoothed like in private markets. It is important to again caveat the methodology used to measure smoothing. If distributions tend to occur during quarters in which most assets have appreciated in value, then the association between changes in equity values and cash distributions may appear smoothed, even if equity valuations are not conservative. Because public firms have two ways to distribute capital back to investors, the basic specification for public markets is as follows:

$$\Delta Equity_{it} = \beta_0 + \beta_1 * Div_{it} + \beta_2 * Rep_{it} + \beta_3 * Iss_{it} + \epsilon_{it} \quad (2)$$

The dependent variable, $\Delta Equity_{it}$, is the quarterly change in the value of equity for firm i in quarter t. Equity values are measured using both book and market values. The independent variables, Div_{it}, Rep_{it}, and Iss_{it}, represent the quarterly cash flows from dividends, share repurchases, and share issuances, respectively. In order to control for unobserved heterogeneity across firms, industries, and time, I include firm, industry, and quarter fixed effects. Standard errors are clustered by firm and time. I also test a variation of Equation (2) by aggregating quarterly shareholder payouts from dividends and repurchases into a single variable in order to yield more analogous results to the private equity sample.

Sample and Summary Statistics

Private Equity

The data on private equity funds comes from Preqin, a large commercial data and information provider for the private capital industry that is headquartered in London, United Kingdom. Preqin provides information on funds, fund managers, investors, transactions, as well as market-wide benchmarks. Preqin was founded in 2003 and began to collect fund level private capital data from public pensions using Freedom of Information Act (FOIA) requests. Now, combined with voluntary data contributions, this database contains information on over 2,200 fund managers globally.

Preqin provides a time series of contributions (i.e., what is called from investors), distributions (i.e., what is paid out to investors), as well as quarterly net asset values (NAVs). All cash flows are net of fees and therefore represent the actual investor experience. I focus on private equity and buyout funds in particular, so I exclude other private capital strategies such as venture, real estate, hedge funds, infrastructure, and natural resources. While there has been a push in the academic literature in recent years to broaden many research inquiries to include multiple types of private capital, I choose to stick with U.S.-focused buyout funds in order to make the private equity sample as comparable as possible to the public equity sample, which is described in the next section. My final sample of funds includes 922 U.S.-focused buyout funds with vintage years between 2000 and 2018, of which 607 have information on quarterly cash flows and valuations.

Private equity (PE) net asset values (NAVs) are the valuations that PE managers provide their investors. The NAV of a fund is the combined enterprise value of all the investments in the fund less the value of debt. The implementation of fair value accounting standards in 2008 (FAS 157 in the U.S.) sought to bring guidance and standardization to valuations in the PE market, which primarily features transactions involving “Level 3” assets. Level 3 assets are those that do not trade frequently and therefore do not have market prices or readily observable inputs to use in valuation. Prior to FAS 157 (now codified as ASC 820), most investments were simply held at cost. NAVs are said to reflect what an asset would be worth in an arm’s length transaction and are at least definitionally more akin to the market value of equity in public markets; however, given that NAVs are known to be conservative and smoothed, they may behave more like book equity, which is known to be backward looking.

As shown in Table 1, my final sample includes 17,440 NAV changes, 18,581 cash contributions, and 8,583 cash distributions. The average (median) quarterly NAV change is $102M ($28M) and the average (median) quarterly contributions and distributions are $235M ($4M) and $621M ($212M), respectively. The average (median) fund size is $1.9B ($800M). There are a total of 374 general partnerships (GPs) in the sample and the average (median) GP has 2.5 (2) funds. The average (median) total value to paid-in (TVPI) ratio and internal rate of return (IRR) are 1.5 (1.5) and 14.6% (13.7%), respectively.

Table 2 shows performance statistics broken down by vintage year, which is the year in which the first investment of a fund is made. The number of funds per vintage year correlates highly with trends in public markets. For example, there are twice as many funds in the 2000 vintage as there are in the 2001–2004 vintages, which are the vintage years immediately following the Tech Bubble. A similar pattern can be seen for the vintage years before, during, and after the Great Financial Crisis. The average TVPI ratio is around 1.5 and is lower in the most recent vintages — which is to be expected given that these vintages are relatively new and have therefore invested heavily and distributed lightly. The average IRR for all vintages is approximately 16% and similar to TVPI, IRRs are lower in the more recent vintages due to the fact that younger funds are still at the beginning of the J-curve. The Kaplan and Schoar (2005) Public Market Equivalent ("K-S PME"), which indicates the overall wealth earned from investing private equity versus investing the same cash flows in a public index, shows that most vintage years outperform public markets (a ratio greater than one indicates that PE fund performance exceeds that of public markets).

Table 3 shows which industries fund managers cited exposure to. It is important to note here that these industry designations reflect the industries that managers said they were either investing in or expected to be investing in when the data were collected. Some funds listed one industry while others listed over forty. Regardless, this table shows that Information Technology, Consumer Discretionary, Industrials, and Communication Services are among the most popular in the sample while Agriculture, Real Estate, Utilities, and Materials are some of the least popular.

Public Equity

The public equity sample utilizes data from CRSP and Compustat. Changes in equity valuations are calculated using both book and market valuations. Book equity is measured using the Compustat balance sheet item Common/Ordinary Equity (CEQQ), which is the sum of common stock, capital surplus, and retained earnings, less treasury stock. The market value of equity for each firm is measured using CRSP variables Price (PRC), which is the closing price or bid/ask average, and Number of Shares Outstanding (SHROUT). Cash flows related to dividends, share repurchases, and share issuances are gathered using Compustat cash flow variables Cash Dividends (DVY), Purchase of Common and Preferred Stock (PRSTKCY), and Sale of Common and Preferred Stock (SSTKY), respectively.

I begin by merging the CRSP Monthly file with the Compustat Quarterly file, which yields a total of 1,396,962 observations. After calculating changes in book and market equity as well as quarterly cash flows from cash dividends, share repurchases, and share issuances, the dataset is collapsed to the quarterly level, which yields a total of 448,992 observations, of which 361,716 have sufficient data for the regressions. As shown in Table 4, there are 361,716 firm-quarter observations that have sufficient data in all fields. The average (median) quarterly change in market and book equity is \$46.2M (\$1.5M) and \$26.7M (\$1.1M), respectively. The average quarterly cash flows for dividends, repurchases, and issuances are \$31M, \$32.5M, and \$19.5M, respectively, with the median value being zero for all three variables.

In Tables 5 and 6, I show equal- and value-weighted industry concentrations, respectively, by calendar year after grouping firms into the Fama-French 12 Industry Classifications. On both an equal- and value-weighted basis, the sample is dominated primarily by Business Equipment, Financials, Health Care, and Other firms.

Empirical Results

Overview

I find that private equity valuations increase by about a dollar for every dollar contributed to a fund but fall by only \$0.80 on average for every dollar distributed. The \$0.80 drop in fund valuations is consistent with, but lower than, the \$0.65 drop in Jenkinson, Sousa, and Stucke (2013). This finding may provide evidence that valuations are marked conservatively relative to future cash flows. For the full sample of public firms, I find that book (market) equity increases by about \$1.14 (\$2.69) over a quarter for every dollar taken in by issuing stock. For every dollar that the average public firm distributes back to investors via share buybacks, book (market) equity tends to decrease by \$0.61 (\$0.80) over the quarter. The fact that both private equity funds and publicly traded securities feature a similar "smoothed" relationship between changes in the value of equity and distributions may suggest that conservative valuations are not unique to private markets. Alternatively, it may be that both private equity funds and public firms time distributions to coincide with periods of high asset appreciation.

Private Equity

I begin by studying the association between changes in net asset values (NAVs) and fund level cash flows (i.e., contributions and distributions) in private equity (PE). The NAV of a PE fund is the aggregate enterprise value of all of the investments less debt (i.e., the equity value). To do this, I run a regression of quarterly NAV changes on quarterly contributions and distributions using a sample of PE funds and the main results are presented in Table 7. I find that for every dollar contributed to a fund, NAVs increase by about $1.03, and for every dollar distributed by a fund, NAVs decrease by about $0.77. When I add in fund and quarter fixed effects, I find that NAVs increase by $0.97 for every dollar contributed and fall by $0.80 for every dollar distributed. The coefficients on contributions are within a couple standard errors of unity, but the coefficients on distributions are neither close to zero nor unity. A major weakness of this regression framework is the granularity of the data. Specifically, because NAVs are at the fund level, it is not possible to know how the individual investments within a fund are performing, and therefore, the appearance of smoothness in cash distributions may simply be a result of other investments appreciating during the same quarters as exits and cash distributions are taking place.

Jenkinson, Sousa, and Stucke (2013; "JSS" hereafter) are the first to perform a private equity fund-level analysis like this and they find similar results: for every dollar called by a private equity fund, NAVs increase by about one dollar, but fall by some amount less than a dollar for every dollar that is distributed back to investors.

Specifically, they find a -0.65 coefficient on distributions, which they interpret as evidence that valuations are conservative and understate distributions by about 35% on average. The logic behind their conclusion is simple: if NAVs are on average neither conservative nor aggressive, then the coefficients on contributions and distributions should be negative one and positive one, respectively. In other words, one would expect — ceteris paribus — a mechanical relationship between fund cash flows and contemporaneous NAV changes. If NAVs tend to be marked conservatively, on the other hand, then the coefficient on distributions should be something less than one. To illustrate the JSS results as well as my own results using a stylized example, consider a hypothetical investment with an intrinsic value of one dollar that is marked at only $0.80. Ignoring fees, the fund's NAV will only fall by $0.80 when the investment is sold, even though a full dollar has been distributed back to investors.

JSS normalize all variables by the size of the fund. I do the same and find qualitatively similar results (see Table 8). A one unit increase in contribution yield equates to a 0.95 increase in NAV yield that is not significantly different from one. A one unit increase in distribution yield is associated with a 0.71 decrease in NAV yield, which is over nineteen standard errors from one. These results add further support to the claim that PE funds value additional dollars at about one for one, but mark NAVs conservatively relative to subsequent cash flows.

A related question is how the passage of FAS 157 may have reduced smoothing. FAS 157 requires private equity investments to be marked at fair value, as opposed to being held at cost. As shown in Table 9, I find that the passage of FAS 157 is associated with a decrease in NAV conservatism. Specifically, NAVs understate distributions by 12 cents less on the dollar after FAS 157 than before. I did not, however, find any statistically significant association between the marginal value of cash contributions after the implementation of fair value accounting. This latter result implies that initial marking behavior by PE fund managers has not changed.

Another interesting question is how the marginal value of contributions and distributions varies by fund performance. In Table 10 I breakdown the main results from Table 1 according to the relative performance of each fund in the sample. Fund level distributions are smoother going from first to fourth quartile funds as well as from above- to below-median funds, which suggests that better performing funds have a tendency to smooth their valuations more. However, I did not find any relationship between the marginal value of contributions and fund performance. This result is in line with PE fund managers holding new investments at cost for at least the first quarter.

Public Equity

Full Sample

The regression of NAV changes on cash flows attempts to capture any directional biases in PE NAVs at the quarterly frequency and provides a basis for comparing the marginal value of a dollar between public and private markets. If in fact NAVs are smoothed, and this regression specification does indeed measure smoothing, then the same specification might be expected to produce a "null" result in a market that is thought to be exempt from smoothing. Again, the same criticism can be made for the public market sample as with the private market sample: if capital is more likely to be distributed following positive performance, then distributions may appear to be smoothed at the quarterly frequency even if equity valuations do not understate future cash flows.

