FAIR VALUE IMPLEMENTATION AND ASSET VALUATIONS IN PRIVATE EQUITY

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ABSTRACT

This paper analyzes the effects of SFAS 157 "Fair Value Measurements" (subsequently, ASC 820) on portfolio valuations reported by private equity (PE) funds. Using a novel fund-level dataset of timed cash flows and net asset values (NAVs), I find that PE firms revised their NAVs upwards on average. Additional cross-sectional tests reveal that fair value implementation had differential effects on reported NAVs depending on fund type, performance, and auditor choice. The Big 4 auditors had a significant impact on post-SFAS 157 NAV reporting, while the non-Big 4 auditors did not. Overall, this study does not find evidence of systematic asset valuation overstatements, which have been a subject of concern for financial regulators in recent years. Together, the findings lend support to the private equity industry's claim that prior to SFAS 157-defined fair value implementation, the general preference among the funds was to report conservative[44] NAV values.

Keywords: *fair value, private equity, buyout funds, venture capital funds, SFAS 157, ASC 820*

INTRODUCTION

This study examines the initial private equity (PE) industry response to fair value adoption for portfolio asset valuation in the United States. I apply an event study methodology to investigate the effects of SFAS 157 "Fair Value Measurements" (subsequently, ASC 820) on net asset values (NAVs) reported by buyout and venture capital (VC) funds.

Since November 2007, SFAS 157 has required most funds to adopt mark-to-market rules for portfolio valuation. Valuation of privately held portfolio assets has always been challenging as such holdings do not have easily observable market values. Under the new standard, PE funds need to re-evaluate their assets using a common set of valuation rules, which were partially intended to limit the discretion that fund managers had in the portfolio valuation process. Private conversations with industry practitioners, including fund managers, auditors, and investors, called limited partners (LPs), reveal a lack of consensus regarding the effect of SFAS 157-defined fair value rules on the reported NAVs. Some argue that fair value hierarchy still affords considerable managerial discretion, especially when market asset prices are not easily observable

[44] It is important to note that in the context of PE industry reporting practices the term "conservatism" means underestimation of the true asset values by the private equity funds.

(Black *et al.*, 2018). Thus, absent enforcement and mandatory disclosure requirements, there was no significant change in NAVs after SFAS 157 went into effect. Others believe that market conditions at the time of introduction should have led to an inevitable cycle of write-downs (Alix Partners, 2008). The third opinion states that NAVs were adjusted upwards, owning to the industry convention of using ”conservative” accounting (i.e., keeping investments at cost and only updating investment value upon disposition) (Gompers and Lerner, 2005).

Among academics, some argue that PE fund managers have incentives to boost valuations to attract new capital (e.g., Brown *et al.*, 2019). Conversely, others state that fund managers face incentives for understating values to demonstrate superior returns upon portfolio exit (Higson and Stucke, 2012; Jenkinson *et al.*, 2013). If managers engaged in opportunistic (over- or under-) valuation of their holdings and SFAS 157 curtailed such behavior, then the new regulation would, in principle, reveal the direction of prior misstatements. Thus, SFAS 157 implementation provides an opportunity to discriminate between conflicting views of reporting bias in the PE industry.

For all stakeholders grappling with NAV bias, the lack of widely available data for analysis and benchmarking remains a challenge. PE industry is relatively new, with institutional-quality funds only emerging in large numbers in the 1980s. This means that the track record is quite short compared to other asset classes. Moreover, precise and comprehensive data for funds are difficult to obtain and generally only provided to investors. This study uses a high-quality dataset supplied by Burgiss, a solutions provider for private capital investors. Burgiss data offer a number of attractive features previously unavailable to researchers and allow for granular, multidimensional analysis. The hand-collected sample provides the exact date of SFAS 157 implementation for each fund, presenting a precise identification of pre- and post-regulation periods, which is a significant advantage for an event study. Moreover, the dataset is sourced exclusively from LPs and includes detailed, verified, and cross-checked cash flow and valuation history of portfolio investments. Fund cash flow and valuation data are further supplemented with information extracted from annual/quarterly fund reports, allowing for empirical analyses on multiple dimensions.

Using these data, I first assess the average effect of SFAS 157 adoption on PE NAVs. After controlling for changes in public equity market returns, the estimated effect of new regulation is positive and statistically significant for the full sample. Hence, pre-SFAS 157 fund asset valuations were, on average, understated. An average fund recorded an upward NAV adjustment of $6M, amounting to a total increase in value of $3.9B for the sample used in this study[45]. While individually significant, these adjustments suggest an even greater effect of SFAS 157 on the entire PE fund universe. Additional evidence indicates that NAV adjustments were significant for VC (buyout) funds in the first (fourth) quarter of 2008, with the magnitude of the SFAS 157 effect for buyout funds being twice that of VC funds. Together, these results indicate that buyout valuation adjustments lagged VC adjustments both in time and in magnitude, suggesting the general preference of buyout funds for more conservative valuation practices.

[45] The dollar impact is calculated by applying the SFAS 157 coefficient estimate to an average-size fund in the full sample (coefficient in Table 2; descriptive statistics in Table 1).

