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INTERIM VALUATIONS, PREDICTABILITY, AND OUTCOMES  
IN PRIVATE EQUITY

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### **ABSTRACT**

Using a novel dataset of U.S. buyout and VC investments, we study the informativeness of fund managers' interim valuation reports about portfolio companies on final outcomes. We find that when investors assess the performance of individual portfolio companies, they can do better than just relying on the most recent reported valuation. The history of reported valuations is also informative. Investments with greater past staleness or more frequent markdowns tend to perform more poorly in the future than other investments. We also find that the timing of an investment's exit is predictable. Moreover, the combined knowledge of interim realized and unrealized returns, past staleness, and past markdown frequency can help predict whether an investment will end up in the left or right tail of all investments. These predictions are informative as early as the first year of the investment.

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# 1 Introduction

As investments in illiquid private equity (PE) assets have grown substantially over recent years, so has interest in the return properties of those investments among practitioners, regulators, and academics. Particular attention has been devoted to the net asset values (NAVs) of these illiquid assets.

Investors or limited partners (including pension funds, endowments, and other asset managers) in private equity investments care about NAVs for at least four reasons. First, limited partners must periodically measure and report the performance of their investments. This is challenging because most investments in PE are illiquid or not traded. Second, employees of some limited partners are compensated based on the measured annual returns of those investments. Third, PE fund managers (or general partners) typically try to raise new or additional funds three to six years after raising the previous or initial fund. At that time, the previous fund will be largely invested but not yet realized. To some extent, limited partners base their investment decision whether to commit to a new fund on the unrealized performance and NAVs of the previous fund(s) (see, for example, [Chung et al. \(2012\)](#)). This may also provide an incentive for the PE manager to inflate NAVs (see, for example, [Barber and Yasuda \(2017\)](#), [Chakraborty and Ewens \(2018\)](#), [Brown et al. \(2019\)](#), and [Jackson et al. \(2022\)](#)). Fourth, a large secondary market has recently emerged in which limited partners (LPs) sell their interest in mature PE funds. For these reasons, buyers and sellers have a strong interest in understanding the extent to which NAVs reflect the true performance of investments.

Information about interim performance is particularly relevant for buyout fund LPs in light of the findings in [Harris et al. \(2023\)](#). For buyouts, they find that the performance of a PE manager's previous fund at the time of seeking investments in a new fund does not predict the performance of the new fund. However, the ultimate (future) performance of the previous fund does predict the performance of the new fund. Accordingly, predictions of the final performance of the previous fund that could be determined from the information available at the time of fundraising could be useful for LPs.

Interim performance is also important in secondary market LP stake sales. For example, [Nadauld et al. \(2019\)](#) shows that stakes are generally sold at a discount to the NAV. Some of this discounting may be due to the illiquidity of the market, but informational frictions and sophistication may also contribute to the discounts. For example, [Cavagnaro et al. \(2019\)](#) and [Sensoy et al. \(2014\)](#) show that LPs are heterogeneous in their skill at picking managers. In our context, this may be related to the accuracy with which LPs

understand quarterly reports on NAVs.

In recent years, NAVs have received considerable attention from academics. Korteweg and Westerfield (2022), Korteweg (2022), and Jenkinson et al. (2023) summarize much of this work, most of which is done at the fund level rather than the level of individual investments within the portfolio. In general, that research finds that NAVs are conservative on average (see, for example, Brown et al. (2019), Easton et al. (2023), and Jenkinson et al. (2013)). A contributing factor to smoothness may be that discount rates vary over time but are not marked by managers (see Boyer et al. (2023)). Another contributing factor may be agency frictions.

Several papers explicitly look at the potential for manipulation of NAVs around fundraising. Most of that research concludes that lower-quality PE managers appear to have inflated NAVs around fundraising while higher-quality PE managers tend to understate their NAVs (see Chakraborty and Ewens (2018), Barber and Yasuda (2017), Brown et al. (2019), Harris et al. (2023)). Agency conflicts may have broad implications ranging from NAVs, as studied in the papers above, to investment decisions as studied by Axelson et al. (2013).

Hüther (2022), using a smaller sample of funds, finds that valuation peaks are driven by poor subsequent investments rather than inflated NAVs. Hüther (2022) uses individual portfolio company or deal-level performance NAVs as well as fund NAVs. He studies 136 funds from a large LP and finds that deal NAV markdowns are largest in the first year and a half after investment and are independent of closeness to fundraising. General partners (GPs) mark down investments that were on average stated at cost, and markdowns are larger in later investments of low-reputation funds.

In this paper, we study the valuation of individual portfolio company investments over the life of the investments in buyout and VC funds. We consider the extent to which interim valuations and the reporting history of those investments predict their future performance. We use a new dataset from the StepStone Group that covers U.S. buyout and VC investments and fund managers. StepStone is a large firm specializing in global private markets, overseeing more than \$130 billion of private capital allocations and has more than \$30 billion of assets under management. Our comparison of the StepStone dataset with the Burgiss dataset that has been extensively used by academics shows that the StepStone data are similar and in some respects superior to that of Burgiss. In particular, StepStone data are not anonymized and have quarterly interim valuations for many individual investments.

We find that information in the interim reports can reliably increase the predictability

of final outcomes. We concentrate on two types of outcomes that are of interest to investors, final realized investment return and timing of investment exit. Exit timing is relevant because PE funds require commitments of future cash flow outlays and because knowing exit timing helps investors with liquidity management. Interim realized and unrealized returns are informative for both exit timing and final realized returns.

We evaluate two measures, both of which can be derived from the history of quarterly reports. Staleness measures the fraction of past quarters with zero returns up to and including the latest fund manager report. Staleness, therefore, captures the frequency with which a fund manager opts not to revise its estimate of an investment’s total value. Markdown frequency measures the fraction of quarters with negative reported returns, thereby capturing the frequency with which a fund manager opts to revise an unrealized investment NAV downward.

Both past staleness and markdown frequencies improve predictability in an economically significant way. The frequent staleness or markdowns are generally bad news for future returns, even as early as the first year of investment. For example, a buyout investment that is completely stale in Year 2 is expected, all else being equal, to exhibit a quarterly return of 13 percentage points lower compared to an investment that had not experience any staleness.

At the same time, past staleness and markdown frequencies are also predictive of how quickly investments exit. For example, a buyout investment that is completely stale in Year 2 is expected, all else being equal, to exit three quarters later than otherwise. This is equivalent to around a 25% delay relative to the average investment.

Based on this predictability, the combination of interim realized and unrealized returns, past staleness, and past markdown frequency helps predict whether an investment will end up among the best- or worst-performing investments at exit. These predictions are informative as early as the first year of the investment. To summarize, our results suggest that interim reporting about PE portfolio company valuations provides useful information for PE investor decision-making.

The paper proceeds as follows. Section 2 describes our data. Section 3 reports our results. Section 4 concludes.

## 2 Data

We use data from the StepStone Group, a large global private markets specialist, overseeing more than \$130 billion of private capital allocations and more than \$30 billion

of assets under management. StepStone collects information about a wide array of PE funds including those it invests in, those its LP clients invest in, and funds that share information about past performance while soliciting new investments.

## 2.1 Comparison with the Burgiss data

As this is one of the first uses of StepStone data in the academic literature, we first compare StepStone’s data to that of Burgiss. Burgiss has come to be considered the most reliable performance dataset in PE research given its breadth and relative lack of bias (see, for example, [Harris et al. \(2014\)](#) and [Korteweg \(2022\)](#)).

Our StepStone data include three levels of specificity: fund-level, investment-level, and (investment x interim report)-level. We can compare the performance information of the two datasets at the fund level. Unlike the Burgiss data, the StepStone data include the full identities of the PE firms, their funds, and portfolio companies. The Burgiss data available for academic use, in contrast, are anonymized. Accordingly, we compare the two datasets using the performance measures for annual statistics for two subsets of fund universes: buyout and venture capital (VC).

We focus on U.S.-based investments by using StepStone and Burgiss filters to restrict the fund currency to the U.S. dollar and the investment geography to be the United States. In the StepStone data, we remove a few instances of open-ended funds, funds with “bonds,” “pooled,” or “synthetic” in their names, funds with a foreign country in the fund’s name, pre-funds (those raised in anticipation of the launch of the main fund), and synthetic funds. The description of the exact cleaning steps for fund-level StepStone data is given in the Internet Appendix A. The identity of funds is kept anonymous in the Burgiss data, making it impossible to implement the same step-by-step filtering.

We restrict both datasets to funds with vintages between 1999 and 2019 to ensure that chosen years have enough observations.<sup>1</sup> Table 1 indicates that StepStone has at least as much fund performance information as Burgiss. The fund numbers and capital committed in the StepStone database are similar for VC funds and higher for buyout funds than in Burgiss. Both StepStone and Burgiss have on average about 70 VC funds with total capitalization of \$22 to \$23 billion per vintage year. To take two representative recent years as examples, StepStone had 99 and 110 VC funds in 2016 and 2017, respectively, compared to Burgiss’s reported 77 and 94. For buyouts, the StepStone data contain on

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<sup>1</sup>One caveat is that Burgiss and StepStone may use slightly different definitions of vintages. While this factor may produce some variation across vintages, it should not affect the overall comparison.

average nine more funds in each vintage year, 65 versus 56, and total capitalization of \$92 billion versus \$73 billion in Burgiss. The number of buyout funds in vintages of 2016 and 2017 were 94 and 73 in StepStone and 80 and 63 in Burgiss. We should note that the StepStone database contains performance information but does not require the fund to have all cash-flow data. The Burgiss database has all cash-flow information for the funds it includes.

Table 1 indicates that the performance results are similar in StepStone and Burgiss. For buyout funds, the average of the fund-size-weighted average annual fund net multiples of invested capital (MOIC) is 1.89 in StepStone and 1.84 in Burgiss. This difference is statistically significant because our sample sizes are very large. But the economic difference is small, corresponding to one-seventeenth of one standard deviation of cross-sectional MOIC in StepStone. The correlation of the average annual MOICs is a very high 0.90, suggesting that Burgiss and StepStone have similar buyout fund performance data.