In contrast to private equity, though, public firms have two mediums to distribute cash back to investors: dividends and repurchases. Thus, the basic specification for the public equity sample is a regression of quarterly changes in equity — measured using both book and market values — on dividends, share repurchases, and share issuances; all of which are aggregated to the quarterly frequency for comparability to private equity.

What I find in public equity is anything but a "null" result. As shown in Tables 11 and 12, when book equity is the dependent variable, I find that for every dollar a company distributes via dividends, its book equity actually increases by 30 cents. Quite a surprising result. When I add in firm, quarter, and industry fixed effects to control for unobserved heterogeneity across firms, time, and industries, I find the association to be a decrease in book equity of approximately 20 cents for every dollar paid out via dividends. The dividend coefficient is far from negative one (more than seventeen standard errors to be exact), but is directionally more palatable when fixed effects are included. Interestingly, dividends display almost no association with changes in the market value of equity. These puzzling results may be explained by a dividend announcement effect (a point discussed in more detail in the Robustness section) or because dividends are expected and therefore already priced. Another possibility is that the quarterly frequency of the data may be the culprit.

The results for repurchases and issuances are more in line with the private equity sample. For every dollar distributed via share repurchases, book (market) equity decrease by $0.26 ($0.16), and for every dollar raised via share issuances, book (market) equity increases by $1.30 ($2.89). When fixed effects are added to the model, the relationship becomes a decrease of $0.58 ($0.78) and an increase of $1.16 ($2.71) for repurchases and issuances, respectively. When I leave dividends out of the book (market) equity model, I find coefficients of -0.61 (-0.80) and 1.14 (2.69) on repurchases and issuances, respectively. Not only are these coefficients significantly different from zero, but they are also significantly different from one. With respect to book equity, the estimates on issuances are over three standard errors from unity while the coefficients on repurchases are more than twelve. When market equity is on the left, the coefficient on repurchases is not statistically different from one, but the coefficient on issuances is.

In order to understand the forces that influence equity valuations better from an accounting perspective, I include the change in retained earnings as a control (see Table 13). My initial hypothesis was that the coefficient on retained earnings, especially with respect to book equity, should be something very close to one. After all, retained earnings represent what a firm has reinvested in itself after making any distributions to its shareholders. Although my original thinking was that the mechanical relationship between retained earnings and book equity would lead to a coefficient near one, I was incorrect. A one dollar increase in retained earnings only corresponds to a 55 cent increase in book equity. This finding highlights the elusive nature of such present value estimates in a regression framework (at the quarterly frequency).

Because buyout funds only pay out cash via distributions (i.e., there is no distinction between dividends and repurchases), I also run the analysis combing dividends and repurchases into a single quarterly cash flow (see Tables 14 and 15). I find that book (market) equity decreases by \$0.39 (\$0.57) for every dollar paid out and increases by \$1.18 (\$2.72) for every dollar taken in. This would suggest that public equity valuations can be smoothed too, and that the market tends to ascribe a positive net present value to the capital that firms raise.

It is common when working with financial variables that have highly skewed distributions to normalize variables so that large outliers do not dominate the results. In the private equity sample, the results did not differ in any marked way when using variables measured in dollars versus using variables measured in cash flow yield, which is just the cash flow in dollars scaled by total assets (the results are robust to other scaling factors too such as contemporaneous or lagged market equity). Next, I repeat the above analyses with cash flow and return variables that are scaled by total assets to see if different units lead to different results in the public equity sample and what I find is that units do indeed matter a lot. As shown in Table 16, when using scaled book equity as the dependent variable, the coefficients on repurchases are not significantly different from unity, but the coefficients on issuances are significantly different from unity, which is the exact opposite of what I find using variables measured in dollars. When the scaled change in the market value of equity is used as the dependent variable (Table 17), the coefficients on both repurchases and issuances are significantly different from one. Tables 18 and 19 further show conflicting results and highlight the fact that variable units can matter a lot in drawing conclusions in this context.

Small Capitalization and Value Firms

In this section I discuss the results from the restricted samples of small capitalization and value firms. Specifically, I only keep firms that have a market-to-book ratio less than one (i.e., value firms) and I require the market capitalization to be between $300M and $2B (i.e., small capitalization). Firms that are at the intersection of small-cap and value are likely to be more representative of the types of firms targeted by PE funds (e.g., Stafford 2017) and the results are qualitatively similar using alternative definitions of value and small capitalization.

I find that for every dollar a small cap-value firm pays out in cash dividends, book (market) equity decreases by only $0.32 ($0.08) on average (see Tables 11 and 12). Recall that that same association is a decrease of $0.30 ($0.14) for the full sample; so far not much of a difference. For repurchases, I find the association to be a decrease of $0.32 and $0.04 in book and market equity, respectively, for every dollar used to repurchase shares for small cap-value firms versus a decrease of $0.58 and $0.78 for the full sample of firms. It is important to note, however, that the "smoothed" association between repurchases and equity changes is only significantly different from unity when changes in market equity are used as the dependent variable. What this implies nevertheless is that the equity of small cap-value firms tends to be smoother compared to the full sample of firms, which has direct implications for estimating the extent of net asset value (NAV) smoothing in private equity.

The idea in private equity (PE) is that for every dollar the average fund distributes back to investors, NAVs only tend to decrease by around $0.70–0.80, on average, and one interpretation of this result is that NAVs — which represent the combined equity value of all of the portfolio companies held within a fund — are marked conservatively. Given that PE funds tend to acquire companies that are smaller in size and are often considered "value" firms (using standard definitions of price-to-earnings, book-to-market, etc.), there is doubt over what should be the correct "null" hypothesis to use on the private equity sample.

What is equally as interesting is that for every dollar public firms raise by issuing shares, the average change in book (market) equity for those in the small cap-value category is only an increase of $0.84 ($0.52) versus an increase of $1.16 ($2.71) for the full sample. The result in the PE sample is somewhere in between: NAVs increase by about $0.97 for every dollar called, which is not significantly different from one. The low marginal value of a dollar in the small cap-value sample vis-à-vis both the full sample of public firms as well as the sample of PE funds may be explained by the value premium (which may not actually be a thing anymore). If value firms are consistently undervalued or simply have poor future prospects, then the market may ascribe a loss in value when cash is transferred from investors to these firms. If so, one would expect to see a low marginal value of dollar. Alternatively, it may be that the well-known negative signal sent by issuing equity (Myers and Majluf 1984) can partially explain the low marginal value of a dollar. However, equity issuances are typically announced a year or more in advance, so it is likely that any negative announcement effect is already incorporated into prices. Furthermore, if negative signaling is the culprit, then one would expect it to appear in the full sample as well, which it does not.

When I leave out dividends and examine only repurchases and issuances, I find that small cap-value firms have an average decrease in book (market) equity of $0.41 ($0.07) for every dollar spent on share buybacks and an increase in book (market) equity of $0.76 ($0.50) for every dollar raised by offering shares. For the full sample, these figures are a decrease in book (market) equity of $0.61 ($0.80) for every dollar used to buy back stock and an increase of $1.14 ($2.70) for every dollar raised via share issuances. With or without dividends, these results show a similar relationship between quarterly changes in equity and cash flows across public and private markets. Moreover, small-cap and value firms show more pronounced distribution smoothing compared to the full sample of public firms. Whether this is due to both book and market equity valuations understating future distributions or simply that firms tend to make distributions during quarters that equity is appreciating is an open question.

To make the public to private comparison even more comparable, I examine the results of combining cash outflows from dividends and share repurchases into a single quarterly cash flow variable (see Tables 14 and 15). For small cap-value firms (full sample), a one dollar cash outflow is associated with a decrease in book and market equity of $0.25 ($0.39) and $0.07 ($0.57), respectively. In this specification, a one dollar inflow from offering shares is associated with a book (market) equity increase of $0.83 ($0.52) for small cap-value firms and an increase of $1.18 ($2.72) for the full sample.

Lastly, I re-do the analysis after normalizing all variables by total assets in order to reduce the potential impact of outliers on the results and to provide a direct comparison to the original private equity results in Jenkinson, Sousa, and Stucke (2013). As shown in Tables 16 and 17, for the full sample of firms, I find that for each (normalized) dollar of dividends paid out over a quarter, book (market) equity decreases on average by $0.76 ($0.46), with both coefficients being within three standard errors from unity. When using non-normalized variables (i.e., dollars), the coefficients on dividends using book and market equity are over twenty-seven and seven standard errors away from unity, respectively. What these results show is that the relationship between dividend payments and equity changes is sensitive to variable normalization, but that such normalization does not change the private equity results in any meaningful way. The normalized results for repurchases are a decrease in book (market) equity of $1.04 ($2.39) for each dollar used to repurchase shares in the full sample and a decrease of $0.80 ($0.68) in the small cap-value sample. In both samples, the coefficients on repurchases are within two standard errors of one when book equity is the dependent variable, which does not imply the existence of distribution smoothing. However, when normalized changes in market capitalization are regressed on normalized repurchases, the average decrease in equity of $2.40 for the full sample is over eleven standard errors from negative one, but in the small cap-value sample, the average decrease of $0.68 is not significantly different from negative one. Recall that when all variables are measured in dollars, the relationship between book (market) equity and share repurchases in the full sample is a decrease of $0.58 ($0.78) and $0.32 ($0.05) for small cap-value firms. The moral of the story is that the normalization of variables is not innocuous.

Table 1

Private Equity Summary Statistics

This table presents quarterly summary statistics for Net Asset Value (NAV) changes, Contributions, and Distributions, as well as the average Fund Size (millions), Number of Funds per General Partnership (Funds per GP), Total Value to Paid-In (TVPI) Capital Ratio, and Fund Internal Rate of Return (IRR) for a sample of U.S.-focused Buyout funds from Preqin with 2000–2018 vintage years. Contributions represent the capital called from investors over a quarter and Distributions represent the amount of cash distributed back to investors over a quarter. Funds per GP is the number of funds raised by a single GP in the sample. NAV Changes are the amounts by which fund-level NAVs change quarter over quarter and represent the appreciation or depreciation in the value of equity to investors. TVPI is the ratio of all cash distributions plus any remaining NAV divided by the total cash contributions for each fund. IRR is the annualized rate of return on each fund from the first capital call to the liquidation or measurent date. All cash flow amounts are measured in USD.

Statistics	NAV Changes (K)	Contributions (K)	Distributions (K)	Fund Size (M)	Funds per GP	TVPI	IRR (%)
Obs.	17,440	18,581	8,583	18,543	374	552	452
Average	102,383	-235,172	620,527	1,862	2.46	1.54	14.60
Std. Dev.	1,050,239	498,752	1,120,590	2,938	1.54	0.55	13.85
Minimum	-18,318,960	-6,092,668	0	25	1	0	-54.8
1st P-tile	-3,338,010	-2,175,000	0	90	1	0.38	-22.3
25th P-tile	-136,555	-230,643	40,000	400	1	1.14	8
Median	28,330	-3,925	211,538	800	2	1.485	13.7
75th P-tile	472,170	0	744,958	1,927	3	1.88	21.65
99th P-tile	2,696,050	270,500	4,706,300	17,642	8	3.11	58.8
Maximum	24,508,470	1,452,284	39,589,366	20,365	9	3.75	93.9

Table 2

Vintage Year Statistics for Private Equity Funds

This table presents vintage year statistics for a sample of private equity funds from Preqin with 2000–2018 vintage years. Funds is the number of funds raised in a given vintage. Total Value to Paid-In (TVPI) is the ratio of all cash distributions plus any remaining NAV divided by the total cash contributions for each fund. Internal Rate of Return (IRR) is the annualized rate of return on each fund from the first capital call to the liquidation or measurent date. K-S PME is the Public Market Equivalent (PME) Multiple of Kaplan and Schoar (2005), which is a ratio of wealth from what a private equity fund earned relative to a public index (e.g., a 1.0 would indicate that a fund broke even with public markets while a 1.2 would indicate outperformance). This ratio is calculated by discounting all cash flows to a single point in time and then dividing the discounted value of all distributions plus any remaining NAV by the discounted value of all contributions.