The next set of analyses examines associations between fund auditors and post-SFAS 157 NAV adjustments. I find that the VC clients of Big 4 auditors recorded significantly positive NAV adjustments; conversely, clients of non-Big 4 auditors did not. A mean-sized fund reported fair value adjustment of $9M, which is economically significant. This result is consistent with the findings in the auditing literature stating that Big 4 auditors are able to bring reported financial statement information to closer concordance with GAAP requirements (Teoh and Wong, 1993).

Further analyses investigate the differential effects of SFAS 157-defined fair value implementation based on fund performance. I observe positive and significant post-SFAS 157 NAV adjustments in the bottom two performance quartiles of the full sample. A separate examination of buyout and VC funds reveals that poorly performing buyout funds recorded an overall positive NAV adjustment. Conversely, VC funds in the second-best performing quartile adjusted their NAVs down. Our results for the second-best-performing quartile complement those of Brown *et al.* (2019) and confirm that asset valuation overstatements occur in narrow settings under very specific circumstances. Overall, average results for poorly performing funds seem to reflect a mixture of the transitory short-term nature of overstatements shown by Brown *et al.* (2019) and the more significant effect of longer-term understatements. Overstatements may be confined to the second and not third and fourth performance quartiles as second quartile funds may inflate NAVs by relatively small, plausible amounts to move into the first performance quartile. Conversely, the worst-performing funds would have to boost NAVs by a larger, less plausible amount, increasing the potential cost of NAV manipulation.

The overall results demonstrate that SFAS 157 significantly affected how assets are valued by both buyout and VC funds. This refutes the claim that a lack of regulatory oversight allows PE managers to ignore accounting regulations. Furthermore, despite expecting that SFAS 157 would trigger an inevitable "cycle of write-downs as companies found rationalizing their valuations next to impossible" (Alix Partners, 2008), SFAS 157 is associated with NAV increases. These findings support the claim that asset valuations by PE funds were conservative on average prior to SFAS 157-defined fair value implementation.

This study makes several contributions. First, NAV inflation represents an ongoing concern for regulators. Despite the economic significance of this asset class, PE industry largely avoids the regulation and disclosure rules that publicly listed companies must follow. The lack of transparency over funds' financial disclosure attracted SEC interest. The agency designated PE valuation practices as one of the main areas of the regulator's concern (Bowden, 2014). However, existing empirical evidence only finds occasional asset overvaluation in very specific settings. This study aims to document average changes in asset values and speak to industry-level practices of portfolio valuation, thus confirming or alleviating the regulator's concerns. Second, as PE industry continues growing, it now offers significant asset class exposure to both sophisticated and unsophisticated investors. The generally accepted argument for the lack of substantive PE industry regulation is that large investors may use their bargaining power to demand strong fund agreement protections for all investors in a fund. However, PE investors, for a variety of reasons, have limited influence on fund policies, including financial statement preparation and disclosure (Clayton, 2020). Thus, exploring the degree of industry

responsiveness to regulations not driven by individual investors' bargaining power is important. Finally, the absence of the documented SFAS 157 effects results in the need for academic studies in this area to make some compromising assumptions about NAV behaviour around the implementation period. For example, the contemporaneous paper by Easton *et al.* (2019) drops the entire SFAS 157 implementation period from analyses. Brown *et al.* (2019), facing a lack of reliable data, ran simulations to assess the effects of SFAS 157. This study complements the findings of Easton *et al.* (2019) and Brown *et al.* (2019) by providing real data-driven evidence on the effects of fair value-based estimates at the time of SFAS 157 adoption while precisely controlling for simultaneous changes in public markets. Additionally, this paper adds to the literature by documenting the impact of auditors on fund-reported NAVs, a question unexplored by previous research.

The remainder of this paper Is organized as follows. Section 2 provides the institutional background and motivates this study. Section 3 describes the data and empirical design used in the empirical tests. Section 4 describes the test results. Section 5 concludes the paper and outlines suggestions for future research.

INSTITUTIONAL BACKGROUND, SFAS157, AND HYPOTHESIS DEVELOPMENT

Institutional Background

Private equity represents a class of alternative assets not publicly traded or listed on an exchange. This study focuses on two major PE fund types: buyout and venture capital funds. VC funds usually invest in early-stage companies, such as start-ups, while buyouts concentrate on relatively mature companies with established operations. When LPs invest in a PE fund, it is managed by a private equity firm (the general partner, (GP)). One GP may have multiple funds under management, differentiated based on their "vintage," (i.e., the year of inception and/or the year in which a fund starts making first investments). Funds are closed-end with a finite life, generally around 10-12 years. In the fund's early years, managers identify investment opportunities and acquire stakes in portfolio companies by "calling" capital from LPs. Once LP and GP sign a limited partnership agreement (LPA), the investor cannot refuse a capital call and must provide cash up to the amount of the capital commitment specified in LPA. When investment stakes are subsequently realized, the cash proceeds net of GP's compensation[46] are distributed back to LPs.