For VC funds, the similarly defined MOICs are 2.14 and 2.37 for StepStone and Burgiss, respectively. While the difference is larger than that for the buyout funds, the higher correlation of 0.95 suggests that the performance data are similar as well. The difference in MOIC corresponds to one-tenth of one standard deviation of cross-sectional MOIC in StepStone. Because the StepStone data have PE firm and fund identities, we confirmed that the dataset includes most of the VC funds that are ranked at the top in terms of either assets under management or performance. For example, for the U.S. VC firms, whose partners are featured in the 2019 Midas list of the top 100 VCs, only five of 32 firms with over \$1.5 billion in assets under management are missing in StepStone. We are unable to confirm the presence of these or other VC firms in the available Burgiss data.

To summarize, the StepStone and Burgiss data are similar, at least for the U.S. universe of buyout and VC funds. StepStone offers three advantages: it fully identifies all funds, it has interim performance metrics, and it has valuation information on underlying portfolio companies that are linked to the funds.

## 2.2 Interim performance data

To study the impact of interim valuations as well as staleness and the frequency of markdowns on final realized performance, we use StepStone’s interim valuation data for individual portfolio companies. For the funds in which StepStone invests or advises on

investment, StepStone receives quarterly reports from PE funds that include information not just on fund performance but also on performance of individual portfolio companies. This information includes invested capital, interim valuation as of the date of the report, and, if appropriate, exit valuation.

We include investments that have exited, have data on the exit valuation, and have at least one interim return. We exclude investment positions that are public securities or derivative hedge positions and those with negative MOICs. The exact data filters for the (investment  $\times$  quarter) data are given in the Internet Appendix A.

Table 2 reports summary statistics for the final buyout and VC samples, which include investments from 893 buyout and 563 VC funds. We observe the performance measures for 9 and 11 portfolio companies on average for buyout and VC funds, respectively, with each investment having on average 9 interim quarters of valuation data. Our sample of portfolio companies covers 44% of the fund commitment size for buyout funds and 28% for VC funds.

### 3 Interim Information and Return Predictability

In this section, we present our main results on PE return predictability as a function of information available to investors during the life cycle of the fund. Section 3.1 discusses predicting future performance and Section 3.2 discusses predicting tail outcomes.

#### 3.1 Predicting Future Performance

In this section, we test whether information in the interim reports can predict the final outcomes for portfolio company investments. We conduct the analysis from the perspective of an investor in PE funds who has access to the time series of reported interim valuations on a quarterly basis. Our analysis thus covers the available span of all return information for LPs in a typical PE fund.

Assume that the investor observes the information set of investment  $i$  to the end of investment's year  $t$ . Armed with this information, we test the predictability of two variables of interest to the investor: the timing of investment exit and the investment return upon exit. By "exit" we mean the final disbursement of investment from the PE fund.<sup>2</sup>

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<sup>2</sup>Although for buyout and VC investments most of the payoff is realized upon exit, some investments realize interim cash inflows. The median buyout (VC) investment has paid out only 16% (0%) of its lifetime value before the last year of the investment.

We proxy the timing of investment exit,  $q_{i,t}$ , as the number of quarters until the PE fund exits the investment. Specifically, we calculate  $q_{i,t}$  as the number of quarters between the exit date (inclusive) and the end of year  $t$  (exclusive).<sup>3</sup> We proxy the investment returns as the geometric average net return between  $t$ 's interim multiple  $R_{i,t}$  calculated as the ratio of investment's NAV to invested capital and the investment's exit multiple  $R_i$ . That is, we calculate  $\bar{r}_{i,t}$  such that  $(1 + \bar{r}_{i,t})^{q_{i,t}} = R_i/R_{i,t}$ .

To predict exit timing and returns, we use four primary explanatory variables, all of which should be readily available to PE fund investors. The first two variables are frequently utilized by investors in their analysis of fund managers and their investments. First, we use the *interim realized* $_{i,t}$ , defined as the ratio of payout paid through  $t$  to invested capital. Second, we use the *interim unrealized* $_{i,t}$ , defined as the ratio of an investment's NAV at the end of  $t$  to invested capital. Combined, these two variables are commonly referred to by practitioners as gross total value multiple.<sup>4</sup>

We then introduce two additional variables that are also readily available to PE fund investors, but that in our experience are typically not utilized. These variables summarize the history of quarterly reports on each investment. Our third variable is interim staleness frequency, *staleness* $_{i,t}$ , which measures the fraction of past quarters with zero returns up to and including the latest quarter report. Staleness captures the frequency with which a fund manager opts not to revise its estimate of the investment's total value, which includes both realized and unrealized components. Finally, we introduce interim markdown frequency, *markdown* $_{i,t}$ , which measures the fraction of quarters with negative reported returns.<sup>5</sup> Markdown captures the frequency with which fund managers opt to revise the investment's total value negatively.

We then estimate

$$y_{i,t} = \gamma_0 + \gamma_1 \text{interim realized}_{i,t} + \gamma_2 \text{interim unrealized}_{i,t} + \gamma_3 \text{staleness}_{i,t} + \gamma_4 \text{markdown}_{i,t} + \epsilon_{i,t} \quad (1)$$

where  $y_{i,t}$  is either the number of quarters through the exit of investment  $i$  or the geometric

<sup>3</sup>Because our data are reported on a quarterly basis and thus we do not know the exact timing of the exit, we exclude investments that will exit in the very next quarter so as to avoid any potential look-ahead bias.

<sup>4</sup>In practice, "paid-in capital" metrics such as total value to paid-in capital (TVPI) and total multiple on invested capital (MOIC) are often reported. Investors use these metrics to analyze the performance of the fund. Fund-level invested capital and paid-in capital may differ because, for example, of the so-called recycling provisions, whereby the fund manager is allowed to reinvest the exit proceeds, thus making it challenging to allocate paid-in capital to individual investments.

<sup>5</sup>If invested capital increases from one quarter to the next one, we compare the next quarter's NAV to this quarter's NAV, subtracting off the increase in invested capital.

average of quarterly gross returns through exit of the same investment.

When might staleness and markdown frequency intuitively be informative to investors? In a world with accurate reports, ex-ante homogeneous investment returns, and no serial correlation, we would not expect any statistically significant slope estimates for any of these four economic measures. In the real world with possible deviations along all three dimensions, however, we can observe predictability.

First, in an environment of substantial information asymmetry and opaqueness, PE fund managers may have a large degree of control over whether to update interim valuation reports.<sup>6</sup> This suggests that reported valuation may have a strategic component as managers may delay or speed up the realization of positive or negative news. In this case, the reported interim multiple deviates from the true interim multiple. Such deviation may bestow predictive power on other variables that are correlated with the true interim multiple. For example, if managers infrequently update the valuation of poorly performing investments, interim staleness would be negatively correlated with future returns because the current valuation is relatively inflated.

Second, even without strategic behavior, managers may choose to be conservative or, conversely, aggressive in valuing different investments. For example, some managers may be generally slow to realize past gains while others may not. In this case, reported interim multiple may predict future appreciation negatively; some aggressive managers will already have realized the returns, so they will not be able to report these returns tomorrow.

Third, ex-ante investment returns may be heterogeneous and belong to different types, such as investments with different expected mean returns or risk, that PE fund investors are not aware of and thus cannot control in their predictability analysis. In this case, our regression coefficients may be significant because past returns inform us about the investment type (e.g., good or bad), which helps us predict future returns. For example, “bad” investments may be prone to losing value. Therefore, when we see an investment with markdowns in the past, we may suspect that it is a bad investment and may expect poorer performance relative to a randomly chosen investment. In this case, the slope of interim markdown frequency would be negative.

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<sup>6</sup>To quote a representative practitioner source, “As private equity funds generally will invest in securities that are not readily marketable, the current fair market values are very often difficult to ascertain ... determining fair value is subjective, and general partners may often take different approaches to estimate it.” A Comprehensive Guide to Private Equity Investing by StepStone ([https://www.stepstonegroup.com/wp-content/uploads/2023/08/Private-Equity-Primer\\_-A-Comprehensive-Guide-to-Private-Equity-Investing-2022-1.pdf](https://www.stepstonegroup.com/wp-content/uploads/2023/08/Private-Equity-Primer_-A-Comprehensive-Guide-to-Private-Equity-Investing-2022-1.pdf)).

Fourth, returns may be serially correlated. In this case, for example, if the investment experienced a higher interim return in the previous quarter, we may expect this quarter's return to also be affected, which would make our regressions significant as well.

Table 3 shows the descriptive statistics for two variables of interest and four predictive measures across five values of year  $t$ . For example, the investment sample in Year 3 includes all the investments in the final sample that do not exit until the end of Year 3. As expected, the timing until exit declines for each subsequent year. For example, investments that did not exit by the end of Year 1 have an average mean timing to exit of 15.3 (15.6) quarters for buyouts (VC), while investments in the Year 5 sample have the mean timing to exit of 11.6 (12.5) quarters.<sup>7</sup>

The interim realized measure increases as well, illustrating that over time fund managers partially realize returns from investments (e.g., via dividends or recapitalizations for buyouts and partial sales of their positions for VC investments). The interim unrealized measure also increases, suggesting that on average managers report higher expected payoffs for investments that are held longer.

The table shows that both staleness and markdowns are common practices across all years of investments for both buyout and VC industries. The average staleness frequency of a buyout investment varies between 29% and 37%. In other words, on average, a buyout fund manager does not update the valuation of their portfolio companies in approximately one of every three quarters. For VC investments, staleness is substantially stronger, at between 71% and 79%. In other words, fund investors on average see an update of a VC fund's portfolio company valuation only one quarter a year.

Of course, some investments are staler than others. For example, not reported in the tables, by the end of Year 2 (Year 5), 46% (30%) of buyout investments and 84% (81%) of VC investments are stale in at least half of the quarters. For VC investments, this implies that a non-trivial minority of investments is substantially less stale than an average investment.