Vintage Year	Funds	TVPI	IRR	K-S PME
2000	63	2.08	16.71	1.28
2001	33	1.97	23.78	1.5
2002	29	1.69	14.80	1.24
2003	28	1.71	11.50	1.49
2004	38	2.04	13.88	1.41
2005	65	1.69	10.18	1.23
2006	77	1.61	8.72	1.07
2007	69	1.96	14.64	1.07
2008	54	1.86	18.53	1.09
2009	24	2.00	23.30	1.34
2010	37	1.94	16.50	1.2
2011	38	1.75	14.66	1.11
2012	55	1.67	19.02	1.26
2013	54	1.48	15.54	1.18
2014	55	1.38	18.70	1.09
2015	62	1.26	17.06	1.04
2016	70	1.11	8.78	0.89
2017	48	0.93		0.8
2018	22	0.87		0.91

Table 3

Number of Private Equity Funds per Industry by Vintage Year

This table shows the number of U.S.-focused buyout funds from Preqin that indicated potential exposure to various industries in each vintage year. There are a total of 921 funds and 3,184 fund-industry combinations. Most funds indicate exposure to one or a handful of industries while a few list over forty.

Vintage	Ag	BusServ	CommServ	ConsDisc	ConsStap	Div	Energy	Fin	HealthCare	IT	Ind	Man	Mat	Misc	RE	Util
2000	0	7	32	14	0	3	3	11	13	24	15	10	1	0	1	1
2001	0	3	8	11	1	3	1	2	8	9	5	6	0	0	0	0
2002	1	3	9	18	2	3	5	4	6	6	11	15	1	0	1	2
2003	0	3	7	14	2	8	3	4	4	8	7	7	2	0	1	0
2004	0	3	12	12	2	2	4	5	4	5	9	9	0	1	1	1
2005	0	5	30	26	2	9	6	7	14	15	33	17	4	0	0	4
2006	1	10	15	41	5	17	7	6	11	15	20	17	3	0	2	1
2007	0	13	16	28	2	8	7	9	16	22	32	17	3	0	1	2
2008	1	9	21	21	2	8	7	12	14	20	23	14	2	0	3	1
2009	0	9	13	14	2	8	2	5	7	19	10	7	2	1	1	1
2010	0	12	6	17	4	5	8	10	10	30	40	15	4	2	0	2
2011	1	8	11	15	3	4	12	4	8	14	19	8	3	2	1	2
2012	1	18	24	43	13	12	10	9	18	42	32	16	8	1	0	0
2013	1	18	26	46	11	11	7	5	25	48	31	22	4	5	0	1
2014	1	25	36	44	12	12	13	14	26	71	67	25	9	5	0	3
2015	1	22	39	46	10	16	16	14	27	59	51	16	7	6	1	5
2016	1	18	18	37	6	17	13	5	18	35	29	12	6	4	2	2
2017	0	18	18	36	9	14	5	12	16	58	31	13	4	0	0	1
2018	0	4	0	11	0	5	3	1	6	4	4	4	0	0	0	0
Total:	9	208	341	494	88	165	132	139	251	504	469	250	63	27	15	29

Table 4

Summary Statistics for Public Firms

This table presents summary statistics for the quarterly changes in market and book equity as well as quarterly cash flows from dividends, share repurchases, and share issuances for a sample of U.S. public firms. The sample is constructed using all firms with available data from CRSP and Compustat over the 2000–2018 period.

Statistics	ΔMarket Equity	ΔBook Equity	Dividends	Repurchases	Issuances
Obs.	361,716	361,716	361,716	356,908	351,279
Average	46.17	26.69	31.03	32.47	19.49
Std. Dev.	2,342.35	788.67	224.53	301.73	324.83
Minimum	-235,035.26	-54,060.00	0.00	0.00	0.00
1st P-tile	-3,606.14	-749.00	0.00	0.00	0.00
25th P-tile	-30.58	3.16	0.00	0.00	0.00
Median	1.49	1.07	0.00	0.00	0.10
75th P-tile	67.91	15.63	3.27	0.16	1.75
99th P-tile	4,234.21	1,184.51	639.22	701.00	286.37
Maximum	183,021.79	150,364.00	33,498.00	45,000.00	49,107.27

Table 5

Public Firms in each FF12 Industry by Year

This table reports the percentage of firms in each of the Fama-French 12 Industries in each calendar year. These data come from CRSP and Compustat over the 2000–2018 period.

Year	Bus Equip	Cons Dur	Cons Non Dur	Chem	Fin	Health	Mfr	Oil	Other	TV	Util	Wholesale
2000	26%	3%	8%	1%	7%	7%	8%	2%	10%	2%	0%	25%
2001	21%	2%	5%	2%	21%	10%	9%	3%	12%	4%	2%	8%
2002	20%	2%	5%	2%	21%	11%	9%	3%	12%	4%	2%	8%
2003	19%	2%	5%	2%	22%	11%	9%	3%	12%	4%	2%	8%
2004	19%	2%	5%	2%	22%	11%	9%	4%	12%	4%	2%	8%
2005	19%	2%	4%	2%	23%	11%	9%	4%	12%	4%	3%	8%
2006	18%	2%	4%	2%	23%	12%	8%	4%	13%	3%	3%	8%
2007	18%	2%	4%	2%	23%	12%	8%	5%	13%	3%	2%	8%
2008	18%	2%	4%	2%	22%	12%	8%	5%	13%	3%	3%	8%
2009	17%	2%	4%	2%	23%	11%	8%	5%	14%	3%	3%	8%
2010	17%	2%	4%	2%	23%	11%	8%	5%	13%	3%	3%	8%
2011	17%	2%	4%	2%	23%	11%	9%	5%	13%	3%	3%	8%
2012	17%	2%	4%	2%	23%	11%	8%	5%	13%	3%	3%	8%
2013	17%	2%	4%	2%	23%	11%	8%	5%	13%	3%	3%	8%
2014	17%	2%	4%	2%	24%	11%	8%	5%	14%	3%	3%	8%
2015	16%	2%	4%	2%	23%	13%	8%	5%	13%	3%	3%	8%
2016	15%	2%	4%	2%	23%	15%	8%	4%	13%	3%	3%	8%
2017	15%	2%	4%	2%	23%	15%	8%	4%	13%	3%	3%	7%
2018	14%	2%	3%	2%	24%	17%	8%	5%	14%	3%	3%	6%

Table 6

Public Equity Market Capitalization in each FF12 Industry by Year

This table reports the total market capitalization in each of the Fama-French 12 Industries in each calendar year. These data come from CRSP and Compustat over the 2000–2018 period.

Year	Bus Equip	Cons Dur	Cons Non Dur	Chem	Fin	Health	Mfr	Oil	Other	TV	Util	Wholesale
2000	37%	0%	4%	0%	1%	7%	2%	0%	3%	3%	0%	41%
2001	21%	2%	4%	2%	19%	12%	5%	6%	9%	9%	3%	8%
2002	17%	2%	6%	3%	22%	12%	6%	6%	9%	7%	3%	8%
2003	17%	2%	5%	3%	23%	12%	6%	6%	9%	7%	3%	9%
2004	17%	2%	5%	3%	22%	11%	6%	7%	10%	6%	3%	8%
2005	16%	1%	5%	3%	23%	10%	6%	9%	10%	6%	3%	8%
2006	15%	1%	5%	3%	24%	10%	6%	10%	10%	5%	4%	7%
2007	15%	1%	5%	3%	22%	9%	7%	10%	10%	6%	4%	7%
2008	16%	1%	5%	4%	18%	10%	7%	13%	10%	6%	4%	7%
2009	17%	1%	6%	4%	17%	10%	6%	11%	10%	5%	4%	8%
2010	18%	1%	6%	4%	18%	9%	7%	11%	11%	5%	4%	8%
2011	17%	1%	6%	4%	18%	8%	7%	12%	11%	5%	4%	8%
2012	17%	1%	6%	4%	18%	9%	6%	10%	10%	6%	4%	9%
2013	17%	2%	6%	4%	19%	9%	6%	10%	10%	5%	4%	9%
2014	17%	2%	6%	4%	19%	10%	6%	9%	10%	6%	4%	8%
2015	19%	2%	6%	3%	20%	11%	6%	7%	10%	5%	4%	9%
2016	19%	1%	6%	3%	20%	10%	5%	6%	10%	5%	4%	9%
2017	21%	1%	5%	3%	21%	9%	6%	6%	10%	5%	4%	8%
2018	22%	1%	4%	3%	22%	10%	6%	6%	10%	4%	4%	6%

Table 7

Explaining Dollar Changes in NAV using Contributions and Distributions

This table presents coefficient estimates from regressing changes in quarterly private equity net asset values (NAVs) on quarterly contributions and distributions using a sample of U.S.-focused private equity funds from Preqin with 2000–2018 vintages. NAVs, Contributions, and Distributions are measured in USD. Robust standard errors shown in parentheses. Bracketed numbers represent the number of standard errors each coefficient is from negative one for distributions and positive one for contributions. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

	I	II	III	IV	V	VI
			ΔNAV			
Distributions	-0.771***	-0.771***	-0.796***	-0.798***	-0.803***	-0.803***
	(0.0114)	(0.0117)	(0.0114)	(0.0114)	(0.0111)	(0.0128)
	[20.1]	[19.6]	[17.9]	[17.7]	[17.7]	[15.4]
Contributions	1.028***	1.028***	1.015***	1.012***	0.965***	0.965***
	(0.0175)	(0.0178)	(0.0198)	(0.0199)	(0.0219)	(0.0260)
	[1.6]	[1.6]	[0.8]	[0.6]	[1.6]	[1.3]
Fund FE			Y	Y	Y	Y
Quarter FE					Y	Y
Q4 FE				Y		
SE Type	HAC	Fund	Fund	Fund	Fund	Fund, Qtr
Observations	8,373	8,373	8,340	8,340	8,339	8,339
R-squared	0.658	0.658	0.691	0.692	0.713	0.713
F	5016	5235	5428	5381	4786	4474

Table 8

Explaining Normalized Changes in NAV using Contributions and Distributions

This table presents coefficient estimates from regressing changes in quarterly private equity net values (NAVs) on quarterly contributions and distributions using a sample of U.S.-focused private equity funds from Preqin with 2000–2018 vintages. NAVs, Contributions, and Distributions are measured in USD and scaled by the size of the fund. Robust standard errors shown in parentheses. Bracketed numbers represent the number of standard errors each coefficient is from negative one for distributions and positive one for contributions. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