Over the life of the fund, LPs receive periodic reports providing information on portfolio companies, including managerial NAV estimates. Although a PE fund may be advised by an adviser registered with the SEC, the funds themselves are not registered with the regulator. Hence, PE funds are not subject to regular public disclosure requirements, providing managers with considerably more discretion when measuring NAVs relative to their counterparts at publicly listed companies. Although the statements need not be prepared according to U.S.

[46] See Metrick and Yasuda (2010) for details on PE fund economics.

generally accepted accounting principles (GAAP) or international financial reporting standards (IFRS), they typically conform to a set of industry standards (Jenkinson *et al.*, 2020).

SFAS 157

On November 15, 2007 Statement No. 157 "Fair Value Measurements" became the first mandatory valuation standard providing a single definition of fair value for all companies using the US GAAP in their financial reporting (Kocis *et al.*, 2009). It established a comprehensive framework for GAAP fair value calculations and expanded disclosures required for items measured at fair value. The new standard did not require that fair value be applied to specific items; rather, it clarified how to value items within the fair value framework.

In the United States, the LPAs generally mandate the use of US GAAP as a basis for financial reporting (Stefanova, 2015). Consequently, Harris *et al.,* 2014, and Scharfman, 2012, argue that since taking effect, SFAS 157 has had a major impact on the valuations of private equity funds. Statement 157 aimed to produce independently verifiable values, where possible without relying on management views for numbers (Hughes, 2008). SFAS 157 defines fair value as the price that would be received for selling an asset or paid for transferring a liability in an orderly transaction between market participants at the measurement date (i.e., exit value) (FASB, 2006). This definition represents a major change in the previously generally accepted idea that fair value represents the price a private equity fund paid to acquire an asset (i.e., entry value) (FASB, 2006; Harris et el., 2014; Oberli, 2015).

SFAS 157 provides a framework for the fair value measurement of exit values. Assets are separated into three distinct categories commonly referred to as levels. Different inputs are used for calculating NAVs for each asset level, as follows:

- Level 1 inputs: Quoted prices for identical assets traded in active markets.
- Level 2 inputs: Quoted prices for comparable assets or liabilities that can be observed directly or indirectly in active markets.
- Level 3 inputs: Applicable to assets without viable market inputs. Values are derived using valuation models requiring assumptions about the future and the estimation of the parameters.

Moreover, SFAS 157 requires specific additional disclosures about the valuation methodologies used by PE funds. Considering the nature of the private equity business model, expecting that most assets will fall under the Level 3 classification is reasonable. After SFAS 157, PE funds are required to disclose the inputs used and the valuation model employed. For example, a fund might state that "For Level 3 investments, the fund values the investment primarily using a discounted cash flow methodology" (Scharfman, 2012).

Overall, SFAS 157 introduction altered managerial discretion over reported NAVs by (1) providing a consistent definition of fair value, (2) prohibiting carrying investments at cost, (3) requiring assets be marked to market every quarter, (4) prohibiting the use of discretionary block discounts, and (5) demanding detailed disclosure of valuation techniques, their underlying assumptions, and inputs. Additionally, if assets are valued using Level 3 inputs, managers must

disclose how their valuations would increase or decrease if they changed one or more inputs to a "reasonably possible" alternative.

A significant body of research explores the influence of managerial judgment in classifying fair value measurements (FVM) under the SFAS 157 hierarchy (Level 1, 2, and 3 inputs) on the quality of financial reporting. Drawing from agency theory (Jensen and Meckling, 1976), scholars argue that managers operating within a "nexus of contracts" may exercise discretion in FVM, either to provide valuable insights or to pursue self-serving goals (Watts, 2003). This discretion is intensified by the reliance on Level 2 and particularly Level 3 inputs, which can lead to biased and unreliable reporting.

Magnan et al., 2015, finds that Level 2 estimates enhance forecast accuracy, but Level 3 estimates increase earnings forecast dispersion. Analysts tend to regard Level 2 inputs as informative while viewing Level 3 estimates as vulnerable to managerial manipulation. For example, Barron et al., 2016, reveal that SFAS 157 lowered analyst forecast errors and uncertainty but did not affect forecast dispersion. Additionally, Badia et al., 2017, demonstrates that managerial conservatism in Level 3 FVM is affected by governance mechanisms and incentives for earnings management.

Several studies specifically address managerial opportunism in FVM. Hsu and Lin, 2016, document a positive correlation between Level 3 FVM and managers' efforts to meet or exceed earnings targets, but they find no such correlation for Level 1 and 2 estimates. Lin et al., 2017, identifies a greater likelihood of accounting restatements for Level 3 assets, particularly shortly after initial disclosure, indicating estimation errors and intentional manipulation. Curtis and Raney, 2016, finds that managers postpone the integration of negative information into Level 3 asset valuations.

Overall, the literature suggests that while SFAS 157 sought to enhance financial reporting, the inherent subjectivity in FVM, particularly concerning Level 3 inputs, creates opportunities for managerial discretion and potentially undermines reporting quality.