For markdowns, fund managers will report negative interim returns in approximately one-fifth of the quarters for buyout investments and in one-tenth of quarters for VC investments. Whether we should be surprised by the frequency of markdown depends, of course, on our prior expectations. Those with investment experience primarily in the stock market may find the frequency of markdowns low. As for staleness, there is a large

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<sup>7</sup>Our results are unchanged if we instead construct the sample for each year conditional on the investment being present in the previous year's sample. See the discussion of Columns (1) and (6) of Table 6 later in this Section.

variation. For Year 2 (Year 5) 50% (73%) of buyout investments and 26% (52%) of VC investments report at least one markdown quarter.

Table 4 shows the prediction results for the number of quarters until exit. For buyout investments, through all years, the interim realized value predicts the exit quarter at a statistically significant level. The larger the interim realized value is, the sooner we expect the investment to exit. For example, the slope estimates suggest that in Year 2, if the investment paid out cash equal to its invested capital, all else being equal, we expect the investment to exit 1.8 quarters, or almost half a year, sooner. Given that the average timing until exit in Year 2 is 13.2 quarters, such an increase in interim realized pushes the investment to exit 14% faster on average. Interim unrealized return is also negatively predictive of exit quarter. As fund managers report an increase in unrealized investment value, investments are expected to exit sooner as well. Taking Year 2 again as an example, if the investment NAV rises by its invested capital, we expect the investment to exit by approximately 2 months sooner.

For VC investments, interim realized is equally highly predictive. In addition to quantitative implications, this implies qualitative signaling to fund investors, because in the VC investment space, the occasions for interim realizations are typically fewer than in buyouts. For example, if the fund manager reports a partial sale of fund's stake in a portfolio company, it should serve as a signal of shorter investment horizon on average. Interim unrealized return, however, is not predictive, clearly showing that predicting the exit of a VC investment is more challenging and that fund managers' reporting on unrealized values has no meaningful signaling.

Turning to staleness and markdown measures, we first observe a potentially surprising and economically important result for PE investors. For buyout investments, even starting from Year 1, interim staleness is strongly predictive of delay in exit, controlling for realized and unrealized reported returns. All else being equal, the staler an investment, the more we expect it to experience an exit postponement. For example, if we compare two investments at the end of Year 2 – one that is completely stale and a different one that does not have a single stale quarter – the exit is delayed by approximately 3.4 quarters on average, or by 25% compared to the average exit timing.

Interim markdowns are also predictive for Years 2 through 5. For example, in Year 2, comparing an investment that has experienced markdowns in every quarter and an investment that has not experienced any markdowns, all else equal, we expect a delay in exit of almost a year. These results demonstrate strongly that for buyout investors staleness and markdowns are highly informative.

For VC investments, staleness is economically predictive with a positive impact as for buyout investments, even though statistical significance varies across the years. The markdown frequency measure is also highly noisy. Interestingly, however, in the first year, markdown frequency has a negative impact (and it is also negative in the subsequent three years, though not statistically significant). This suggests that if a VC investment is marked down frequently, it could be an indicator of exiting sooner which increases the chances of writing off the investment eventually in light of the results presented below.

Table 5 shows prediction results for future returns. For both buyouts and VC investments, interim unrealized return becomes a predictor of future returns starting later in the life of an investment. For example, in Year 4, if the investment’s interim unrealized multiple increases by its invested capital, future quarterly returns are expected to be 2.5 percentage points higher for buyouts and 3.7 percentage points higher for VC investments. Interim realized return has weakly positive impact on future returns.

The table shows that staleness and markdowns are significantly informative, even taken reported interim performance into account. Frequent staleness or markdowns are generally bad news for future returns, even as early as in the first year of investment. Taking Year 2 again as an illustration, an investment that is completely stale is expected, all else being equal, to exhibit a quarterly return of 13 percentage points lower compared to an investment that has not experienced any staleness. This effect holds true for all years 1 through 5. Markdown frequency also predicts lower future returns. In Year 2, an investment that has experienced markdowns for every quarter is expected to return 14 percentage points less per quarter than an investment that has not experienced any markdowns. This effect also persists through all years.

For VC investments, staleness also significantly predicts lower future returns. Markdowns, in contrast, are not informative. This once again points to the difficulty of predicting VC investments’ outcomes.

We have applied several robustness tests to alleviate concerns about potential biases. Table 6 reports the typical results of these tests for Years 2 and 5 (see the Internet Appendix for the complete set of robustness results).

One potential concern is the unequal sample size across different years. For example, the sample size in Year 3 is larger than that in Year 1, because a condition for investment inclusion in a specific year’s sample is that there must be at least one interim return. Mechanically, an investment in Year 3 is more likely to report an interim return than an investment in Year 1. This implies that we should expect such variation in sample sizes if our dataset’s coverage of interim reports is random and unbiased. Indeed, conditional

on an investment entering Year 3, it is not more or less likely to be a better or worse investment. Results reported in Columns (1) and (6) of Table 6 confirm that rerunning the analysis only on investments present in the previous year’s sample increases noise but does not alter the results.

Similarly, controlling for cohort fixed effects (Columns (2) and (7) of Table 6) and fund manager fixed effects (Columns (3) and (8) produces similar results, albeit with larger standard errors.

Another cause for potential concern is the correlation between exit timing and quality of investments. For example, higher-quality investments with larger realized returns may be more likely to exit earlier in the case of funds of more recent vintages. To control for a potential bias that may result from such a correlation, we also reran our analysis only for vintages before 2010 (where most investments have exited). Our results are unchanged, as shown in Columns (4) and (9).

Finally, we also control for the stage of the fund, specifically whether it is still in its investment period, by introducing for the Year 2 sample a fixed effect on whether the fund is in its fourth year or later since the vintage year of the fund (Column (5)). Again, the results are unchanged.

To summarize, our findings indicate that both the latest reports and the *history of reports* are informative in predicting the outcomes of buyout investments. PE fund investors who have access to the history of interim reports can utilize staleness or markdowns in predicting investment exits and future returns. PE fund investors can use this information to better evaluate interim fund performance and plan for cash flows, particularly buyout funds.

The results also suggest that fund managers may not be conservative when marking their losers. At the same time, fund managers appear conservative when marking their winners in the sense that investments that have historically been marked up still realize good returns going forward.

## 3.2 Predicting Tail Outcomes

It is well known that tail outcomes for both buyout and, particularly, VC funds are important for overall fund performance. For buyout funds, one investment that results in a complete write-off may have a significant impact on overall fund performance. Conversely, an outlier success can lead to better-than-average performance for both buyout and VC funds. PE fund investors, therefore, often pay particular attention to fund in-

vestments that result in extremely poor performance for buyout funds and outlier-level positive performance (especially for VC funds).

In this section, we test whether interim reports enable investors to predict such tail outcomes. To this end, we estimate a standard linear probability model, predicting performance given interim multiple, staleness, and markdowns:

$$\begin{aligned} \tilde{y}_{i,t} = & \gamma_0 + \gamma_1 \text{interim realized}_{i,t} + \gamma_2 \text{interim unrealized}_{i,t} \\ & + \gamma_3 \text{staleness}_{i,t} + \gamma_4 \text{markdown}_{i,t} + \epsilon_{i,t} \end{aligned} \quad (2)$$

where  $\tilde{y}_{i,t}$  indicates an exit multiple tail outcome (with the specific values defined below) and all the other notations are as in Equation (1).

Tail outcomes can be measured in different ways. First, the exit multiple threshold can be set as an absolute value. For example, the left tail for poor performance could be intuitively set as any exit multiple below one, resulting in a loss, while the right tail can be set at a value of three, implying an investment with a gross return of at least three times the initial investment. Second, the exit multiple threshold can be set using an investment’s relative performance. For example, investors may be interested in whether the investment exit multiple is in the bottom or top 25% of the pre-specified cohort of investments (say, investments that started in the same quarter and are in the same asset class).

In practice, investors are interested in both absolute and relative performance. For example, investors facing financial constraints have to allocate funds among select fund managers and may choose the relative performance of the fund manager as an input in the allocation decision, while still utilizing absolute performance of tail outcomes in updating their prior assessments of a fund manager’s abilities. Therefore, in our empirical analysis we let  $\tilde{y}_{i,t}$  take four different values: (1) exit multiple below one, (2) exit multiple of three or above, (3) exit multiple in the top 25% of its vintage cohort, or (4) exit multiple in the bottom 25% of its vintage cohort.

Table 7 reports the results. For buyouts, interim unrealized returns are highly predictive of a negative tail outcome, suggesting that fund manager’s updates on NAV are informative. Interim realized returns are also highly informative, even in early years, suggesting that higher-quality investments tend to result in higher earlier partial pay-offs. Moreover, controlling for interim returns, both staleness and markdowns positively predict the chance of poor performance.<sup>8</sup> Once again, comparing an investment that is entirely stale with an investment that has updates every quarter (or that is marked

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<sup>8</sup>As shown in the Internet Appendix, such predictability is already clearly visible in Year 1.

down every quarter compared to one that is not marked down even once), the likelihood of an exit multiple below 1 increases by 25.7 percentage points (31.6 percentage points) in Year 2. The effect becomes economically even more pronounced with time. In Year 5, the likelihood of a poor exit increases by 36 percentage points for staleness and 51.2 percentage points for markdown metrics. Similar results are observed when we analyze the likelihood of the investment ending up in the bottom quartile of its vintage peers.

As for predictability of positive exit multiple tails, for buyouts interim realized and unrealized returns are equally highly predictive. Not surprisingly, the higher the reported and realized returns in interim years, the higher the likelihood of an eventual highly positive outcome. Staleness and markdowns are also highly predictive of a positive outcome. For example, in Year 5, using a similar metric, frequent staleness (markdowns) decreases the likelihood of a positive tail outcome by 13 (36) percentage points.