	I	II	III	IV	V	VI
	ΔNAV / Fund Size					
Distributions / Fund Size	-0.636***	-0.636***	-0.705***	-0.706***	-0.707***	-0.707***
	(0.0134)	(0.0174)	(0.0179)	(0.0180)	(0.0177)	(0.0153)
	[27.2]	[20.9]	[16.5]	[16.3]	[16.6]	[19.2]
Contributions / Fund Size	1.026***	1.026***	0.975***	0.973***	0.954***	0.954***
	(0.0332)	(0.0304)	(0.0346)	(0.0346)	(0.0361)	(0.0384)
	[0.8]	[0.9]	[0.7]	[0.8]	[1.3]	[1.2]
Fund FE			Y	Y	Y	Y
Quarter FE					Y	Y
Q4 FE				Y		
SE Type	HAC	Fund	Fund	Fund	Fund	Fund, Qtr
Observations	8,362	8,362	8,329	8,329	8,328	8,328
R-squared	0.605	0.605	0.665	0.666	0.674	0.674
F	1598	1372	1856	1857	1885	2249

Table 9

Explaining Changes in NAV Smoothing Before and After FAS 157

This table presents coefficient estimates from regressing changes in quarterly private equity net asset values (NAVs) on quarterly contributions and distributions using a sample of U.S.-focused private equity funds from Preqin with 2000–2018 vintages. NAVs, Contributions, and Distributions are measured in USD. FAS is a dummy variable equal to one if the transaction occurred during or after 2008, which is roughly when fair value accounting (FAS 157) was adopted in the U.S. Robust standard errors shown in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

	I	II	III	IV	V	VI
	ΔNAV					
Distributions	-0.772***	-0.641***	-0.641***	-0.620***	-0.695***	-0.695***
	(0.0114)	(0.0377)	(0.0387)	(0.0406)	(0.0469)	(0.0399)
Distributions * FAS		-0.149***	-0.149***	-0.203***	-0.124**	-0.124***
		(0.0383)	(0.0399)	(0.0421)	(0.0488)	(0.0420)
Contributions	1.027***	1.062***	1.062***	1.087***	0.992***	0.992***
	(0.0175)	(0.0312)	(0.0297)	(0.0314)	(0.0447)	(0.0507)
Contributions * FAS		-0.0585*	-0.0585*	-0.133***	-0.0334	-0.0334
		(0.0352)	(0.0344)	(0.0400)	(0.0505)	(0.0570)
Fund FE				Y	Y	Y
Quarter FE					Y	Y
Q4 FE						
SE Type	HAC	HAC	Fund	Fund	Fund	Fund, Qtr
Observations	8,373	8,373	8,373	8,340	8,339	8,339
R-squared	0.659	0.662	0.662	0.697	0.714	0.714
F	5016	2598	2695	3000	2639	2345

Table 10

Do better performing funds smooth more?

This table presents coefficient estimates from regressing changes in quarterly private equity net asset values (NAVs) on quarterly contributions and distributions using a sample of U.S.-focused private equity funds from Preqin with 2000–2018 vintages. NAVs, Contributions, and Distributions are measured in USD. The sample is split by first through fourth quartile performers (Models I–IV) as well as by above- and below-median performers (Models V and VI). Robust standard errors are clustered by fund and time and are shown in parentheses. Bracketed numbers represent the number of standard errors each coefficient is from negative one for distributions and positive one for contributions. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

	I	II	III	IV	V	VI
	ΔNAV				ΔNAV	
Distributions	-0.776***	-0.785***	-0.834***	-0.881***	-0.781***	-0.855***
	(0.0212)	(0.0186)	(0.0241)	(0.0231)	(0.0157)	(0.0188)
	[10.6]	[11.6]	[6.9]	[5.2]	[13.9]	[7.7]
Contributions	0.940***	1.023***	0.904***	0.954***	0.990***	0.922***
	(0.0617)	(0.0339)	(0.0403)	(0.0565)	(0.0334)	(0.0357)
	[1.0]	[0.7]	[2.4]	[0.8]	[0.3]	[2.2]
Performance Filter:	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile	Above Median	Below Median
Fund FE	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y
Observations	2,146	2,552	2,035	1,520	4,703	3,562
R-squared	0.672	0.760	0.740	0.728	0.707	0.731
F	1504	1841	1018	1088	2901	1550

Table 11

Explaining Dollar Changes in Book Equity using Dividends, Repurchases, and Issuances

This table presents coefficient estimates from regressing quarterly changes in book equity on quarterly cash flows from dividends, share repurchases, and share issuances using CRSP and Compustat data from 2000–2018. Changes in equity valuations and all cash flow variables are measured in dollars at the quarterly frequency. Standard errors are clustered by firm and time and are shown in parentheses. Bracketed numbers reflect the number of standard errors each coefficient is from negative one for dividends and repurchases and positive one for issuances. "FS", "V", "S", and "V&S" refer to Full Sample, Value, Small, and Value & Small, respectively, which are characteristic filters for the sample. "Value" firms are those with book-to-market ratios less than or equal to one and "Small" firms are those with market values between $300M and $2B. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

	I	II	III	IV	V	VI	VII	VIII	IX
					ΔBook Equity				
Dividends	0.302***	-0.204***		-0.299***		-0.334***		-0.324***	
	(0.0479)	(0.0466)		(0.0668)		(0.0674)		(0.0745)	
	[27.2]	[17.1]		[10.5]		[9.9]		[9.1]	
Repurchases	-0.258***	-0.581***	-0.605***	-0.295***	-0.347***	-0.390***	-0.469***	-0.322***	-0.409***
	(0.0276)	(0.0345)	(0.0347)	(0.0549)	(0.0569)	(0.0594)	(0.0646)	(0.0699)	(0.0757)
	[26.9]	[12.1]	[11.4]	[12.8]	[11.5]	[10.3]	[8.2]	[9.7]	[7.8]
Issuances	1.304***	1.164***	1.142***	0.853***	0.779***	0.898***	0.872***	0.836***	0.762***
	(0.0535)	(0.0445)	(0.0455)	(0.0980)	(0.104)	(0.0457)	(0.0464)	(0.107)	(0.108)
	[5.7]	[3.7]	[3.1]	[1.5]	[2.1]	[2.2]	[2.8]	[1.5]	[2.2]
Sample:	FS	FS	FS	V	V	S	S	V&S	V&S
Firm FE		Y	Y	Y	Y	Y	Y	Y	Y
Quarter FE		Y	Y	Y	Y	Y	Y	Y	Y
Industry FE		Y	Y	Y	Y	Y	Y	Y	Y
Observations	361,716	361,697	361,697	83,023	83,023	114,156	114,156	19,189	19,189
R-squared	0.080	0.229	0.227	0.186	0.179	0.195	0.187	0.191	0.182
F	208.8	253.8	359.0	36.11	42.57	129.0	178.7	24.93	31.62

Table 12

Explaining Dollar Changes in Market Equity using Dividends, Repurchases, and Issuances

This table presents coefficient estimates from regressing quarterly changes in market equity on quarterly cash flows from dividends, share repurchases, and share issuances using CRSP and Compustat data from 2000–2018. Changes in equity valuations and all cash flow variables are measured in dollars at the quarterly frequency. Standard errors are clustered by firm and time and are shown in parentheses. Bracketed numbers reflect the number of standard errors each coefficient is from negative one for dividends and repurchases and positive one for issuances. "FS", "V", "S", and "V&S" refer to Full Sample, Value, Small, and Value & Small, respectively, which are characteristic filters for the sample. "Value" firms are those with book-to-market ratios less than or equal to one and "Small" firms are those with market values between $300M and $2B. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

	I	II	III	IV	V	VI	VII	VIII	IX
	ΔMarket Equity								
Dividends	0.352*	-0.192		-0.142**		-0.145***		-0.0843***	
	(0.180)	(0.156)		(0.0614)		(0.0235)		(0.0188)	
	[7.5]	[5.2]		[14.0]		[36.4]		[48.7]	
Repurchases	-0.156	-0.780***	-0.803***	-0.176	-0.200	-0.221***	-0.255***	-0.0449	-0.0676**
	(0.176)	(0.175)	(0.182)	(0.147)	(0.148)	(0.0389)	(0.0408)	(0.0286)	(0.0312)
	[4.8]	[1.3]	[1.1]	[5.6]	[5.4]	[20]	[18.3]	[33.4]	[29.9]
Issuances	2.887***	2.713***	2.691***	0.849***	0.814***	0.973***	0.962***	0.523***	0.503***
	(0.234)	(0.200)	(0.202)	(0.226)	(0.232)	(0.0488)	(0.0495)	(0.0735)	(0.0742)
	[8.1]	[8.6]	[8.4]	[0.7]	[0.8]	[0.6]	[0.8]	[6.5]	[6.7]
Sample:	FS	FS	FS	V	V	S	S	V&S	V&S
Firm FE		Y	Y	Y	Y	Y	Y	Y	Y
Quarter FE		Y	Y	Y	Y	Y	Y	Y	Y
Industry FE		Y	Y	Y	Y	Y	Y	Y	Y
Observations	361,716	361,697	361,697	83,023	83,023	114,156	114,156	19,189	19,189
R-squared	0.020	0.090	0.090	0.065	0.064	0.179	0.179	0.197	0.196
F	52.64	62.06	90.27	8.744	6.175	142.2	190.8	22.05	24.63

Table 13

Explaining Changes in Book Equity using Dividends, Repurchases, Issuances, and Retained Earnings

This table presents coefficient estimates from regressing quarterly changes in book equity on quarterly cash flows from dividends, share repurchases, share issuances, and changes in retained earnings using CRSP and Compustat data from 2000–2018. Changes in equity valuations and all cash flow variables are either measured in dollars (Panel A) or scaled by total assets (Panel B). Standard errors are clustered by firm and time and are shown in parentheses. Bracketed numbers reflect the number of standard errors each coefficient is from negative one for dividends and repurchases and positive one for issuances. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

Panel A: Variables in Dollars	I	II	III	Panel B: Variables Scaled by Total Assets (TA)	IV	V	VI
	ΔBook Equity				ΔBook Equity / TA		
Dividends	-0.133***	-0.297***		Dividends / TA	-0.356***	-0.507***	
	(0.0377)	(0.0395)			(0.0400)	(0.0421)	
	[23.0]	[17.8]			[16.1]	[11.7]	
Repurchases	-0.446***	-0.670***	-0.704***	Repurchases / TA	-0.840***	-1.031***	-1.040***
	(0.0307)	(0.0260)	(0.0265)		(0.0282)	(0.0154)	(0.0153)
	[18.0]	[12.7]	[11.2]		[5.7]	[2.0]	[2.6]
Issuances	1.230***	1.079***	1.046***	Issuances / TA	0.918***	0.949***	0.949***
	(0.0470)	(0.0429)	(0.0460)		(0.00863)	(0.00643)	(0.00643)
	[4.9]	[1.8]	[1.0]		[9.5]	[7.9]	[7.9]
ΔRetained Earnings	0.496***	0.549***	0.547***	ΔRetained Earnings / TA	0.642***	0.645***	0.645***
	(0.0262)	(0.0214)	(0.0220)		(0.00729)	(0.00790)	(0.00791)
	[19.2]	[21.1]	[20.6]		[49.1]	[44.9]	[44.9]
Firm FE		Y	Y			Y	Y
Quarter FE		Y	Y			Y	Y
Industry FE		Y	Y			Y	Y
Observations	361,716	361,697	361,697		361,716	361,697	361,697
R-squared	0.410	0.523	0.519		0.620	0.674	0.673
F	250.7	389.8	451.0		5260	7809	10359

Table 14

Explaining Dollar Changes in Book Equity using Dividends, Repurchases, and Issuances (2)