Hypothesis Development

NAVs are regularly used as key variables in investment and asset allocation decisions. Indicators of past and current fund performance are among the most important marketing tools during fundraising. While the performance of fully resolved funds is known with certainty, the performance of unresolved funds relies on estimates of NAVs and is subject to managerial discretion. Consequently, fund managers may distort recent NAVs when seeking new capital (Brown *et al.*, 2019). For example, fund managers with relatively weak performance have incentives to overstate NAVs. However, if they do, these actions will result in lower subsequent performance (relative to what would have been observed with undistorted NAVs). Unwinding of such overvaluations is not necessarily immediate. However, it is inevitable that actual cash flows eventually determine fund returns. This presents a disincentive for engaging in NAV inflation activities.

Additionally, considerable discretion in the valuation methodologies remains. Consequently, fund NAVs likely incorporate a subjective assessment of the true economic value.

A bias can enter NAV estimates in several ways. First, valuing companies using comparable firms requires a judgment in selecting the set of appropriate firms for comparison. Second, valuing companies using cash flow models involves a set of subjective modeling assumptions about growth rates, discount rates, and so on. Finally, a bias in NAVs can be derived from the timing of the transition to fair value from historical cost accounting

(or the timing of write-downs of less successful investments). For example, Higson and Stucke, 2012, argue that NAVs may underestimate current realizable value of assets and, particularly, are likely to provide an underestimation of future cash flows.

I expect that the observed post-SFAS 157 NAV changes reflect the netting of incentives for biased NAV reporting. Based on prior literature (Higson and Stucke, 2012) and industry claims about historical valuation conservatism, it is plausible that PE funds corrected their valuation bias by recording an upward NAV adjustment to conform with the new fair value regulation. In contrast, if the SEC's concerns about opportunistic performance overstatements are correct, some funds had to write their NAVs down post-SFAS 157 implementation. Thus, whether SFAS 157 corrected prior NAV reporting biases and, if so, the direction of the change, is an empirical question. If most funds reported conservatively, the SFAS 157 effect will be positive, reflecting average upward NAV adjustment across funds. Conversely, negative NAV adjustment would indicate valuation overstatements during the pre-SFAS 157 reporting period.

I further predict that three cross-sectional fund attributes will lead to observable variations in average post-SFAS 157 NAV adjustment. First, prior literature indicates that the direction of NAV reporting bias may depend on fund strategy. For example, Jenkinson et al., 2020, state that VC funds tend to be more aggressive in their valuations than buyout funds, meaning that VC funds tend to report higher NAVs relative to buyout funds. This could be due to several factors, including the inherent difficulty in valuing young, high-growth companies that VC funds invest in, as well as potential incentives for VC fund managers to report higher NAVs to attract investors. Additionally, Jenkinson et al., 2013, based on the analyses of CalPERS (California Public Employees' Retirement System) buyout and VC investments, find that buyout funds report more conservative NAVs than VC funds. Thus, I expect that buyout funds recorded higher positive NAV adjustments than VC funds. Second, top-performing funds have incentives to be conservative with their portfolio valuations to reduce the odds of being mistakenly classified as NAV manipulators (Brown *et al.*, 2019). Such reputational costs would be of less concern for GPs who may be hindered in raising new funds owing to the weaker performance of their current fund. Consequently, I expect that top-performing (bottom-performing) funds recorded positive (negative) NAV adjustments post-SFAS 157. Finally, I expect more significant post-SFAS 157 NAV adjustment for fund-clients of Big 4 auditors. Prior research argues that Big 4 auditors are able to bring reported financial statement information to a closer concordance with GAAP requirements (Teoh and Wong, 1993). Thus, I expect Big 4 auditors to significantly affect post-SFAS 157 NAVs, consistent with a significant update of the asset values owing to new fair value determination requirements.

DATA AND RESEARCH DESIGN

Data and Sample

I derived all data from the Burgiss Group, which provides software and information solutions to LPs, advisors, and fund of funds in the PE market. Burgiss data originates exclusively from LPs and includes complete transactional history between the LPs and their primary fund investments. This feature of the Burgiss dataset allows for a particularly reliable analysis of fund-level performance[47].

Our dataset was constructed based on manual collection of necessary data from annual and/or quarterly financial statements. Only funds with a full set of financial statements and complete transactional histories from vintage years[48] 1995-2005 were included in the sample to ensure a meaningful analysis of the NAV changes when SFAS 157 was implemented. I observe the funds' reported quarterly NAVs and cash flows until Jan.1, 2013, providing up to 5 years of post-implementation observations.

Panel A of Table 1 presents the descriptive statistics of the sample. Imposed data requirements and manual collection time constraints result in a final dataset containing 638 funds with an almost equal split between buyout (300) and VC (338) funds. Over time, the number of funds and size of capital commitments have grown and peaked in the year 2000 before decreasing, consistent with market trends and the tech bubble of the early 2000s. Substantial industry growth during the final vintage years of the sample (2004 and 2005) reflects the market's overall bullishness, which continued up to the steep declines associated with the 2008 financial crisis.

Panel B demonstrates the general preference for Big 4 auditors, especially for larger funds. However, median fund sizes for Big 4 and non-Big 4 auditors are comparable in magnitude, suggesting that skewness is driven by a small number of mega-fund Big 4 clients. Overall, funds of different sizes seem very well represented by all auditor-type groups.