For VC investments, predictability of severe losses is also significant for many years and specifications and in the same direction as for buyouts. The significance of all four metrics in predicting exit multiples below one is also economically meaningful. In particular, both staleness and markdowns continue to be highly significant. For example, our staleness metric suggests that a complete lack of updates on VC investments increases the likelihood of a poor outcome by 19.8 percentage points in Year 2 and by 47.9 percentage points in Year 5. The markdown frequency metric increases the likelihood of a poor outcome by 26.7 and 63.4 percentage points in Years 2 and 5, respectively. The fact that for VC investments, the predictability of a bottom quartile exit is less strong than for buyout investments reflects the nature of VC investments: investors expect losses to be frequent.

For positive tail outcomes, interim realized and unrealized returns are highly predictive in all specifications. Staleness and markdown frequency are not predictive in Year 2 but highly predictive in Year 5. For example, our staleness (markdown frequency) metric decreases the likelihood of an exit multiple of at least three by 19.1 (39) percentage points in Year 5. Overall, staleness and markdowns send clearly negative signals of large magnitudes for tail outcomes. Taken together, our results show that interim reports, including report history, are informative with regard to predicting tail outcomes, for both buyout and VC investments.

## 4 Conclusion

Using a novel dataset of U.S. buyout and VC investments, we study whether fund managers' interim valuations can help investors predict the future outcomes of those investments. We find that the history of reported valuations is in fact informative of returns and exit timing. Investors can do better than merely relying on the latest valuation report when analyzing and predicting the performance of their PE investments. The level and path of past reported valuations help predict future realized returns and their timing.

Particularly for buyout funds, portfolio company investments with greater staleness or more frequent markdowns in the past tend to perform more poorly in the future than other investments. At the same time, past staleness and markdown frequencies are also predictive of how quickly investments exit. Similar results hold for VC investments, although the overall extent of predictability is lower.

We conclude that eventual investment performance is predictable based on interim reports. A number of economic mechanisms could explain our results, including strategic behavior, behavioral biases, heterogeneous investment quality, or investment momentum. Future research focusing on the exact sources of predictability would be very useful.

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## 5 Tables

**Table 1:** Summary Statistics Comparing Fund-Level Data: Burgiss vs StepStone

**(a) Buyout**

| Variables                      | StepStone | Burgiss | Difference (S-B) | Correlation |
|--------------------------------|-----------|---------|------------------|-------------|
| Capitalization (\$B)           | 91.80     | 73.00   | 18.80            | 0.96        |
| # of Funds                     | 65.14     | 55.86   | 9.29             | 0.87        |
| Weighted-Average MOIC          | 1.89      | 1.84    | 0.05             | 0.90        |
| Cross-Sectional Std. Dev. MOIC | 0.85      | -       | -                | -           |
| 95th Percentile MOIC           | 3.39      | 2.98    | 0.41             | 0.33        |
| 75th Percentile MOIC           | 2.25      | 2.22    | 0.03             | 0.91        |
| 50th Percentile MOIC           | 1.81      | 1.78    | 0.03             | 0.81        |
| 25th Percentile MOIC           | 1.48      | 1.43    | 0.05             | 0.69        |
| 5th Percentile MOIC            | 0.98      | 0.92    | 0.06             | 0.33        |

**Note:** All statistics are averaged across vintages 1999–2019. That is to say, Avg. # of Funds captures the average number of funds within vintages. Weighted-Average MOIC is calculated as the mean MOIC of funds in each vintage, weighted by fund size, which is then averaged over all vintages. The 95th Percentile MOIC is a fund’s MOIC at the 95th percentile within a vintage, averaged over all vintages in the data. So, the 95th Percentile MOIC is the typical fund performance at the 95th percentile that we can expect to see if we chose a vintage at random.

**(b) VC**

| Variable                       | StepStone | Burgiss | Difference (S-B) | Correlation |
|--------------------------------|-----------|---------|------------------|-------------|
| Capitalization (\$B)           | 23.67     | 21.53   | 2.14             | 0.81        |
| # of Funds                     | 70.10     | 70.71   | -0.62            | 0.91        |
| Weighted-Average MOIC          | 2.14      | 2.37    | -0.23            | 0.95        |
| Cross-Sectional Std. Dev. MOIC | 2.46      | -       | -                | -           |
| 95th Percentile MOIC           | 5.75      | 5.82    | -0.07            | 0.75        |
| 75th Percentile MOIC           | 2.75      | 2.67    | 0.08             | 0.95        |
| 50th Percentile MOIC           | 1.89      | 1.80    | 0.09             | 0.98        |
| 25th Percentile MOIC           | 1.30      | 1.19    | 0.11             | 0.95        |
| 5th Percentile MOIC            | 0.71      | 0.68    | 0.03             | 0.89        |

**Note:** All statistics are averaged across vintages 1999–2019. That is to say, Avg. # of Funds captures the average number of funds within vintages. Weighted-Average MOIC is calculated as the mean MOIC of funds in each vintage, weighted by fund size, which is then averaged over all vintages. The 95th Percentile MOIC is a fund’s MOIC at the 95th percentile within a vintage, averaged over all vintages in the data. So, the 95th Percentile MOIC is the typical fund performance at the 95th percentile that we can expect to see if we chose a vintage at random.

**Table 2:** Summary Statistics for Interim Valuation Sample**(a)** Buyout

| Statistic                                    | Mean  | Median | Std.   | No of Funds |
|----------------------------------------------|-------|--------|--------|-------------|
| No. of Observed Deals in the Fund            | 8.58  | 5.0    | 10.94  | 893         |
| Fund's Per Deal Invested Capital (USD mm)    | 78.79 | 43.01  | 100.53 | 893         |
| Fund Size (USD bn)                           | 1.82  | 0.75   | 3.04   | 893         |
| % of Fund AUM Covered by Observed Deals      | 43.98 | 35.4   | 41.77  | 893         |
| Fund's Avg. Gross Multiple on Observed Deals | 2.79  | 2.41   | 2.19   | 893         |
| Fund's Net Multiple                          | 2.02  | 1.87   | 0.91   | 857         |

**(b)** VC

| Statistic                                    | Mean  | Median | Std.  | No of Funds |
|----------------------------------------------|-------|--------|-------|-------------|
| No. of Observed Deals in the Fund            | 11.43 | 6.0    | 15.02 | 563         |
| Fund's Per Deal Invested Capital (USD mm)    | 9.96  | 7.4    | 10.88 | 563         |
| Fund Size (USD bn)                           | 0.39  | 0.26   | 0.46  | 563         |
| % of Fund AUM Covered by Observed Deals      | 28.1  | 19.48  | 32.23 | 563         |
| Fund's Avg. Gross Multiple on Observed Deals | 2.66  | 1.49   | 5.8   | 563         |
| Fund's Net Multiple                          | 2.61  | 1.96   | 2.33  | 542         |

The table shows summary statistics for the final interim valuation buyout (panel a) and VC (panel b) samples. Appendix A provides the cleaning steps for sample construction. If we have observations of an investment with the same name undertaken by the same fund, which occurs if the fund offers different terms to different LPs, we take the mean values for those repeated investment observations.

**Table 3:** Summary Statistics for Final Investment Samples**(a)** Buyout

| Statistic             | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|-----------------------|--------|--------|--------|--------|--------|
| Exit Gross Multiple   | 2.58   | 2.62   | 2.52   | 2.41   | 2.25   |
| Quarters Until Exit   | 15.29  | 13.19  | 12.04  | 11.98  | 11.58  |
| Interim Realized      | 0.04   | 0.14   | 0.26   | 0.36   | 0.44   |
| Interim Unrealized    | 1.19   | 1.38   | 1.43   | 1.4    | 1.31   |
| Interim Staleness (%) | 37.36  | 31.53  | 28.97  | 29.18  | 31.08  |
| Interim Markdowns (%) | 17.99  | 20.05  | 22.26  | 23.47  | 24.57  |
| Number of Investments | 1626   | 1875   | 1940   | 1856   | 1548   |

**(b)** VC

| Statistic             | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|-----------------------|--------|--------|--------|--------|--------|
| Exit Gross Multiple   | 1.66   | 1.69   | 1.62   | 1.72   | 1.78   |
| Quarters Until Exit   | 15.56  | 14.56  | 13.51  | 13.33  | 12.51  |
| Interim Realized      | 0.05   | 0.08   | 0.1    | 0.1    | 0.18   |
| Interim Unrealized    | 1.16   | 1.32   | 1.38   | 1.45   | 1.53   |
| Interim Staleness (%) | 78.66  | 75.53  | 75.6   | 74.06  | 71.41  |
| Interim Markdowns (%) | 7.75   | 9.01   | 10.19  | 11.21  | 13.0   |
| Number of Investments | 1162   | 1213   | 1316   | 1209   | 1077   |

The table shows summary statistics for samples of investments that did not exit at the end of Year  $t$  for buyouts (panel a) and VC (panel b). For Exit Multiple, Quarters Until Exit, Interim Realized, and Interim Unrealized mean values are reported.