This table presents coefficient estimates from regressing quarterly changes in book equity on quarterly cash flows from dividends, share repurchases, and share issuances using CRSP and Compustat data from 2000–2018. Changes in equity valuations and all cash flow variables are measured in dollars at the quarterly frequency. Standard errors are clustered by firm and time and are shown in parentheses. Bracketed numbers reflect the number of standard errors each coefficient is from negative one for dividends and repurchases and positive one for issuances. "FS", "V", "S", and "V&S" refer to Full Sample, Value, Small, and Value & Small, respectively, which are characteristic filters for the sample. "Value" firms are those with book-to-market ratios less than or equal to one and "Small" firms are those with market values between $300M and $2B. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

	I	II	III	IV	V	VI	VII	VIII
	ΔBook Equity							
Dividends + Repurchases	-0.00535	-0.390***	0.0397	-0.243***	-0.0220	-0.273***	-0.0204	-0.247***
	(0.0234)	(0.0248)	(0.0314)	(0.0371)	(0.0278)	(0.0453)	(0.0285)	(0.0501)
	[42.5]	[24.6]	[33.1]	[20.4]	[35.2]	[16]	[34.4]	[15]
Issuances	1.338***	1.179***	0.882***	0.858***	0.828***	0.891***	0.740***	0.825***
	(0.0542)	(0.0438)	(0.116)	(0.0985)	(0.0436)	(0.0471)	(0.0968)	(0.110)
	[6.2]	[4.1]	[1]	[1.4]	[3.9]	[2.3]	[2.7]	[1.6]
Sample:	FS	FS	V	V	S	S	V&S	V&S
Firm FE		Y		Y		Y		Y
Quarter FE		Y		Y		Y		Y
Industry FE		Y		Y		Y		Y
Observations	361,716	361,697	83,037	83,023	114,505	114,156	19,281	19,189
R-squared	0.064	0.228	0.023	0.188	0.036	0.193	0.014	0.190
F	312.9	399.3	30.80	51.72	186.6	179.2	30.87	31.46

Table 15

Explaining Dollar Changes in Market Equity using Dividends, Repurchases, and Issuances (2)

This table presents coefficient estimates from regressing quarterly changes in market equity on quarterly cash flows from dividends, share repurchases, and share issuances using CRSP and Compustat data from 2000–2018. Changes in equity valuations and all cash flow variables are measured in dollars at the quarterly frequency. Standard errors are clustered by firm and time and are shown in parentheses. Bracketed numbers reflect the number of standard errors each coefficient is from negative one for dividends and repurchases and positive one for issuances. "FS", "V", "S", and "V&S" refer to Full Sample, Value, Small, and Value & Small, respectively, which are characteristic filters for the sample. "Value" firms are those with book-to-market ratios less than or equal to one and "Small" firms are those with market values between $300M and $2B. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

	I	II	III	IV	V	VI	VII	VIII
	ΔMarket Equity							
Dividends + Repurchases	0.0809	-0.567***	-0.0170	-0.158**	-0.144***	-0.178***	-0.0496***	-0.0685***
	(0.141)	(0.142)	(0.0761)	(0.0767)	(0.0244)	(0.0210)	(0.0168)	(0.0156)
	[7.7]	[3.0]	[12.9]	[11.0]	[35.1]	[39.1]	[56.6]	[59.7]
Issuances	2.905***	2.723***	0.883***	0.849***	0.952***	0.972***	0.456***	0.524***
	(0.237)	(0.200)	(0.228)	(0.226)	(0.0653)	(0.0486)	(0.0775)	(0.0733)
	[8.0]	[8.6]	[0.5]	[0.7]	[0.7]	[0.6]	[7.0]	[6.5]
Sample:	FS	FS	V	V	S	S	V&S	V&S
Firm FE		Y		Y		Y		Y
Quarter FE		Y		Y		Y		Y
Industry FE		Y		Y		Y		Y
Observations	361,716	361,697	83,037	83,023	114,505	114,156	19,281	19,189
R-squared	0.020	0.090	0.004	0.065	0.015	0.179	0.008	0.197
F	75.34	93.17	7.888	7.846	135.0	210.0	22.77	31.50

Table 16

Explaining Normalized Changes in Book Equity using Dividends, Repurchases, and Issuances

This table presents coefficient estimates from regressing quarterly changes in book equity on quarterly cash flows from dividends, share repurchases, and share issuances using CRSP and Compustat data from 2000–2018. All variables are measured at the quarterly frequency and scaled by total assets. Standard errors are clustered by firm and time and are shown in parentheses. Bracketed numbers reflect the number of standard errors each coefficient is from negative one for dividends and repurchases and positive one for issuances. "FS", "V", "S", and "V&S" refer to Full Sample, Value, Small, and Value & Small, respectively, which are characteristic filters for the sample. "Value" firms are those with book-to-market ratios less than or equal to one and "Small" firms are those with market values between \$300M and \$2B. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

	I	II	III	IV	V	VI	VII	VIII
	ΔBook Equity / Assets							
Dividends / Assets	-0.755***		-0.328***		-1.043***		-0.410***	
	(0.0692)		(0.0691)		(0.100)		(0.107)	
	[3.5]		[9.7]		[0.4]		[5.5]	
Repurchases / Assets	-1.038***	-1.051***	-0.719***	-0.734***	-1.169***	-1.179***	-0.798***	-0.819***
	(0.0227)	(0.0224)	(0.0592)	(0.0589)	(0.0305)	(0.0302)	(0.0954)	(0.0929)
	[1.7]	[2.3]	[4.7]	[4.5]	[5.5]	[5.9]	[2.1]	[1.9]
Issuances / Assets	0.922***	0.922***	0.673***	0.672***	0.956***	0.956***	0.773***	0.772***
	(0.0112)	(0.0112)	(0.0348)	(0.0347)	(0.0125)	(0.0125)	(0.0378)	(0.0378)
	[7.0]	[7.0]	[9.4]	[9.5]	[3.5]	[3.5]	[6.0]	[6.0]
Sample:	FS	FS	V	V	S	S	V&S	V&S
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	361,697	361,697	83,023	83,023	114,156	114,156	19,189	19,189
R-squared	0.404	0.402	0.271	0.270	0.485	0.481	0.305	0.303
F	2491	3756	139.2	206.6	2429	3695	155.4	238.0

Table 17

Explaining Normalized Changes in Market Equity using Dividends, Repurchases, and Issuances

This table presents coefficient estimates from regressing quarterly changes in market equity on quarterly cash flows from dividends, share repurchases, and share issuances using CRSP and Compustat data from 2000–2018. All variables are measured at the quarterly frequency and scaled by total assets. Standard errors are clustered by firm and time and are shown in parentheses. Bracketed numbers reflect the number of standard errors each coefficient is from negative one for dividends and repurchases and positive one for issuances. "FS", "V", "S", and "V&S" refer to Full Sample, Value, Small, and Value & Small, respectively, which are characteristic filters for the sample. "Value" firms are those with book-to-market ratios less than or equal to one and "Small" firms are those with market values between $300M and $2B. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

	I	II	III	IV	V	VI	VII	VIII
	ΔMarket Equity / Assets							
Dividends / Assets	-0.460*		-0.152		-0.685*		0.309	
	(0.237)		(0.139)		(0.374)		(0.262)	
	[2.3]		[6.1]		[0.8]		[5.0]	
Repurchases / Assets	-2.390***	-2.397***	-0.555***	-0.562***	-3.073***	-3.080***	-0.681***	-0.665***
	(0.122)	(0.121)	(0.130)	(0.130)	(0.200)	(0.200)	(0.241)	(0.241)
	[11.4]	[11.5]	[3.4]	[3.4]	[10.4]	[10.4]	[1.3]	[1.4]
Issuances / Assets	1.610***	1.610***	0.791***	0.790***	1.866***	1.866***	0.978***	0.979***
	(0.0510)	(0.0510)	(0.0998)	(0.0999)	(0.0895)	(0.0896)	(0.206)	(0.206)
	[12.0]	[12.0]	[2.1]	[2.1]	[9.7]	[9.7]	[0.1]	[0.1]
Sample:	FS	FS	V	V	S	S	V&S	V&S
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	361,697	361,697	83,023	83,023	114,156	114,156	19,189	19,189
R-squared	0.107	0.107	0.093	0.093	0.138	0.138	0.158	0.158
F	453.7	676.1	27.37	39.87	239.9	359.9	10.30	13.96

Table 18

Explaining Normalized Changes in Book Equity using Dividends, Repurchases, and Issuances (2)

This table presents coefficient estimates from regressing quarterly changes in book equity on quarterly cash flows from dividends, share repurchases, and share issuances using CRSP and Compustat data from 2000–2018. All variables are measured at the quarterly frequency and scaled by total assets. Standard errors are clustered by firm and time and are shown in parentheses. Bracketed numbers reflect the number of standard errors each coefficient is from negative one for dividends and repurchases and positive one for issuances. "FS", "V", "S", and "V&S" refer to Full Sample, Value, Small, and Value & Small, respectively, which are characteristic filters for the sample. "Value" firms are those with book-to-market ratios less than or equal to one and "Small" firms are those with market values between $300M and $2B. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

	I	II	III	IV	V	VI	VII	VIII
	ΔBook Equity / Assets							
(Dividends + Repurchases) / Assets	-0.373***	-0.912***	-0.370***	-0.513***	-0.677***	-1.065***	-0.598***	-0.604***
	(0.0274)	(0.0225)	(0.0681)	(0.0467)	(0.0393)	(0.0301)	(0.122)	(0.0669)
	[22.9]	[3.9]	[9.3]	[10.4]	[8.2]	[2.2]	[3.3]	[5.9]
Issuances / Assets	0.636***	0.923***	0.534***	0.674***	0.789***	0.957***	0.636***	0.774***
	(0.0136)	(0.0112)	(0.0549)	(0.0348)	(0.0148)	(0.0125)	(0.115)	(0.0379)
	[26.8]	[6.9]	[8.5]	[9.4]	[14.3]	[3.4]	[3.2]	[6.0]
Sample:	FS	FS	V	V	S	S	V&S	V&S
Firm FE		Y		Y		Y		Y
Quarter FE		Y		Y		Y		Y
Industry FE		Y		Y		Y		Y
Observations	361,716	361,697	83,037	83,023	114,505	114,156	19,281	19,189
R-squared	0.164	0.407	0.077	0.272	0.317	0.493	0.165	0.307
F	1104	3568	88.07	192.1	2196	3550	133.3	232.9

Table 19

Explaining Normalized Changes in Market Equity using Dividends, Repurchases, and Issuances (2)

This table presents coefficient estimates from regressing quarterly changes in market equity on quarterly cash flows from dividends, share repurchases, and share issuances using CRSP and Compustat data from 2000–2018. All variables are measured at the quarterly frequency and scaled by total assets. Standard errors are clustered by firm and time and are shown in parentheses. Bracketed numbers reflect the number of standard errors each coefficient is from negative one for dividends and repurchases and positive one for issuances. "FS", "V", "S", and "V&S" refer to Full Sample, Value, Small, and Value & Small, respectively, which are characteristic filters for the sample. "Value" firms are those with book-to-market ratios less than or equal to one and "Small" firms are those with market values between $300M and $2B. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

	I	II	III	IV	V	VI	VII	VIII
	ΔMarket Equity / Assets							
(Dividends + Repurchases) / Assets	0.684	-0.677***	0.206	-0.192	-0.494	-0.873**	0.270	0.257
	(0.420)	(0.232)	(0.152)	(0.139)	(0.485)	(0.374)	(0.210)	(0.262)
	[4.0]	[1.4]	[7.9]	[5.8]	[1.0]	[0.3]	[6.0]	[4.8]
Issuances / Assets	0.569	2.282***	0.402**	0.981***	2.429***	2.732***	0.516	0.718**
	(0.490)	(0.241)	(0.199)	(0.165)	(0.542)	(0.384)	(0.384)	(0.348)
	[0.9]	[5.3]	[3.0]	[0.1]	[2.6]	[4.5]	[1.3]	[0.8]
Sample:	FS	FS	V	V	S	S	V&S	V&S
Firm FE		Y		Y		Y		Y
Quarter FE		Y		Y		Y		Y
Industry FE		Y		Y		Y		Y
Observations	361,716	361,697	83,037	83,023	114,505	114,156	19,281	19,189
R-squared	0.016	0.104	0.009	0.093	0.032	0.134	0.017	0.157
F	135.5	490.0	19.83	33.13	181.1	215.8	8.423	12.14

CHAPTER 4

DO INVESTORS PREFER SMOOTHED RETURNS?