[47] See Harris *et al.* (2014) for a description of the Burgiss Manager Service.

[48] Burgiss classifies a vintage year as the year in which a fund first draws capital from its LPs.

Table 1
DESCRIPTIVE STATISTICS
Panel A: Sample composition by vintage year

Vintage year	Venture capital	Buyout	Total funds vintage year	Total capital commitment, $M
1995	18	15	33	10,195
1996	17	19	36	6,647
1997	21	25	46	23,701
1998	35	37	72	37,485
1999	47	31	78	57,011
2000	63	43	106	67,590
2001	33	18	51	31,378
2002	14	16	30	11,184
2003	21	15	36	16,873
2004	26	28	54	66,009
2005	30	53	83	63,863

Table 1
DESCRIPTIVE STATISTICS
Panel B: Sample descriptive statistics (continued)

Auditor group	Auditor	Number of fund-clients	Fund size, $M				Auditor group, $M	
			Min	Max	Mean	Med	Mean	Median
Big 4	1	162	180	22,460	908	350	905	348
	2	65	22	20,200	1,133	400		
	3	105	22	8,000	673	350		
	4	51	84	4,660	907	450		
Non-Big 4	5	13	130	1,500	625	310	375	270
	6	15	13	420	215	230		
	7	8	260	1,620	625	310		
	8	6	37	220	132	140		
	9	5	120	460	323	390		
	10	26	31	350	164	185		

Research Design

Our first research objective is to determine the average effect of SFAS 157 implementation on PE asset valuations. Hence, I utilize a model which uses quarterly cash flow and NAV observations to examine asset valuations reported over the life of the fund. The model assumes that NAV changes for one of three reasons: (1) cash is called from LPs and is invested in a portfolio company, (2) cash is paid out to investors upon investment realizations, and (3) the

valuation of an existing portfolio company is changed. The resulting regression estimates the following fixed-effects model (Jenkinson et al. 2013):

$$y_{it} = \alpha_{it} + x_{0it}\beta_{it} + u_{it} \quad (1)$$

The dependent variable in this specification is a quarterly change in the NAV, normalized by fund size. Our main independent variable of interest - *SFAS157* - equals 0 before January 1, 2008, and 1 thereafter. Each fund's SFAS 157 adoption date (January 1, 2008) was determined based on financial statement disclosures sent to LPs at the end of each year. Additional independent variables include quarterly cash flows in (*CashIn*) and out (*CashOut*) of the fund (capital calls and distributions), normalized by fund size. Quarterly *changes in the S&P500* index control for returns in public equity markets. The *lagged S&P500* variable controls for potential lagged market and financial crisis effects (Kaplan and Schoar, 2005; Oberli, 2015; Easton et al., 2019). The age-fixed effect controls for a so-called *j-curve* pattern in cash flows and NAVs over the life of the fund[49]. Robust standard errors were clustered at the fund level. The full list of variables and their definitions are presented in Appendix A.

This regression-based approach estimates the average impact of cash flows on reported NAV changes. By including cash inflows and outflows as explanatory variables, I control for their influence on NAV movements, allowing the regression to isolate the portion of NAV change attributable to valuation adjustments. The coefficients on the cash flow variables represent the average relationship between cash flows and reported NAVs, which allows to infer the remaining change is due to valuation changes. This approach provides a more nuanced understanding of how cash flows interact with valuation changes over time.

EMPIRICAL RESULTS

Table 2 presents the results related to the average effects of SFAS 157-defined fair value adoption in the PE industry. The variable of interest - *SFAS157* - is positive and statistically significant for the full sample. Upward revision indicates that net asset values were understated, on average. An average fund recorded an upward NAV adjustment of $6M, amounting to a total $3.9B increase in value for the sample used in this study. This finding supports the argument that fund managers use conservative asset values to avoid negative returns surprises (alternatively, boost apparent returns) when assets are ultimately sold.

When the sample is split between the buyout and VC funds, results indicate that VC firms largely led upward NAV revision in initial regression specification. Additionally, quarterly analysis of NAV changes (Table 2, specification 2) reveals a distinctive difference between buyouts and VCs. VC funds restated NAVs in the first quarter of 2008, while significant changes in buyout funds' NAVs were observed in the fourth quarter of 2008.

[49] For more information on the j-curve, see Kocis et al. (2009) and Oberli (2015).

Hence, it appears that buyout funds undervalued their assets and delayed updating their NAVs for as long as possible. The coefficient magnitude of abnormal adjustments (0.04 for buyouts vs. 0.02 for VC funds) supports the hypothesis that buyout firms reported more conservatively than VC funds before implementing SFAS 157 and had to record more significant NAV adjustments to bring their valuations closer to fair value.