**Table 4:** Predicting Exit Timing**(a)** Buyout

|                             | Quarters to Exit ( $q_{i,t}$ ) |                      |                      |                      |                      |
|-----------------------------|--------------------------------|----------------------|----------------------|----------------------|----------------------|
|                             | Year 1                         | Year 2               | Year 3               | Year 4               | Year 5               |
| Interim Staleness Frequency | 1.886***<br>(0.530)            | 3.438***<br>(0.593)  | 3.153***<br>(0.649)  | 3.089***<br>(0.715)  | 2.755***<br>(0.783)  |
| Interim Markdown Frequency  | 0.371<br>(0.730)               | 3.880***<br>(0.817)  | 3.297***<br>(0.878)  | 3.341***<br>(0.997)  | 2.380*<br>(1.148)    |
| Interim Realized            | -4.373***<br>(1.188)           | -1.757***<br>(0.518) | -1.105***<br>(0.295) | -1.317***<br>(0.258) | -1.211***<br>(0.224) |
| Interim Unrealized          | -0.794*<br>(0.366)             | -0.716***<br>(0.200) | -0.891***<br>(0.201) | -1.185***<br>(0.192) | -0.789***<br>(0.213) |
| (Intercept)                 | 15.649***<br>(0.606)           | 12.558***<br>(0.493) | 11.952***<br>(0.543) | 12.423***<br>(0.588) | 11.704***<br>(0.659) |
| Estimator                   | OLS                            | OLS                  | OLS                  | OLS                  | OLS                  |
| $N$                         | 1,626                          | 1,875                | 1,940                | 1,856                | 1,548                |
| $R^2$                       | 0.025                          | 0.045                | 0.046                | 0.066                | 0.049                |

**(b)** VC

|                             | Quarters to Exit ( $q_{i,t}$ ) |                      |                      |                      |                     |
|-----------------------------|--------------------------------|----------------------|----------------------|----------------------|---------------------|
|                             | Year 1                         | Year 2               | Year 3               | Year 4               | Year 5              |
| Interim Staleness Frequency | 0.315<br>(1.036)               | 3.485**<br>(1.234)   | 2.091<br>(1.365)     | 2.387<br>(1.392)     | 5.143***<br>(1.355) |
| Interim Markdown Frequency  | -3.376*<br>(1.707)             | -0.361<br>(2.150)    | -2.042<br>(2.205)    | -2.018<br>(2.406)    | 0.731<br>(2.089)    |
| Interim Realized            | -1.883**<br>(0.706)            | -1.194**<br>(0.437)  | -1.596***<br>(0.439) | -1.805***<br>(0.499) | -0.726**<br>(0.252) |
| Interim Unrealized          | -0.173<br>(0.375)              | 0.028<br>(0.273)     | 0.242<br>(0.225)     | 0.208<br>(0.191)     | 0.096<br>(0.165)    |
| (Intercept)                 | 15.868***<br>(1.133)           | 12.019***<br>(1.245) | 11.964***<br>(1.363) | 11.663***<br>(1.376) | 8.733***<br>(1.287) |
| Estimator                   | OLS                            | OLS                  | OLS                  | OLS                  | OLS                 |
| $N$                         | 1,162                          | 1,213                | 1,316                | 1,209                | 1,077               |
| $R^2$                       | 0.015                          | 0.024                | 0.026                | 0.028                | 0.041               |

**Note:** Column (1) uses information from interim reports in the first 1 year of the investment to predict final outcomes. Column (2) uses information on year 2, column (3) uses information on year 3, etc.

**Table 5:** Predicting Future Returns**(a)** Buyout

|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                      |                      |                      |                     |
|-----------------------------|----------------------------------------------------|----------------------|----------------------|----------------------|---------------------|
|                             | Year 1                                             | Year 2               | Year 3               | Year 4               | Year 5              |
| Interim Staleness Frequency | -0.072***<br>(0.017)                               | -0.134***<br>(0.020) | -0.125***<br>(0.021) | -0.099***<br>(0.023) | -0.063*<br>(0.026)  |
| Interim Markdown Frequency  | -0.100***<br>(0.023)                               | -0.144***<br>(0.027) | -0.163***<br>(0.028) | -0.133***<br>(0.033) | -0.107**<br>(0.038) |
| Interim Realized            | 0.047<br>(0.038)                                   | 0.038*<br>(0.017)    | 0.019*<br>(0.010)    | 0.015<br>(0.008)     | 0.018*<br>(0.007)   |
| Interim Unrealized          | 0.016<br>(0.012)                                   | 0.008<br>(0.007)     | 0.020**<br>(0.006)   | 0.025***<br>(0.006)  | 0.029***<br>(0.007) |
| (Intercept)                 | 0.016<br>(0.019)                                   | 0.053**<br>(0.016)   | 0.030<br>(0.018)     | 0.003<br>(0.019)     | -0.032<br>(0.022)   |
| $N$                         | 1,626                                              | 1,875                | 1,940                | 1,856                | 1,548               |
| $R^2$                       | 0.022                                              | 0.038                | 0.044                | 0.035                | 0.031               |

**(b)** VC

|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                      |                    |                      |                   |
|-----------------------------|----------------------------------------------------|----------------------|--------------------|----------------------|-------------------|
|                             | Year 1                                             | Year 2               | Year 3             | Year 4               | Year 5            |
| Interim Staleness Frequency | -0.154**<br>(0.054)                                | -0.253***<br>(0.066) | -0.249*<br>(0.101) | -0.282***<br>(0.070) | -0.178<br>(0.109) |
| Interim Markdown Frequency  | -0.040<br>(0.089)                                  | -0.136<br>(0.116)    | -0.223<br>(0.163)  | -0.166<br>(0.121)    | -0.143<br>(0.169) |
| Interim Realized            | 0.068<br>(0.037)                                   | 0.030<br>(0.024)     | 0.040<br>(0.032)   | 0.060*<br>(0.025)    | 0.028<br>(0.020)  |
| Interim Unrealized          | -0.018<br>(0.020)                                  | 0.024<br>(0.015)     | 0.007<br>(0.017)   | 0.037***<br>(0.010)  | 0.027*<br>(0.013) |
| (Intercept)                 | -0.115<br>(0.059)                                  | -0.103<br>(0.067)    | -0.063<br>(0.101)  | -0.119<br>(0.069)    | -0.141<br>(0.104) |
| $N$                         | 1,162                                              | 1,213                | 1,316              | 1,209                | 1,077             |
| $R^2$                       | 0.016                                              | 0.024                | 0.009              | 0.049                | 0.011             |

**Note:** Column (1) uses information from interim reports in the first 1 year of the investment to predict final outcomes. Column (2) uses information on year 2, column (3) uses information on year 3, etc.

**Table 6: Robustness**

**(a) Exit**

|                             | Year 2                         |                     |                     |                      |                      | Year 5               |                      |                      |                      |
|-----------------------------|--------------------------------|---------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                             | Quarters to Exit ( $q_{i,t}$ ) |                     |                     |                      |                      |                      |                      |                      |                      |
|                             | (1)                            | (2)                 | (3)                 | (4)                  | (5)                  | (6)                  | (7)                  | (8)                  | (9)                  |
| Interim Staleness Frequency | 2.422**<br>(0.747)             | 1.494**<br>(0.465)  | 3.653***<br>(0.679) | 2.305**<br>(0.816)   | 3.425***<br>(0.593)  | 2.422**<br>(0.747)   | 0.642<br>(0.664)     | 4.278***<br>(1.050)  | 1.930*<br>(0.860)    |
| Interim Markdown Frequency  | 1.557<br>(1.081)               | 2.768***<br>(0.735) | 3.014***<br>(0.769) | 2.943*<br>(1.178)    | 3.883***<br>(0.816)  | 1.557<br>(1.081)     | 1.358<br>(0.994)     | 1.538<br>(1.255)     | 1.957<br>(1.279)     |
| Interim Realized            | -1.712**<br>(0.601)            | -1.879**<br>(0.582) | -2.204**<br>(0.682) | -2.466***<br>(0.727) | -1.748***<br>(0.518) | -1.712**<br>(0.601)  | -0.905***<br>(0.200) | -1.227***<br>(0.183) | -1.317***<br>(0.254) |
| Interim Unrealized          | -1.185***<br>(0.284)           | -0.746**<br>(0.235) | -0.786**<br>(0.262) | -0.734**<br>(0.262)  | -0.715***<br>(0.200) | -1.185***<br>(0.284) | -0.518*<br>(0.202)   | -0.376<br>(0.217)    | -0.664**<br>(0.239)  |
| (Intercept)                 | 13.652***<br>(0.673)           |                     |                     | 15.264***<br>(0.706) |                      | 13.652***<br>(0.673) |                      |                      | 12.839***<br>(0.734) |
| Cohort FE                   |                                | Yes                 |                     |                      |                      |                      | Yes                  |                      |                      |
| GP FE                       |                                |                     | Yes                 |                      |                      |                      |                      | Yes                  |                      |
| 4th+ Year Fund FE           |                                |                     |                     |                      | Yes                  |                      |                      |                      |                      |
| $N$                         | 1,267                          | 1,875               | 1,842               | 1,121                | 1,875                | 1,267                | 1,547                | 1,511                | 1,326                |
| $R^2$                       | 0.040                          | 0.209               | 0.212               | 0.037                | 0.046                | 0.040                | 0.218                | 0.210                | 0.040                |
| Within- $R^2$               |                                | 0.033               | 0.053               |                      | 0.045                |                      | 0.022                | 0.048                |                      |

**(b) Returns**

|                             | Year 2                                             |                      |                      |                      |                      | Year 5               |                     |                     |                     |
|-----------------------------|----------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------------------|---------------------|---------------------|
|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                      |                      |                      |                      |                      |                     |                     |                     |
|                             | (1)                                                | (2)                  | (3)                  | (4)                  | (5)                  | (6)                  | (7)                 | (8)                 | (9)                 |
| Interim Staleness Frequency | -0.118***<br>(0.025)                               | -0.130***<br>(0.022) | -0.122***<br>(0.024) | -0.104***<br>(0.023) | -0.133***<br>(0.020) | -0.118***<br>(0.025) | -0.064<br>(0.034)   | -0.016<br>(0.032)   | -0.067*<br>(0.027)  |
| Interim Markdown Frequency  | -0.162***<br>(0.037)                               | -0.139***<br>(0.032) | -0.123***<br>(0.027) | -0.128***<br>(0.034) | -0.144***<br>(0.027) | -0.162***<br>(0.037) | -0.119*<br>(0.046)  | -0.104*<br>(0.051)  | -0.112**<br>(0.040) |
| Interim Realized            | 0.041*<br>(0.020)                                  | 0.043**<br>(0.013)   | 0.032**<br>(0.012)   | 0.038<br>(0.021)     | 0.037*<br>(0.017)    | 0.041*<br>(0.020)    | 0.016<br>(0.009)    | 0.017*<br>(0.009)   | 0.017*<br>(0.008)   |
| Interim Unrealized          | 0.022*<br>(0.010)                                  | 0.005<br>(0.010)     | 0.008<br>(0.010)     | 0.001<br>(0.008)     | 0.007<br>(0.007)     | 0.022*<br>(0.010)    | 0.028***<br>(0.005) | 0.030***<br>(0.007) | 0.027***<br>(0.008) |
| (Intercept)                 | 0.038<br>(0.023)                                   |                      |                      | 0.037<br>(0.020)     |                      | 0.038<br>(0.023)     |                     |                     | -0.031<br>(0.023)   |
| Cohort FE                   |                                                    | Yes                  |                      |                      |                      |                      | Yes                 |                     |                     |
| GP FE                       |                                                    |                      | Yes                  |                      |                      |                      |                     | Yes                 |                     |
| 4th+ Year Fund FE           |                                                    |                      |                      |                      | Yes                  |                      |                     |                     |                     |
| $N$                         | 1,267                                              | 1,875                | 1,842                | 1,121                | 1,875                | 1,267                | 1,547               | 1,511               | 1,326               |
| $R^2$                       | 0.042                                              | 0.063                | 0.190                | 0.028                | 0.039                | 0.042                | 0.069               | 0.240               | 0.029               |
| Within- $R^2$               |                                                    | 0.035                | 0.030                |                      | 0.037                |                      | 0.029               | 0.031               |                     |