Empirical Methodology

In the earlier sections I regress quarterly changes in equity values on quarterly cash flows using a sample of private equity (PE) funds and a sample of public firms. The idea is to measure the extent to which PE funds understate valuations as well as to estimate the marginal value that PE funds place on the cash they call from investors and to then compare the results to publicly traded firms by regressing quarterly changes in book and market equity on quarterly cash flows from dividends, share repurchases, and share issuances. In this section I carry that same intuition to the cross section of PE funds by running a regression of quarterly changes in net asset values (NAVs) on quarterly contributions and distributions fund by fund. In this way I am able to capture the value that each fund places on dollars called as well as dollars distributed. Using this information allows me to test whether the marginal value of cash has any predictive power over fundraising success. In other words, I am able to test whether investors prefer smoothed returns. The baseline linear probability model that I employ is the following:

$$FoF_i = \beta_0 + \beta_1 * DistValue_i + \beta_2 * ContValue_i + \epsilon_i \tag{3}$$

FoF_i is an indicator variable that is equal to one if there is a follow-on fund raised after fund *i* from the same general partnership and zero otherwise. $DistValue_i$ and $ContValue_i$ are the marginal values of distributions and contributions, respectively, for fund *i*. I also repeat this analysis using both logit and probit models and I find qualitatively similar results.

Sample and Summary Statistics

Panel A of Table 20 shows summary statistics for the marginal value of contributions and distributions for the full sample of PE funds. Panel B shows summary statistics for those funds that had follow-on funds within the same fund family and Panel C shows summary statistics for those funds that did not have any subsequent funds in the same fund family. The assumption here is that those partnerships who do not raise future funds are failed fundraisers. Naturally, some of these general partnerships may have chosen not to raise any future funds or some may have in fact raised future funds that just did not end up in the sample. Regardless, by and large private equity general partnerships earn most of their money through management fees, which are heavily dependent upon successfully raising future funds. Thus, the existence of a follow-on fund is a decent proxy for fundraising success and investor demand.

Out of the 399 funds with adequate data, 272 had subsequent funds and 127 had no subsequent funds within the same general partnership. The median (average) change in NAV for every dollar contributed is 1.02 (1.19). For successful fundraisers the median (average) is 1.02 (1.15) and for unsuccessful fundraisers it is 1.01 (1.25).

With respect to distributions, the median (average) change in NAV for every dollar paid out to investors is 0.85 (1.04). Successful and unsuccessful fundraisers smoothed distributions by about the same. The median (average) for the former is 0.85 (0.84) and for the latter is 0.86 (1.45). There are (perhaps unsurprisingly) stark differences in performance between successful and unsuccessful fundraisers. The median (average) total value to paid-in (TVPI) ratio for successful and unsuccessful fundraisers are 1.73 (1.81) and 1.17 (1.25), respectively. The median (average) internal rate of return (IRR) for successful and unsuccessful fundraisers are 15.05% (16.75%) and 11.8% (11.65%), respectively. The summary statistics clearly show that partnerships with better performing funds tend to raise follow-on funds; however, there is no clear bifurcation with respect to the marginal value of contributions and distributions.

Empirical Results

In this section I use the limited dependent variable regression model to see if investors have a higher likelihood of subscribing to follow-on funds from general partnerships that smooth more (see Table 21). I test not only the relationship between smoothed distributions and fundraising success, but also the association between the marginal value of cash contributions and fundraising success.

For a one percent increase in the Distribution Value of a fund (higher values mean less smooth), the probability of raising a future fund decreases by 0.129% unconditionally (Column I). When including TVPI and IRR as performance controls, a one percent increase in the Distribution Value is associated with a 0.09% decrease in the probability of raising a future fund (Column V). It is interesting to note that when just TVPI or IRR is included as a control (Columns II and III), both load positively and significantly, which is a very intuitive result. Partnerships with funds that perform well tend to raise future funds. However, when both IRR and TVPI are included together as controls, IRR loads negatively (Columns IV–VI). Fund Size has a positive association with respect to raising follow-on funds, which is also very intuitive. Partnerships with successful funds tend to raise larger future funds (which earn those partnerships higher management fees). Interestingly, the marginal value of cash called from investors is not significantly related to fundraising success. This could be a result of most funds holding investments at cost, which would imply limited information content in initial valuation markups. I repeat this same analysis using both logit and probit models as shown in Tables 22 and 23 and I find qualitatively similar results.

Table 20

The Marginal Value of a Dollar to Private Equity Funds

This table reports the marginal value of cash called from investors, Contribution Value, and the marginal value of cash distributed back to investors, Distribution Value. These estimates represent the coefficients from regressing changes in quarterly net asset values on contemporaneous contributions and distributions for each fund. Estimates presented with and without winsorization of 1% at each tail. Total Value to Paid-In (TVPI) is the ratio of all cash distributions plus any remaining NAV divided by the total cash contributions for each fund. The Internal Rate of Return, IRR, is the annualized rate of return on each fund from the first capital call to the liquidation or measurent date. The average (median) value of a dollar called from investors is $1.19 ($1.02) and the average (median) value of a dollar distributed back to investors is $1.04 ($0.85).

Statistics	Contribution Value	Distribution Value	Contribution Value (w)	Distribution Value (w)	TVPI	IRR (%)
Panel A: Full Sample						
Observations	399	399	399	399	552	452
Average	1.19	1.04	1.14	0.92	1.54	14.60
Standard Deviation	1.16	2.35	0.74	0.66	0.55	13.85
25th Percentile	0.81	0.72	0.81	0.72	1.14	8.00
Median	1.02	0.85	1.02	0.85	1.49	13.70
75th Percentile	1.24	0.98	1.24	0.98	1.88	21.65
Panel B: Successful Fundraisers						
Observations	272	272	272	272	288	262
Average	1.15	0.84	1.12	1.11	1.81	16.75
Standard Deviation	0.99	0.29	0.67	0.69	0.51	11.65
25th Percentile	0.84	0.72	0.84	0.80	1.47	9.60
Median	1.02	0.85	1.02	1.01	1.73	15.05
75th Percentile	1.25	0.96	1.25	1.24	2.09	22.20
Panel C: Unsuccessful Fundraisers						
Observations	127	127	127	127	264	190
Average	1.25	1.45	1.17	1.09	1.25	11.65
Standard Deviation	1.46	4.12	0.86	1.07	0.44	15.96
25th Percentile	0.75	0.72	0.75	0.72	0.98	3.80
Median	1.01	0.86	1.01	0.86	1.17	11.80
75th Percentile	1.21	1.07	1.21	1.07	1.48	18.90

Table 21

Do investors reward managers who smooth more?

This table presents linear probability model coefficient estimates from an indicator variable, FoF, which is equal to one if a fund has a subsequent fund in the same fund family or zero otherwise, on Distribution Values (which represent smoothness) and Contribution Values (which represent the marginal value of each dollar called). Total Value to Paid-In Capital (TVPI), Internal Rate of Return (IRR), and Fund Size are included as controls. The sample includes 399 U.S.-focused buyout funds from Preqin with 2000–2018 vintages. Contribution Values and Distribution Values are calculated by regressing changes in net asset values on contributions and distributions fund by fund. As Distribution Value increases, the less smooth a fund's valuations are relative to future cash flows. As Contribution Value increases, the higher the marginal value placed on each dollar called from investors. Robust standard errors in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

	I	II	III	IV	V	VI
	FoF					
Distribution Value	-0.129***	-0.0943***	-0.130***	-0.0797***	-0.0885***	
	(0.0213)	(0.0225)	(0.0251)	(0.0246)	(0.0266)	
Contribution Value	0.00481	-0.0189	0.00966	-0.00343	0.00264	
	(0.0299)	(0.0354)	(0.0332)	(0.0417)	(0.0418)	
TVPI		0.287***		0.355***	0.358***	0.509***
		(0.0429)		(0.0731)	(0.0732)	(0.0598)
IRR			0.590***	-0.457	-0.465	-0.731***
			(0.193)	(0.296)	(0.296)	(0.217)
Fund Size					0.0178***	0.0240***
					(0.00623)	(0.00661)
Observations	399	395	363	363	363	450
R-squared	0.032	0.133	0.053	0.127	0.140	0.210
F	20.98	30.44	11.00	18.86	15.28	36.52

Table 22

Do investors reward managers who smooth more? (2)

This table presents logistic regression coefficient estimates from regressing an indicator variable, FoF, which is equal to one if a fund has a subsequent fund in the same fund family or zero otherwise, on Distribution Values (which represent smoothness) and Contribution Values (which represent the marginal value of each dollar called). Total Value to Paid-In Capital (TVPI), Internal Rate of Return (IRR), and Fund Size are included as controls. The sample includes 399 U.S.-focused buyout funds from Preqin with 2000–2018 vintages. Contribution Values and Distribution Values are calculated by regressing changes in net values on contributions and distributions fund by fund. As Distribution Value increases, the less smooth a fund's valuations are relative to future cash flows. Contribution Value increases, the higher the marginal value placed on each dollar called from investors. Robust standard errors in parentheses. ***, **, and represent statistical significance at the 1%, 5%, and 10% level, respectively.

	I	II	III	IV	V	VI
	FoF					
Distribution Value	-0.682***	-0.505***	-0.699***	-0.416**	-0.484**	
	(0.2087)	(0.1895)	(0.2343)	(0.2056)	(0.2183)	
Contribution Value	0.025	-0.0232	0.081	0.068	0.112	
	(0.1605)	(0.2229)	(0.1942)	(0.2745)	(0.2809)	
TVPI		1.732***		2.273***	2.281***	3.128***
		(0.3448)		(0.5887)	(0.5911)	(0.5220)
IRR			3.162***	-3.285**	-3.366*	-4.753***
			(1.1411)	(1.814)	(1.8159)	(1.3967)
Fund Size					0.109**	0.128***
					(0.0539)	(0.0525)
Observations	399	395	363	363	363	450
Pseudo R-squared	0.0255	0.1197	0.0446	0.1178	0.1299	0.1885

Table 23

Do investors reward managers who smooth more? (3)

This table presents probit regression coefficient estimates from regressing an indicator variable, FoF, which is equal to one if a fund has a subsequent fund in the same fund family or zero otherwise, on Distribution Values (which represent smoothness) and Contribution Values (which represent the marginal value of each dollar called). Total Value to Paid-In Capital (TVPI), Internal Rate of Return (IRR), and Fund Size are included as controls. The sample includes 399 U.S.-focused buyout funds from Preqin with 2000–2018 vintages. Contribution Values and Distribution Values are calculated by regressing changes in net values on contributions and distributions fund by fund. As Distribution Value increases, the less smooth a fund's valuations are relative to future cash flows. Contribution Value increases, the higher the marginal value placed on each dollar called from investors. Robust standard errors in parentheses. ***, **, and represent statistical significance at the 1%, 5%, and 10% level, respectively.