Table 2
SFAS 157 EFFECT ON NET ASSET VALUES

Variable	(1)			(2)		
	Full sample	Buyouts	VCs	Full sample	Buyouts	VCs
SFAS 157	0.01***	0.002	0.01***			
	(3.93)	(0.81)	(3.12)			
Cash In	1.09***	0.97***	1.2***	1.09***	0.96***	1.2***
	(28.86)	(17.98)	(22.94)	(28.84)	(17.93)	(22.88)
Cash Out	−0.55***	−0.53***	−0.59***	−0.5***	−0.53***	−0.59***
	(−23.90)	(−19.97)	(−14.66)	(−23.92)	(−20.05)	(−14.69)
S&P 500	0.26***	0.18***	0.31***	0.26***	0.18***	0.31***
	(15.24)	(7.22)	(13.87)	(15.25)	(7.29)	(13.86)
S&P 500 lag1	0.13***	−0.06*	0.13***	0.14***	0.09***	0.17***
	(8.47)	(−1.65)	(3.92)	(8.48)	(3.78)	(7.84)
Q1 2008				0.008	−0.007	0.02***
				(1.25)	(−0.75)	(2.31)
Q2 2008				0.001	−0.003	0.006
				(0.18)	(−0.2)	(−0.23)
Q3 2008				−0.01	−0.01	−0.008
				(−1.37)	(−1.3)	(−0.57)
Q4 2008				0.01**	0.04***	−0.003
				(1.9)	(3.53)	(−1.37)
Fixed effects	YES	YES	YES	YES	YES	YES
Observations	7,369	3,012	4,357	7,369	3,012	4,357
Adjusted R-squared	0.39	0.38	0.42	0.37	0.38	0.40

This table presents the results of fixed-effects multivariate regressions. The dependent variable is a quarterly NAV change, normalized by fund size. In specification (1), the variable of interest - *SFAS 157* - is an indicator variable that equals 0 before the end of 2007 and 1 thereafter. Specification (2) decomposes *SFAS 157* into quarterly observations - *Q1, Q2, Q3, and Q4 2008*. *Cash In* and *Cash Out* represent quarterly cash flows in and out of the fund (capital calls and distributions), normalized by the fund size. *S&P500* index controls for returns in public equity markets and the lagged *S&P500* variable controls for potential lagged financial crisis effects. Age fixed effect controls for a so-called *j-curve* pattern in cash flows and NAVs over the life of the fund. Robust standard errors are clustered at the fund level.
t-statistic in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3, which presents the associations between fund performance and recorded fair value adjustments, reveals a number of interesting results. First, top-performing funds demonstrate insignificant NAV changes after implementing the fair value standard (Panel A).

This result rejects the hypothesis that top-performing PE firms reported more conservatively pre-SFAS 157. However, bottom-performing funds are associated with significant upward valuation adjustments (Panel B). This is consistent with conservative asset value reporting pre-SFAS 157; however, this is only for the worst-performing PE funds. Third, VC funds in the second-best performing quartile (Table 3, Panel A) demonstrate negative post-regulation adjustments – the opposite of the predicted effect. However, this result is consistent with the peer-chasing hypothesis (Brown *et al.*, 2019), which posits that PE funds inflate their NAVs to provide the appearance of similarity to funds from top-performing quartiles. Additionally, Harris *et al.* (2012) states that belonging to the top-performing quartile is a status widely prized in the industry, especially considering past research showing return persistence by funds raised by the same GP (Kaplan and Schoar, 2005). Why the incentives of buyout funds would be different from VC funds as a function of performance is not immediately clear. However, to the extent that they are, overstatements are unlikely to be observable in all performance quartiles. Manipulating reported second-best performing quartile NAVs towards the top-performing quartile is less costly relative to the bottom quartile NAV manipulation. Funds in the second-best performance quartile need to inflate NAVs by relatively small, plausible amounts to move into the top performance quartile, while worst-performing funds would need to inflate NAVs by larger, less plausible amounts to do the same. Thus, downward NAV revisions by second-best performing funds may reflect higher incentives for pre-SFAS 157 overstatements.

Table 3
POST-SFAS 157 NET ASSET VALUE CHANGES, BY FUND PERFORMANCE

Panel A: Top performers

Variable	Top performing			Second best		
	Full sample	Buyouts	VCs	Full sample	Buyouts	VCs
SFAS 157	0.01	−0.002	0.02	−0.004	−0.001	−0.01**
	(1.41)	(−0.27)	(1.63)	(−1.39)	(−0.18)	(−2.43)
Cash In	1.12***	1.04***	1.17***	0.94***	0.87***	1.05***
	(9.80)	(7.65)	(6.33)	(20.56)	(12.29)	(18.35)
Cash Out	−0.48***	−0.51***	−0.55***	−0.70***	−0.74***	−0.65***
	(−8.99)	(−8.37)	(−5.19)	(−24.61)	(−17.93)	(−16.53)
S&P 500	0.37***	0.34***	0.39***	0.18***	0.22***	0.12***
	(10.35)	(7.54)	(7.28)	(12.03)	(9.59)	(6.94)
S&P 500 lag1	0.13***	0.10**	0.15***	0.04***	0.04	0.04**
	(3.59)	(2.14)	(2.83)	(2.61)	(1.50)	(2.43)
Fixed effects	YES	YES	YES	YES	YES	YES
Observations	1,887	878	999	2,199	1,079	1,120
Adjusted R-squared	0.17	0.22	0.16	0.39	0.38	0.43