**Note:** Columns (1)-(5) use information from interim reports in the first 2 years of the investment to predict final outcomes. Columns (6)-(9) use information from the first 5 years to predict final outcomes. Columns (1) and (6) rerun baseline analysis only on investments that are present in previous year's sample. Columns (2) and (7) adds fixed effect on investments' cohort. Columns (3) and (8) add fixed effect on GP firm managing the fund that owns the investment. Columns (4) and (9) restricts the sample to funds with vintage weakly prior to 2010. Column (5) adds a fixed effect when the fund that owns the investments is in its 4th+ year.

**Table 7: Predicting Tails****(a) Buyout**

|                             | Year 2               | Year 5               | Year 2                      | Year 5               | Year 2                 | Year 5               | Year 2                   | Year 5               |
|-----------------------------|----------------------|----------------------|-----------------------------|----------------------|------------------------|----------------------|--------------------------|----------------------|
|                             | Exit Multiple < 1    |                      | Exit Multiple in Bottom 25% |                      | Exit Multiple $\geq 3$ |                      | Exit Multiple in Top 25% |                      |
|                             | (1)                  | (2)                  | (3)                         | (4)                  | (5)                    | (6)                  | (7)                      | (8)                  |
| Interim Staleness Frequency | 0.257***<br>(0.028)  | 0.359***<br>(0.038)  | 0.267***<br>(0.030)         | 0.303***<br>(0.036)  | -0.195***<br>(0.032)   | -0.132***<br>(0.034) | -0.072*<br>(0.030)       | -0.105**<br>(0.035)  |
| Interim Markdown Frequency  | 0.316***<br>(0.038)  | 0.512***<br>(0.055)  | 0.334***<br>(0.041)         | 0.479***<br>(0.053)  | -0.322***<br>(0.044)   | -0.359***<br>(0.049) | -0.184***<br>(0.041)     | -0.370***<br>(0.050) |
| Interim Realized            | -0.098***<br>(0.021) | -0.093***<br>(0.010) | -0.108***<br>(0.023)        | -0.075***<br>(0.010) | 0.159***<br>(0.024)    | 0.143***<br>(0.009)  | 0.160***<br>(0.023)      | 0.135***<br>(0.009)  |
| Interim Unrealized          | -0.035***<br>(0.006) | -0.026***<br>(0.005) | -0.039***<br>(0.007)        | -0.020***<br>(0.004) | 0.057***<br>(0.007)    | 0.042***<br>(0.004)  | 0.055***<br>(0.007)      | 0.039***<br>(0.004)  |
| (Intercept)                 | 0.124***<br>(0.021)  | 0.155***<br>(0.028)  | 0.172***<br>(0.022)         | 0.103***<br>(0.026)  | 0.345***<br>(0.024)    | 0.252***<br>(0.025)  | 0.214***<br>(0.023)      | 0.262***<br>(0.025)  |
| $N$                         | 1,916                | 1,686                | 1,916                       | 1,686                | 1,916                  | 1,686                | 1,916                    | 1,686                |
| $R^2$                       | 0.090                | 0.155                | 0.089                       | 0.126                | 0.090                  | 0.230                | 0.065                    | 0.201                |

**(b) VC**

|                             | Year 2               | Year 5               | Year 2                      | Year 5              | Year 2                 | Year 5               | Year 2                   | Year 5               |
|-----------------------------|----------------------|----------------------|-----------------------------|---------------------|------------------------|----------------------|--------------------------|----------------------|
|                             | Exit Multiple < 1    |                      | Exit Multiple in Bottom 25% |                     | Exit Multiple $\geq 3$ |                      | Exit Multiple in Top 25% |                      |
|                             | (1)                  | (2)                  | (3)                         | (4)                 | (5)                    | (6)                  | (7)                      | (8)                  |
| Interim Staleness Frequency | 0.198**<br>(0.062)   | 0.479***<br>(0.069)  | 0.277***<br>(0.058)         | 0.315***<br>(0.064) | -0.055<br>(0.048)      | -0.191***<br>(0.055) | -0.044<br>(0.055)        | -0.246***<br>(0.061) |
| Interim Markdown Frequency  | 0.267*<br>(0.105)    | 0.634***<br>(0.105)  | 0.134<br>(0.098)            | 0.258**<br>(0.097)  | -0.190*<br>(0.082)     | -0.390***<br>(0.083) | -0.085<br>(0.093)        | -0.429***<br>(0.092) |
| Interim Realized            | -0.093***<br>(0.022) | -0.048***<br>(0.009) | -0.039<br>(0.021)           | -0.022*<br>(0.009)  | 0.092***<br>(0.017)    | 0.067***<br>(0.007)  | 0.069***<br>(0.020)      | 0.043***<br>(0.008)  |
| Interim Unrealized          | -0.077***<br>(0.012) | -0.010***<br>(0.002) | -0.028*<br>(0.011)          | -0.003<br>(0.002)   | 0.095***<br>(0.009)    | 0.013***<br>(0.002)  | 0.086***<br>(0.011)      | 0.013***<br>(0.002)  |
| (Intercept)                 | 0.521***<br>(0.061)  | 0.176**<br>(0.063)   | 0.111<br>(0.057)            | 0.024<br>(0.058)    | 0.125**<br>(0.048)     | 0.350***<br>(0.050)  | 0.183***<br>(0.054)      | 0.449***<br>(0.055)  |
| $N$                         | 1,285                | 1,235                | 1,285                       | 1,235               | 1,285                  | 1,235                | 1,285                    | 1,235                |
| $R^2$                       | 0.069                | 0.096                | 0.041                       | 0.037               | 0.115                  | 0.147                | 0.068                    | 0.093                |

**Note:** Columns (1), (3), (5), and (7) use information from interim reports in the first 2 year of the investment to predict final outcomes. Columns (2), (4), (6), and (8) use information from interim reports in the first 5 year of the investment to predict final outcomes. Columns (1) and (2) predict whether an investment will exit with a multiple less than 1. Columns (3) and (4) predict whether an investment will exit in the bottom 25% of its cohort. Columns (5) and (6) predict whether an investment will exit with a multiple of at least 3. Columns (7) and (8) predict whether an investment will exit in the top 25% of its cohort.

# Internet Appendix

## A Sample Construction

We start with the fund-level dataset downloaded from StepStone Group that includes buyout, growth equity, and VC funds whose investment geography is classified as U.S. and the main currency is USD. We classify growth equity funds under VC nomenclature.

In the initial data cleaning, we exclude the following observations:

- Funds that are identified as a pre-fund or synthetic fund or that have fund names that include “pre-fund” or “synthetic.”
- Funds with a name that includes Asia, Europe, South America, Latin America, Brazil, India, Israel, Mexico, Africa, China, Kazakhstan, or Russia, as well as with a name that includes “bond” or “pooled.”
- Funds with missing commitment size.
- Open-ended funds, such as evergreen investment vehicles.
- Funds that are still fundraising.
- Funds that have neither a net IRR nor TVPI.
- Funds with net IRR or TVPI information that precedes 2020 or older than 12 years after the fund’s vintage.

We then consider the interim cash-flow dataset (“interim dataset”) and implement the following data adjustments and filtering steps.

- We match the interim dataset to the fund data we constructed at the previous step and keep only the interim observations for these funds.
- We exclude investment observations with names that include "Hedge," "FX," "Derivative," "Other Credit," "Fund of," or "SPDR".
- We exclude investments that we could not match to Capital IQs.
- We shift all dates, such as investment exit, investment entry, and investment reporting date to the end of the quarter of all these dates.
- If investment interim data are from after the investment exit date or before the investment origination date, these observations are excluded.

Interim data for investments of the same name and in the same fund can be different. This situation likely occurs because some LPs are given different terms (Begenau and Siriwardane (2024)). To ensure this does not affect our results, we identify an individual investment that also tracks the source of the report. If multiple reports exist for the same

investment on the same date, we average all financial values. Some interim data may be mutually contradictory about exit and entry dates due to changes in reporting. In the case of multiple entry dates, we set each investment’s entry date to the mode of entry dates for that investment.

After completing this step, we have 904 unique funds, 9397 unique investments, and an average of 8.87 quarterly reports for each investment for buyout investments. For VC investments, the corresponding metrics are 568, 7545, and 8.89, respectively.

Finally, StepStone also provided us with the investment-level dataset that contains exit multiples. We merge the exit multiple data with the interim dataset. If the investment multiple exists for both the investment-level and cash-flow datasets, we use the investment-level dataset. If there are multiple observations for the same (investment x fund) entry, we use the observation with the amount of invested capital that is closest to the invested capital in the cash-flow data. We exclude (investment x fund) entries with missing exit multiple or exit dates or with negative exit multiples.

Our final sample consists of 8,331 investments of 894 funds for buyouts and 6,822 investments of 563 funds for VC investments.