	I	II	III	IV	V	VI
	FoF					
Distribution Value	-0.413***	-0.299***	-0.410***	-0.26**	-0.292**	
	(0.1143)	(0.1085)	(0.1261)	(0.1178)	(0.1244)	
Contribution Value	0.0137	-0.063	0.041	-0.034	-0.012	
	(0.0943)	(0.1318)	(0.11)	(0.1546)	(0.1569)	
TVPI		0.966***		1.172***	1.18***	1.649***
		(0.1824)		(0.2935)	(0.293)	(0.2937)
IRR			1.825***	-1.486	1.555	-2.389***
			(0.6485)	(0.9723)	(0.9652)	(0.7978)
Fund Size					0.062**	0.075***
					(0.0291)	(0.0278)
Observations	399	395	363	363	363	450
Pseudo R-squared	0.0255	0.1168	0.0439	0.1107	0.1228	0.1776

CHAPTER 5

ROBUSTNESS

Dividend Announcements

One of the more surprising results in this paper is the association between changes in the value of equity and cash dividends. The basic specification employed to measure this association is a regression of quarterly changes in the value of equity on quarterly cash flows from dividends, share buybacks, and share issuances. In the full sample of public firms, I find that payouts to shareholders via cash dividends over a quarter are associated with an *increase* of \$0.30 (\$0.35) in book (market) equity. When firm, quarter, and industry fixed effects are added to the model, I find the association to be a decrease of \$0.20 (\$0.19) in book (market) equity for every dollar that a firm pays out in dividends. The association between book equity changes and dividends is statistically significantly different from both zero and one, but for changes in market equity, the association is only statistically different from one.

One possible reason for these anomalous results is that due to the consistency with which dividend-paying firms often make these types of distributions to shareholders, these cash outflows may already be priced. Another explanation is that there may be a dividend announcement effect in the sample that causes the equity of dividend payers to increase in the quarters in which dividends are declared, giving the appearance of smoothed equity due to a positive and abnormal reaction to dividend news. In this section I conduct an event study to measure the impact of dividend announcements on firm value. The use of event studies in corporate finance dates back over half a century (Ball and Brown 1968; Fama, Fisher, Jensen, and Roll 1969) and there exists a large literature on the announcement effects of dividends. Pettit (1972), Watts (1973), and Aharony and Swary (1980) all find evidence that changes in dividend policy provide useful information content with respect to future earnings.

The model I use for expected returns is the classic four factor model of Fama and French (1992) and Carhart (1997):

$$E(R_{it}) - R_{ft} = R_{ft} + \mathrm{B}_1\left(R_{mt} - R_{ft}\right) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOM_t + \epsilon_{it} \qquad (4)$$

The estimation window is 100 days and each security is required to have a minimum of 70 days of returns to be included. There is a 50-day gap between the end of the estimation window and the beginning of the event window. The event window begins 10 days before the announcement and ends 10 days after the announcement. The sample of CRSP-Compustat firms over the 2000–2018 period includes a total of 241,077 dividend announcements and 237,360 of these meet the minimum information requirements. For each day in the event period, I report the number of total, positive, and negative abnormal returns along with mean abnormal returns, cumulative abnormal returns, and t-statistics. The standardized cross-sectional t-statistics I report are calculated using the methodology of Boehmer, Musumeci, and

Poulsen (1991). The benefit of using this methodology compared to traditional t-statistics is that it explicitly takes into account serial correlation and event-induced volatility.

I find a small but significantly positive dividend announcement effect over the 2000–2018 period and I interpret this result as a partial, but not total, explanation for why there is such a small average decrease in the value of equity relative to contemporaneous cash outflows in the form of dividends. As shown in Table 24 and Figure 1, there are significantly positive cumulative abnormal returns that begin one day before the dividend announcement and extend up to 10 days after the announcement. I repeat this event study using the payment date and find qualitatively similar results. There is an average of 38 days between the declaration date and the payment date that has a standard deviation of 24 days. The 25th, 50th, and 75th percentiles are 43, 31, and 27 days, respectively. What this means is that in addition to a positive reaction to dividend announcements (and payments) within a quarter, which has the potential to create a "smoothed" relationship between equity valuations and dividend cash flows even if valuations are not conservative relative to future cash flows, there are also potential spillover effects from quarter to quarter.

Ownership Concentration

In this section I investigate the extent to which shareholder concentration may help explain the marginal value of cash. Because private equity funds tend to acquire 100% of a target firm's equity, and therefore take complete control of the organization, I test the degree to which ownership concentration in public firms may have explanatory power over valuation smoothing. Specifically, I investigate whether shareholder concentration has a mediating effect on the association between changes in the value of equity and cash flows. If the equity of public firms with greater shareholder concentration is smoother than firms with highly dispersed ownership structures, this may help explain the smoothed nature of private equity valuations.

To study the effect of ownership structure on valuation smoothing, I use data from Orbis, which is Bureau van Dijk's flagship company database, to augment the sample of public firms from CRSP and Compustat with ownership information. I use this information to create an ownership concentration index for each firm that is akin to the Herfindahl-Hirschman Index (HHI) used to measure market concentration and I do this by summing the squared shareholder ownership for each firm. Then, I estimate the association between ownership concentration and the marginal change in equity for a one dollar change in cash flow. I include separately the effects on equity valuations from dividends, repurchases, and issuances, and I test this association using both changes in book and market equity.

The regression model I use to quantify this association is as follows:

$$OwnConc_i = \beta_0 + \beta_1 * \frac{\partial Equity_i}{\partial Div_i} + \beta_2 * \frac{\partial Equity_i}{\partial Rep_i} + \beta_3 * \frac{\partial Equity_i}{\partial Iss_i} + \epsilon_i \qquad (5)$$

The dependent variable ownership concentration, $OwnConc_i$, is the HHI-like measure of shareholder concentration for firm i that is calculated by summing the squared percentages of ownership. $\frac{\partial Equity_i}{\partial Div_i}$, $\frac{\partial Equity_i}{\partial Rep_i}$, and $\frac{\partial Equity_i}{\partial Iss_i}$ are the marginal changes in equity — measured using both book and market values — for a one dollar change in cash dividends, share buybacks, and share issuances, respectively. For example, if for a particular firm $\frac{\partial Equity_i}{\partial Div_i} = -0.25$, this means that, on average, the value of equity decreases by $0.25 for every dollar paid out in dividends over a quarter. It is important to emphasize the fact that while share prices tend to decrease by an amount equal to (or at least close to) the dividend amount at the daily frequency, this is not the case — on average — at the quarterly frequency. Formally, these variables represent the partial derivatives of the change in equity for a one dollar change in cash flow and these partials are measured by regressing changes in the value of equity over a quarter on quarterly cash flows to and from shareholders.

Regarding the book value of equity, I only find a significant association between the marginal value of dividends and ownership concentration. A one percent increase in shareholder concentration is associated with a 0.04% decrease in the marginal change in book equity for a one dollar change in cash dividends (Table 25, Column II). This means that the value of equity decreases by a lesser amount relative to each dollar paid out in dividends for firms that have shareholders with large concentrated positions. Interestingly, this relationship only exists for dividend payments and not for share buybacks. Given the elusive nature of dividend cash flows, I am hesitant to attribute this finding to anything more than a spurious correlation. Regarding the market value of equity, I find a significant association between ownership concentration and the marginal change in equity relative to both cash outflows via dividends and cash inflows via share issuances. Like with book equity, though, I do not find any statistically significant relationship for cash outflows via share repurchases.

One potential weakness of this approach is that I am only able to capture the relationship between *current* shareholder concentration and the marginal change in equity with respect to changes in cash flows. Shareholder concentration may vary significantly through time and by only having available data for a single snapshot in time I am losing critical variation in the data. Regardless, I do not find evidence that suggests shareholder concentration is significantly associated with distribution smoothing.

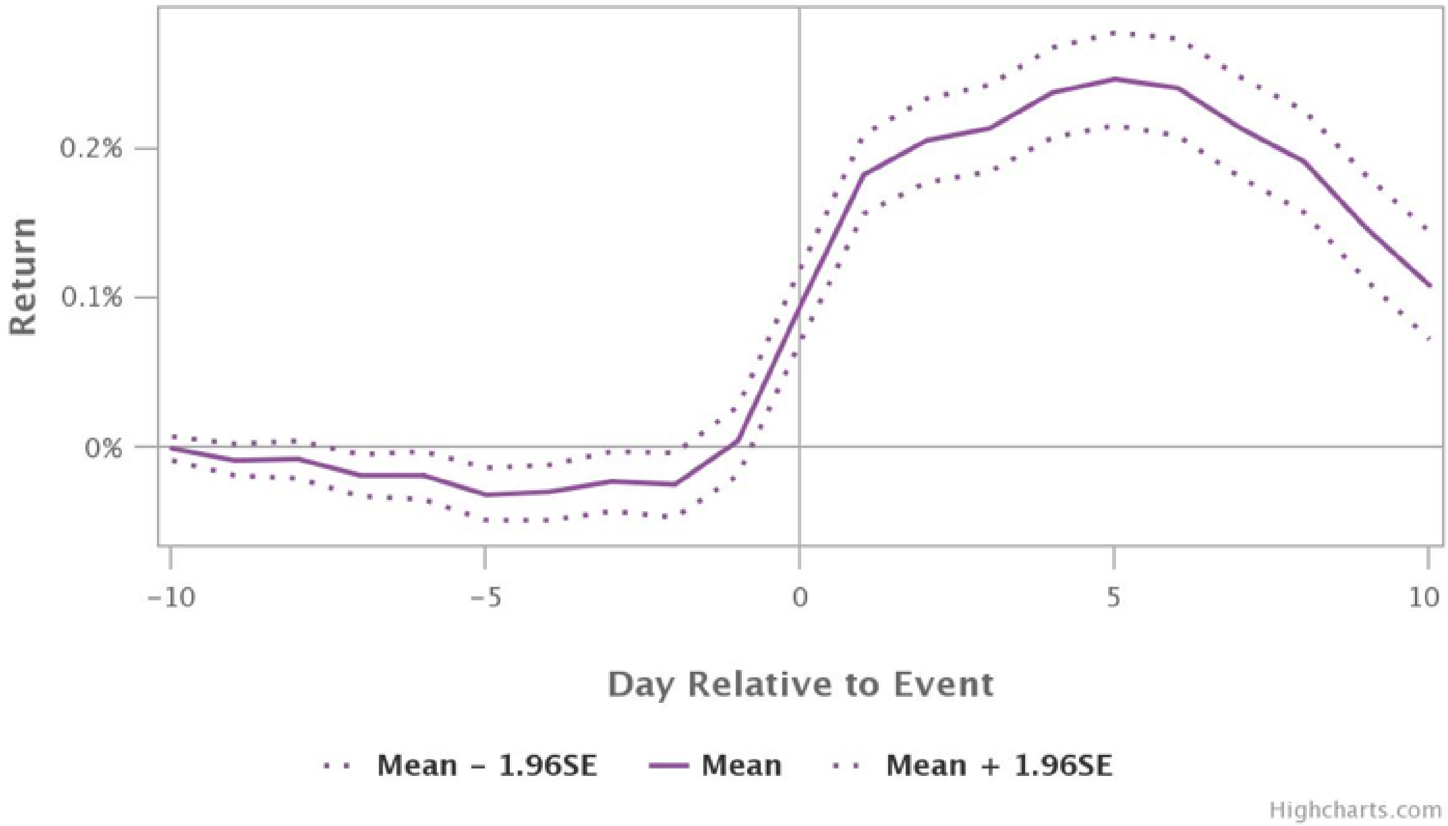


Figure 1. Abormal Reactions to Dividend Announcements. This figure shows abnormal returns surrounding dividend declarations from a sample of CRSP-Compustat firms over the 2000–2018 period. Expected returns are modeled using the four factor model of Fama and French (1992) and Carhart (1997). The estimation window is 100 days and the event window is (–10,+10).