Panel B: Bottom performers

Variable	Second worst			Bottom performing		
	Full sample	Buyouts	VCs	Full sample	Buyouts	VCs
SFAS 157	0.01**	0.007	0.00	0.02	0.03***	0.00
	(2.21)	(0.98)	(0.69)	(−3.48)	(4.68)	(0.07)
Cash In	1.17***	1.00***	1.30***	1.15***	0.95***	1.30***
	(20.33)	(8.40)	(20.39)	(17.08)	(10.91)	(14.01)
Cash Out	−0.70***	−0.79***	−0.65***	−0.47***	−0.62***	−0.40***
	(−15.73)	(−10.02)	(−11.83)	(−6.79)	(−7.24)	(−4.05)
S&P 500	0.16***	0.21***	0.13***	0.15***	0.09***	0.19***
	(8.80)	(5.74)	(6.56)	(7.51)	(3.37)	(6.67)
S&P 500 lag1	0.08***	0.10**	0.07***	0.10***	0.07***	0.11**
	(4.55)	(2.83)	(3.41)	(4.82)	(1.50)	(2.43)
Fixed effects	YES	YES	YES	YES	YES	YES
Observations	1,744	515	1,229	1,549	540	1,009
Adjusted R-squared	0.35	0.34	0.38	0.23	0.32	0.30

This table presents the results of the fixed-effects multivariate regressions. Fund performance is determined based on the Public Market Equivalent (PME) calculation (Kaplan and Schoar, 2005). The dependent variable is a quarterly NAV change, normalized by fund size. The variable of interest - *SFAS 157* - is an indicator variable that equals 0 before the end of 2007 and 1 thereafter. *Cash In* and *Cash Out* represent quarterly cash flows in and out of the fund (capital calls and distributions), normalized by fund size. The *S&P500* index controls for returns in public equity markets and the lagged *S&P500* variable controls for potential lagged financial crisis effects. Age fixed effect controls for a so-called *j-curve* pattern in cash flows and NAVs over the life of the fund. Robust standard errors are clustered at the fund level.
t-statistic in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The final set of regression analyses examines the associations between post-SFAS 157 NAV adjustments and fund auditors. Table 4 presents the results. The coefficient for the variable of interest - *SFAS 157* - is positive and highly significant for full sample and VC funds, but not buyout funds. Thus, Big 4 auditors are associated with significantly positive NAV adjustments, while non-Big 4 auditors are not. For example, mean-sized fund clients of Big 4 auditors reported a fair value adjustment of $9M. While explaining the differences between Big 4 and non-Big 4 auditors is beyond the scope of this paper, our result is consistent with auditing literature arguing that high-quality (Big N) auditors can bring the reported numbers closer to GAAP requirements. Specifically, in our setting, applying a new GAAP standard resulted in significant NAV adjustments by fund-clients of Big 4 auditors.

Table 4
POST-SFAS 157 NET ASSET VALUE CHANGES, BY AUDITOR

Variable	Big 4			Non-Big 4		
	Full sample	Buyouts	VCs	Full sample	Buyouts	VCs
SFAS 157	0.01***	0.001	0.01***	0.006	0.01	−0.002
	(3.00)	(0.14)	(2.49)	(0.88)	(0.88)	(−0.13)
Cash In	1.11***	0.98***	1.25***	0.99***	0.83***	1.15***
	(28.09)	(16.61)	(23.19)	(8.76)	(6.67)	(6.33)
Cash Out	−0.55***	−0.61***	−0.52***	−0.52***	−0.52***	−0.53***
	(−23.11)	(−18.99)	(−14.32)	(−6.73)	(−6.85)	(−3.79)
S&P 500	0.22***	0.26***	0.20***	0.17***	0.08**	0.25***
	(18.00)	(13.70)	(12.12)	(4.62)	(1.89)	(4.34)
S&P 500 lag1	0.09***	0.06***	0.10***	0.07**	0.11***	0.03
	(6.92)	(3.42)	(6.20)	(1.97)	(2.84)	(0.53)
Fixed effects	YES	YES	YES	YES	YES	YES
Observations	6,350	2,551	3,799	1,019	461	558
Adjusted R-squared	0.25	0.28	0.23	0.15	0.22	0.15

This table presents the results of the fixed-effects multivariate regressions. The dependent variable is a quarterly NAV change, normalized by fund size. The variable of interest - *SFAS 157* - is an indicator variable that equals 0 before the end of 2007 and 1 thereafter. *Cash In* and *Cash Out* represent quarterly cash flows in and out of the fund (capital calls and distributions), normalized by fund size. The *S&P500* index controls for returns in public equity markets and the lagged *S&P500* variable controls for potential lagged financial crisis effects. Age fixed effect controls for a so-called *j-curve* pattern in cash flows and NAVs over the life of the fund. Robust standard errors are clustered at the fund level.
t-statistic in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

CONCLUSIONS

This study analyzes how SFAS 157 “Fair Value Measurements” affected PE net asset values. Based on a novel fund-level dataset of quarterly cash flows and net asset values from the Burgiss Group, our results demonstrate that SFAS 157 significantly affected reported NAVs.