All of our regressions predict final outcomes given information up to an interim year. We select samples based on *interim realized*, *interim unrealized*, *interim markdown frequency*, *interim staleness frequency*, and exit multiple that satisfy the following conditions. For an investment to be included in the regression, it must have non-missing interim realized and unrealized multiples, at least two consecutive interim reports in the previous period that allow us to calculate interim staleness and markdown, interim unrealized multiple weakly greater than 0.1, and exit multiple weakly greater than interim realized multiple, and the investment must not exit in the very next quarter. To calculate staleness and markdowns, we skip quarters in which invested capital has changed by more than 10% from one interim quarter to the next. When invested capital changes by less than 10% between two consecutive quarters, we determine the numerator in the interim return formula as the increase in total value less the increase in invested capital. If the interim return is 0, we consider that result stale. If the interim return is negative, we consider it a markdown.

In Tables 4–6 and related tables in the Internet Appendix, to minimize the impact of outliers on estimates of conditional expectations, we restrict the sample to investments whose exit multiples are weakly less than 20 and where the sum of their interim realized plus unrealized multiples is weakly less than 20. For estimates that require cohort comparisons, we exclude investments with cohorts that contain fewer than 10 investments.

For the tail outcome empirical analysis we manually check all the investments with exit multiples of at least 20 and exclude two investments that we could not independently corroborate.

## B Robustness

**Table B1:** Quarterly Returns Regressions for Vintages Weakly Before 2010

| (a) Buyout                  |                                                    |                      |                      |                     |                     |
|-----------------------------|----------------------------------------------------|----------------------|----------------------|---------------------|---------------------|
|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                      |                      |                     |                     |
|                             | (1)                                                | (2)                  | (3)                  | (4)                 | (5)                 |
| Interim Staleness Frequency | -0.058**<br>(0.021)                                | -0.104***<br>(0.023) | -0.106***<br>(0.024) | -0.069**<br>(0.026) | -0.067*<br>(0.027)  |
| Interim Markdown Frequency  | -0.088**<br>(0.031)                                | -0.128***<br>(0.034) | -0.173***<br>(0.033) | -0.101**<br>(0.037) | -0.112**<br>(0.040) |
| Interim Realized            | 0.034<br>(0.043)                                   | 0.038<br>(0.021)     | 0.036*<br>(0.015)    | 0.019<br>(0.011)    | 0.017*<br>(0.008)   |
| Interim Unrealized          | 0.010<br>(0.012)                                   | 0.001<br>(0.008)     | 0.009<br>(0.007)     | 0.032***<br>(0.007) | 0.027***<br>(0.008) |
| (Intercept)                 | 0.008<br>(0.023)                                   | 0.037<br>(0.020)     | 0.030<br>(0.020)     | -0.032<br>(0.022)   | -0.031<br>(0.023)   |
| $N$                         | 928                                                | 1,121                | 1,322                | 1,428               | 1,326               |
| $R^2$                       | 0.015                                              | 0.028                | 0.040                | 0.033               | 0.029               |

  

| (b) VC                      |                                                    |                    |                   |                      |                   |
|-----------------------------|----------------------------------------------------|--------------------|-------------------|----------------------|-------------------|
|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                    |                   |                      |                   |
|                             | Year 1                                             | Year 2             | Year 3            | Year 4               | Year 5            |
| Interim Staleness Frequency | -0.143*<br>(0.062)                                 | -0.208*<br>(0.083) | -0.240<br>(0.124) | -0.271***<br>(0.077) | -0.202<br>(0.126) |
| Interim Markdown Frequency  | -0.112<br>(0.106)                                  | -0.171<br>(0.148)  | -0.214<br>(0.200) | -0.141<br>(0.134)    | -0.224<br>(0.201) |
| Interim Realized            | 0.061<br>(0.036)                                   | 0.031<br>(0.025)   | 0.053<br>(0.044)  | 0.058*<br>(0.027)    | 0.026<br>(0.025)  |
| Interim Unrealized          | -0.016<br>(0.022)                                  | 0.009<br>(0.019)   | -0.005<br>(0.020) | 0.036***<br>(0.011)  | 0.023<br>(0.015)  |
| (Intercept)                 | -0.107<br>(0.066)                                  | -0.110<br>(0.084)  | -0.052<br>(0.124) | -0.125<br>(0.076)    | -0.102<br>(0.121) |
| $N$                         | 708                                                | 774                | 983               | 982                  | 922               |
| $R^2$                       | 0.015                                              | 0.015              | 0.007             | 0.048                | 0.009             |

**Note:** Each column uses information from interim reports up to the year indicated to predict geometric average quarterly returns going forward. This robustness table excludes investments made by funds from after the 2010 vintage.

**Table B2:** Exit Quarter Regressions for Vintages Weakly Before 2010**(a) Buyout**

|                             | Quarters to Exit ( $q_{i,t}$ ) |                      |                      |                      |                      |
|-----------------------------|--------------------------------|----------------------|----------------------|----------------------|----------------------|
|                             | (1)                            | (2)                  | (3)                  | (4)                  | (5)                  |
| Interim Staleness Frequency | 0.534<br>(0.751)               | 2.305**<br>(0.816)   | 2.104**<br>(0.811)   | 2.062*<br>(0.839)    | 1.930*<br>(0.860)    |
| Interim Markdown Frequency  | -1.091<br>(1.087)              | 2.943*<br>(1.178)    | 3.056**<br>(1.108)   | 2.628*<br>(1.183)    | 1.957<br>(1.279)     |
| Interim Realized            | -4.895**<br>(1.517)            | -2.466***<br>(0.727) | -2.263***<br>(0.498) | -1.979***<br>(0.347) | -1.317***<br>(0.254) |
| Interim Unrealized          | -0.776<br>(0.434)              | -0.734**<br>(0.262)  | -0.701**<br>(0.247)  | -1.071***<br>(0.240) | -0.664**<br>(0.239)  |
| (Intercept)                 | 18.341***<br>(0.800)           | 15.264***<br>(0.706) | 14.059***<br>(0.687) | 14.382***<br>(0.712) | 12.839***<br>(0.734) |
| Estimator                   | OLS                            | OLS                  | OLS                  | OLS                  | OLS                  |
| $N$                         | 928                            | 1,121                | 1,322                | 1,428                | 1,326                |
| $R^2$                       | 0.020                          | 0.037                | 0.044                | 0.059                | 0.040                |

**(b) VC**

|                             | Quarters to Exit ( $q_{i,t}$ ) |                      |                      |                      |                     |
|-----------------------------|--------------------------------|----------------------|----------------------|----------------------|---------------------|
|                             | Year 1                         | Year 2               | Year 3               | Year 4               | Year 5              |
| Interim Staleness Frequency | 1.049<br>(1.331)               | 3.845*<br>(1.663)    | 1.495<br>(1.633)     | 3.068*<br>(1.559)    | 6.065***<br>(1.515) |
| Interim Markdown Frequency  | -3.855<br>(2.280)              | -1.879<br>(2.955)    | -3.062<br>(2.640)    | -1.509<br>(2.724)    | 2.873<br>(2.410)    |
| Interim Realized            | -2.036**<br>(0.787)            | -1.238*<br>(0.492)   | -1.825**<br>(0.578)  | -1.989***<br>(0.541) | -0.698*<br>(0.302)  |
| Interim Unrealized          | 0.117<br>(0.480)               | 0.335<br>(0.381)     | 0.307<br>(0.267)     | 0.353<br>(0.221)     | 0.118<br>(0.185)    |
| (Intercept)                 | 16.837***<br>(1.421)           | 13.685***<br>(1.688) | 13.972***<br>(1.638) | 12.192***<br>(1.549) | 8.721***<br>(1.454) |
| Estimator                   | OLS                            | OLS                  | OLS                  | OLS                  | OLS                 |
| $N$                         | 708                            | 774                  | 983                  | 982                  | 922                 |
| $R^2$                       | 0.024                          | 0.036                | 0.024                | 0.034                | 0.038               |

**Note:** Each column uses information from interim reports up to the year indicated to predict how many more quarters to exit remain for each investment. This robustness table excludes investments made by funds from after the 2010 vintage.

**Table B3:** Quarterly Returns Regressions with 4th+ Year Fixed Effect**(a) Buyout**

|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                      |                      |
|-----------------------------|----------------------------------------------------|----------------------|----------------------|
|                             | (1)                                                | (2)                  | (3)                  |
| Interim Staleness Frequency | -0.072***<br>(0.017)                               | -0.133***<br>(0.020) | -0.125***<br>(0.021) |
| Interim Markdown Frequency  | -0.100***<br>(0.023)                               | -0.144***<br>(0.027) | -0.162***<br>(0.028) |
| Interim Realized            | 0.047<br>(0.038)                                   | 0.037*<br>(0.017)    | 0.019*<br>(0.010)    |
| Interim Unrealized          | 0.016<br>(0.012)                                   | 0.007<br>(0.007)     | 0.020**<br>(0.006)   |
| 4th+ Year FE                | Yes                                                | Yes                  | Yes                  |
| $N$                         | 1,626                                              | 1,875                | 1,940                |
| $R^2$                       | 0.022                                              | 0.039                | 0.045                |
| Within- $R^2$               | 0.022                                              | 0.037                | 0.044                |

**(b) VC**

|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                      |                    |
|-----------------------------|----------------------------------------------------|----------------------|--------------------|
|                             | (1)                                                | (2)                  | (3)                |
| Interim Staleness Frequency | -0.155**<br>(0.054)                                | -0.258***<br>(0.067) | -0.245*<br>(0.101) |
| Interim Markdown Frequency  | -0.041<br>(0.089)                                  | -0.136<br>(0.116)    | -0.208<br>(0.163)  |
| Interim Realized            | 0.069<br>(0.037)                                   | 0.030<br>(0.024)     | 0.041<br>(0.032)   |
| Interim Unrealized          | -0.018<br>(0.020)                                  | 0.024<br>(0.015)     | 0.007<br>(0.017)   |
| 4th+ Year FE                | Yes                                                | Yes                  | Yes                |
| $N$                         | 1,162                                              | 1,213                | 1,316              |
| $R^2$                       | 0.016                                              | 0.026                | 0.010              |
| Within- $R^2$               | 0.016                                              | 0.025                | 0.009              |

**Note:** Each column uses information from interim reports up to the year indicated to predict geometric average quarterly returns going forward. This robustness table places fixed effect on investments that are in the 4th+ year of their respective funds.