Table 24

Dividend Announcement Event Study

This table presents the event study results of dividend announcements. Panel A includes the number of total, positive, and negative abnormal returns along with mean cumulative abnormal returns, mean abnormal returns, and t-statistics. Expected returns are modeled using the four factor model of Fama and French (1992) and Carhart (1997). Standardized cross-sectional t-statistics are reported using the methodology of Boehmer, Musumeci, and Poulsen (1991). The estimation window is 100 days and each security is required to have a minimum of 70 days worth of returns. The gap between the estimation and event window is 50 days. The original sample of CRSP-Compustat firms over the 2000–2018 period contains 241,077 dividend declarations and 237,360 of these events meet the minimum information requirements. Panel B includes summary statistics that describe the distribution of time between the announcement of a dividend and the pay date.

Panel A: Dividend Announcement Event Study

Event Day	Number of Negative Abnormal Returns	Number of Positive Abnormal Returns	Number of Abnormal Returns	Mean Cumulative Abnormal Return	Mean Abnormal Return	Standardized Cross-sectional t-statistics
-5	121,356	116,005	237,361	-0.000327	-0.000127	-8.33
-4	119,610	117,751	237,361	-0.000315	0.000012	-2.38
-3	117,193	120,168	237,361	-0.000237	0.000078	6.86
-2	119,091	118,270	237,361	-0.000262	-0.000025	-0.66
-1	115,250	122,109	237,359	0.000033	0.000295	15.16
0	114,047	123,310	237,357	0.000941	0.000909	23.91
1	115,246	122,111	237,357	0.001812	0.000871	13.36
2	118,778	118,578	237,356	0.002041	0.000229	1.92
3	118,745	118,609	237,354	0.002123	0.000082	-1.22
4	117,517	119,837	237,354	0.002362	0.000239	3.39
5	118,660	118,690	237,350	0.002452	0.000090	-1.85

Panel B: Days between Dividend Announcement and Pay Date

	N	Mean	Std Dev	p25	p50	p75
Declaration Date – Pay Date	241,077	-37.51	24.06	-43	-31	-27

Table 25

Ownership Concentration and the Marginal Value of Cash

This table presents coefficient estimates from regressing Ownership Concentration on the marginal value of cash from dividends, share repurchases, and share issuances. The dependent variable, Ownership Concentration, is calculated by summing the squared ownership percentages of blockholders. Shareholder information is collected from Orbis, which is part of the Bureau van Dijk database. Information on cash flows and equity values is collected from CRSP and Compustat for the years 2000–2018. The independent variables are the partial derivatives from cross-sectional regressions where the dependent variable is the change in the quarterly value of equity (book and market) and the independent variables are quarterly cash flows from dividends, share repurchases, and share issuances. ***, **, and * represent 1%, 5%, and 10% significance, respectively. Robust standard errors are shown in parentheses.

	I	II	III	IV
	Ownership Concentration			
∂Book Equity / ∂Dividends	-0.0375	-0.0387***		
	(0.0234)	(0.0147)		
∂Book Equity / ∂Repurchases	0.0582	0.0545		
	(0.0967)	(0.0846)		
∂Book Equity / ∂Issuances	0.486	0.566		
	(0.892)	(0.806)		
∂Market Equity / ∂Dividends			-0.00416	-0.00508***
			(0.00316)	(0.00183)
∂Market Equity / ∂Repurchases			-0.0749	-0.0590
			(0.153)	(0.138)
∂Market Equity / ∂Issuances			-0.406***	-0.400***
			(0.151)	(0.134)
Industry Fixed Effects		Y		Y
Observations	2,647	2,647	2,647	2,647
R-squared	0.001	0.044	0.002	0.046
F	1.074	2.585	3.102	5.909

CHAPTER 6

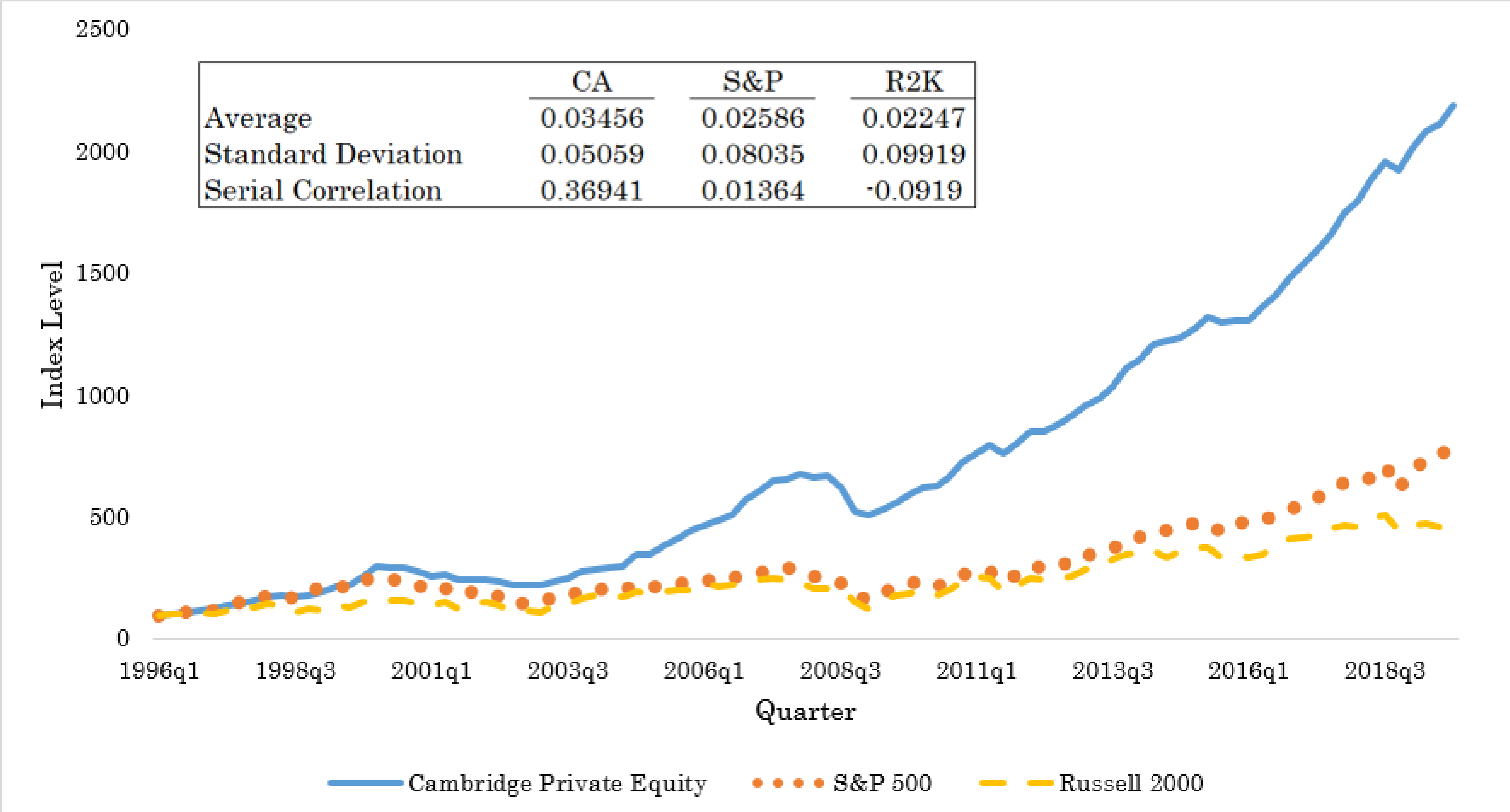
CONCLUDING REMARKS

In this dissertation I measure the smoothness of equity valuations in both public and private markets and I find that valuation smoothing is a phenomenon that is not unique to private markets. Consistent with the value premium, the equity valuations of small capitalization and value firms are smoother than other public firms. Given that private equity funds tend to target firms with these characteristics, this may at least partially explain the conservative nature of private equity fund valuations. Additionally, I find that better performing private equity partnerships tend to smooth their valuations more and investors reward these partnerships by subscribing to their future funds.

The clear preference for smoothing is an interesting result that has implications for both public and private markets. Let us consider for a moment what an individual or household would have earned from investing one hundred dollars in public markets over the 1996–2019 period and compare it to what that same individual or household would have earned from investing in private equity. As shown in Figure 2, the private equity investment not only outperformed, but had substantially lower volatility — which of course came at the expense of additional serial correlation (and lower liquidity). Serial correlation is inertia in returns that represents additional risk and should not be taken lightly; however, for a longer-term investor, it is hard to see how the extra persistence and lower liquidity would have really been that harmful. Some have suggested that investors may even be willing to pay a premium in order to avoid confronting the vagaries and vicissitudes of public markets on a daily basis (i.e., an illiquidity premium). Ilamen, Chandra, and McQuinn (2019) conclude that the preference for smoothed returns has to a large extent driven the significant growth in demand for private equity as the performance advantage over public markets appears to have narrowed in recent years. The major sacrifice in liquidity and transparency from allocating capital to private markets is a tradeoff that an ever-growing number of investors appear to be more than happy to accept.

With few exceptions, though, investing in private equity is usually only a viable option for large institutions and high-net-worth individuals. One possible remedy is to increase regulatory oversight in the private equity market so that Main Street investors can share in the prosperity while simultaneously enjoying similar protections to what they receive in public markets. The problem with regulatory interference, as is too often the case, is that it has the potential to harm the very parties that it intends to help. It is plain to see that markets like private equity are replete with information and agency issues that leave open boundless opportunities for fraud and cheating. The research, however, suggests that most private equity investors are sophisticated counterparties who are aware of the incentives to game returns and who are more than capable of performing their own due diligence.

Another solution is to let sleeping dogs lie in private markets and to allow for smoothed (and levered if desired) portfolios of publicly traded securities to be offered to the general public. Such a solution may provide the best of both worlds: let markets that are functioning continue functioning while simultaneously fulfilling the demands of investors to hold risky equity investments that are only revalued every once in a while. The potential benefits to investors from smoothed portfolios include high expected returns (and high risk), a way around leverage constraints, and best of all, smoothed portfolios are unlikely to fall off a cliff over a single angry tweet.



	CA	S&P	R2K
Average	0.03456	0.02586	0.02247
Standard Deviation	0.05059	0.08035	0.09919
Serial Correlation	0.36941	0.01364	-0.0919

Figure 2. Private vs. Public Market Indices. This figure plots the time series of returns for Cambridge Private Equity, S&P 500, and Russell 2000 indices. The table included in the graphic shows the quarterly average, standard deviation, and first-order serial correlation for each index.

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