Furthermore, despite the industry's claims about the potential depressive effect of the fair value standard, PE firms revised their net asset values upward on average. Magnitudes of such revisions are larger for the buyout subsample, supporting previous researchers' argument that buyout funds value their holdings more conservatively than VC funds. Additionally, the effect of SFAS 157 on reported NAVs varies with a fund's auditor. Clients of Big 4 auditors recorded positive and significant changes in net asset values, while clients of non-Big 4 auditors did not. Overall upward adjustments add up to $3.9B for the sample used in this study, which suggests an even more significant effect if extrapolated to the entire PE fund universe. In summary, this study does not find evidence of systematic asset valuation overstatements, which are the subject of concern for the SEC in recent years. On average, our findings support the PE industry's stated general preference to understate asset valuations prior to SFAS 157 introduction.

Caveats and suggestions for future research

There are some caveats to the empirical analyses presented in this paper. The effects of SFAS 157 implementation may have been more pronounced if all PE funds fully complied with the new regulation. However, annual reports show that some funds decided against SFAS 157 adoption. For example, some funds refused to adjust asset valuations as per special paragraphs in the auditor letters attached to the financial statements. Auditor statements revealed that unrecorded upward fair value adjustment amounts ranged between 18M-138M. General partners listed a variety of reasons to adhere to their historical valuation practices. Some argued that fair value methodology did not fairly represent actual investment values, while others stated that their partnership agreement did not require SFAS 157 adoption. Therefore, such financial reporting choices may have significantly affected the empirical detection of fair value adjustments and their magnitudes. However, suggesting that unrecorded adjustments would strengthen the demonstrated results because all such adjustments were positive is reasonable. Because auditor letters indicated that all unrecorded NAV adjustments were positive, including these funds in the sample would likely have reinforced the paper's findings. This addition would have increased the number of observations and amplified both the direction and magnitude of the reported adjustments.

In PE research, analyzing the buyout and VC funds separately to draw performance-related inferences has become conventional. However, why financial reporting practices would differ across the two fund categories is not clear. Arguably, buyout portfolio holdings may be easier to value as buyouts invest in more established companies with predictable cash flows, while VC funds invest in inherently hard-to-value start-up companies. Conversely, VC portfolio companies usually go through multiple rounds of financing, allowing NAVs to be updated based on the latest market valuation of the start-up. While these characteristics directly influence fund-level measures of risk and ultimate performance, why financial reporting based on the same set of accounting standards differs is less clear. This presents a fruitful avenue for future research to examine the determinants and consequences of financial reporting practices in the private equity industry.

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APPENDIX

A. Variable Definitions

Variable	Definition
SFAS 157	Indicator variable that equals 0 before January 1, 2008, and 1 thereafter, marking the adoption of SFAS 157.
Cash In	Quarterly cash flows into the fund (capital calls), normalized by fund size.
Cash Out	Quarterly cash flows out of the fund (distributions), normalized by fund size.
S&P 500	Quarterly return of the S&P 500 index, used to control for returns in public equity markets, calculated based on *sprtrn* variable from the CRSP database.
S&P 500 lag1	Lagged quarterly return of the S&P 500 index, used to control for potential delays in mark-to-market adjustments and lagged financial crisis effects.
Q1 2008	Indicator variable for the first quarter of 2008, used to decompose the effect of SFAS 157.
Q2 2008	Indicator variable for the second quarter of 2008, used to decompose the effect of SFAS 157.
Q3 2008	Indicator variable for the third quarter of 2008, used to decompose the effect of SFAS 157.
Q4 2008	Indicator variable for the fourth quarter of 2008, used to decompose the effect of SFAS 157.
PME (Public Market Equivalent)	The fund performance variable measured using the Public Market Equivalent from Kaplan and Schoar, 2005. See Appendix B for calculation description.
Vintage Year	Burgiss defines the vintage year as the first year when the fund draws capital from investors (LPs).
Big 4 Auditor	Indicator variable for funds audited by one of the Big 4 auditing firms.
Age Fixed Effect	Fixed effect to control for the age of the fund, capturing the j-curve pattern in cash flows and NAVs over the life of the fund. Vintage year is used as a starting point for the age calculation.

B. Public Market Equivalent

The public market equivalent (PME) method (Kaplan and Schoar, 2005) reflects the return to private equity investments relative to public equities. PME calculation discounts all distributions and the residual value of the fund using the respective index (in this paper, S&P500) and divides the resulting value by the sum of all contributions to the fund discounted using the respective index:

$$PME = \frac{\sum_{t=0}^{T} \frac{D_t}{1+r_t}}{\sum_{t=0}^{T} \frac{C_t}{1+r_t}}$$

where r_t is the time-varying return on an investable index, D_t is a capital distribution from a private equity fund to investors, C_t is a capital contribution of investors to a private equity fund.

A fund with a PME greater than 1 outperformed an investable index (net of all fees). For example, a PME of 1.2 indicates that a private investment generated a cumulative outperformance of 20% over the stated index. The PME can be viewed as a market-adjusted performance multiple of the private equity investment.