**Table B4:** Exit Quarter Regressions with 4th+ Year Fixed Effect**(a)** Buyout

|                             | Quarters to Exit ( $q_{i,t}$ ) |                      |                      |
|-----------------------------|--------------------------------|----------------------|----------------------|
|                             | (1)                            | (2)                  | (3)                  |
| Interim Staleness Frequency | 1.839***<br>(0.529)            | 3.425***<br>(0.593)  | 3.156***<br>(0.649)  |
| Interim Markdown Frequency  | 0.409<br>(0.728)               | 3.883***<br>(0.816)  | 3.304***<br>(0.880)  |
| Interim Realized            | -4.400***<br>(1.185)           | -1.748***<br>(0.518) | -1.105***<br>(0.295) |
| Interim Unrealized          | -0.802*<br>(0.366)             | -0.715***<br>(0.200) | -0.892***<br>(0.201) |
| 4th+ Year FE                | Yes                            | Yes                  | Yes                  |
| $N$                         | 1,626                          | 1,875                | 1,940                |
| $R^2$                       | 0.030                          | 0.046                | 0.046                |
| Within- $R^2$               | 0.024                          | 0.045                | 0.046                |

**(b)** VC

|                             | Quarters to Exit ( $q_{i,t}$ ) |                     |                      |
|-----------------------------|--------------------------------|---------------------|----------------------|
|                             | (1)                            | (2)                 | (3)                  |
| Interim Staleness Frequency | 0.390<br>(1.039)               | 3.570**<br>(1.235)  | 2.153<br>(1.365)     |
| Interim Markdown Frequency  | -3.363*<br>(1.707)             | -0.351<br>(2.149)   | -1.799<br>(2.209)    |
| Interim Realized            | -1.914**<br>(0.707)            | -1.201**<br>(0.437) | -1.576***<br>(0.439) |
| Interim Unrealized          | -0.163<br>(0.376)              | 0.032<br>(0.273)    | 0.241<br>(0.225)     |
| 4th+ Year FE                | Yes                            | Yes                 | Yes                  |
| $N$                         | 1,162                          | 1,213               | 1,316                |
| $R^2$                       | 0.016                          | 0.026               | 0.027                |
| Within- $R^2$               | 0.015                          | 0.025               | 0.025                |

**Note:** Each column uses information from interim reports up to the year indicated to predict how many more quarters to exit remain for each investment. This robustness table places fixed effect on investments that are in the 4th+ year of their respective funds.

**Table B5: Quarterly Returns Regressions with Cohort Fixed Effect****(a) Buyout**

|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                      |                      |                     |                     |
|-----------------------------|----------------------------------------------------|----------------------|----------------------|---------------------|---------------------|
|                             | (1)                                                | (2)                  | (3)                  | (4)                 | (5)                 |
| Interim Staleness Frequency | -0.070**<br>(0.020)                                | -0.130***<br>(0.022) | -0.126***<br>(0.021) | -0.097**<br>(0.034) | -0.064<br>(0.034)   |
| Interim Markdown Frequency  | -0.101***<br>(0.023)                               | -0.139***<br>(0.032) | -0.164***<br>(0.034) | -0.119**<br>(0.036) | -0.119*<br>(0.046)  |
| Interim Realized            | 0.048<br>(0.037)                                   | 0.043**<br>(0.013)   | 0.020*<br>(0.007)    | 0.015*<br>(0.006)   | 0.016<br>(0.009)    |
| Interim Unrealized          | 0.016<br>(0.009)                                   | 0.005<br>(0.010)     | 0.020*<br>(0.008)    | 0.023***<br>(0.006) | 0.028***<br>(0.005) |
| Cohort FE                   | Yes                                                | Yes                  | Yes                  | Yes                 | Yes                 |
| $N$                         | 1,624                                              | 1,875                | 1,937                | 1,856               | 1,547               |
| $R^2$                       | 0.049                                              | 0.063                | 0.071                | 0.070               | 0.069               |
| Within- $R^2$               | 0.021                                              | 0.035                | 0.041                | 0.029               | 0.029               |

**(b) VC**

|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                      |                      |                      |                     |
|-----------------------------|----------------------------------------------------|----------------------|----------------------|----------------------|---------------------|
|                             | Year 1                                             | Year 2               | Year 3               | Year 4               | Year 5              |
| Interim Staleness Frequency | -0.160**<br>(0.050)                                | -0.308***<br>(0.058) | -0.269***<br>(0.055) | -0.285***<br>(0.059) | -0.242**<br>(0.083) |
| Interim Markdown Frequency  | -0.048<br>(0.078)                                  | -0.179<br>(0.091)    | -0.180*<br>(0.086)   | -0.103<br>(0.085)    | -0.178<br>(0.110)   |
| Interim Realized            | 0.079*<br>(0.034)                                  | 0.036*<br>(0.015)    | 0.040**<br>(0.013)   | 0.069***<br>(0.017)  | 0.032***<br>(0.009) |
| Interim Unrealized          | -0.008<br>(0.019)                                  | 0.027<br>(0.019)     | 0.012<br>(0.015)     | 0.039***<br>(0.008)  | 0.028***<br>(0.007) |
| Cohort FE                   | Yes                                                | Yes                  | Yes                  | Yes                  | Yes                 |
| $N$                         | 1,161                                              | 1,213                | 1,314                | 1,209                | 1,075               |
| $R^2$                       | 0.051                                              | 0.083                | 0.049                | 0.094                | 0.054               |
| Within- $R^2$               | 0.015                                              | 0.032                | 0.010                | 0.053                | 0.014               |

**Note:** Each column uses information from interim reports up to the year indicated to predict geometric average quarterly returns going forward. This robustness table puts fixed effect on the quarter in which each investment begins. In this way, it controls for cohort fixed effects.

**Table B6:** Exit Quarter Regressions with Cohort Fixed Effect**(a)** Buyout

|                             | Quarters to Exit ( $q_{i,t}$ ) |                     |                    |                     |                      |
|-----------------------------|--------------------------------|---------------------|--------------------|---------------------|----------------------|
|                             | (1)                            | (2)                 | (3)                | (4)                 | (5)                  |
| Interim Staleness Frequency | 0.997*<br>(0.463)              | 1.494**<br>(0.465)  | 0.644<br>(0.846)   | 0.703<br>(0.806)    | 0.642<br>(0.664)     |
| Interim Markdown Frequency  | -0.035<br>(0.852)              | 2.768***<br>(0.735) | 1.855<br>(1.188)   | 2.819*<br>(1.334)   | 1.358<br>(0.994)     |
| Interim Realized            | -5.224***<br>(0.830)           | -1.879**<br>(0.582) | -0.818*<br>(0.387) | -0.857**<br>(0.285) | -0.905***<br>(0.200) |
| Interim Unrealized          | -0.770<br>(0.479)              | -0.746**<br>(0.235) | -0.621*<br>(0.235) | -0.623**<br>(0.205) | -0.518*<br>(0.202)   |
| Cohort FE                   | Yes                            | Yes                 | Yes                | Yes                 | Yes                  |
| $N$                         | 1,624                          | 1,875               | 1,937              | 1,856               | 1,547                |
| $R^2$                       | 0.180                          | 0.209               | 0.235              | 0.262               | 0.218                |
| Within- $R^2$               | 0.024                          | 0.033               | 0.018              | 0.027               | 0.022                |

**(b)** VC

|                             | Quarters to Exit ( $q_{i,t}$ ) |                    |                      |                      |                      |
|-----------------------------|--------------------------------|--------------------|----------------------|----------------------|----------------------|
|                             | Year 1                         | Year 2             | Year 3               | Year 4               | Year 5               |
| Interim Staleness Frequency | 0.393<br>(0.864)               | 2.240*<br>(0.966)  | 1.109<br>(1.071)     | 1.548<br>(1.683)     | 4.648***<br>(1.135)  |
| Interim Markdown Frequency  | -2.825*<br>(1.304)             | -0.259<br>(1.622)  | -2.437<br>(1.854)    | -1.437<br>(3.088)    | 1.972<br>(1.823)     |
| Interim Realized            | -0.967<br>(0.660)              | -0.760*<br>(0.319) | -1.349***<br>(0.315) | -1.836***<br>(0.383) | -0.662***<br>(0.161) |
| Interim Unrealized          | 0.247<br>(0.469)               | 0.240<br>(0.230)   | 0.225<br>(0.180)     | 0.406*<br>(0.182)    | 0.225<br>(0.129)     |
| Cohort FE                   | Yes                            | Yes                | Yes                  | Yes                  | Yes                  |
| $N$                         | 1,161                          | 1,213              | 1,314                | 1,209                | 1,075                |
| $R^2$                       | 0.204                          | 0.230              | 0.208                | 0.175                | 0.201                |
| Within- $R^2$               | 0.008                          | 0.012              | 0.019                | 0.024                | 0.030                |

**Note:** Each column uses information from interim reports up to the year indicated to predict how many more quarters to exit remain for each investment. This robustness table puts fixed effect on the quarter in which each investment begins. In this way, it controls for cohort fixed effects.

**Table B7:** Quarterly Returns Regressions with PE Firm Fixed Effect**(a)** Buyout

|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                      |                      |                     |                     |
|-----------------------------|----------------------------------------------------|----------------------|----------------------|---------------------|---------------------|
|                             | (1)                                                | (2)                  | (3)                  | (4)                 | (5)                 |
| Interim Staleness Frequency | -0.072***<br>(0.021)                               | -0.122***<br>(0.024) | -0.103***<br>(0.023) | -0.062<br>(0.034)   | -0.016<br>(0.032)   |
| Interim Markdown Frequency  | -0.076**<br>(0.027)                                | -0.123***<br>(0.027) | -0.159***<br>(0.028) | -0.104**<br>(0.037) | -0.104*<br>(0.051)  |
| Interim Realized            | 0.066*<br>(0.030)                                  | 0.032**<br>(0.012)   | 0.019*<br>(0.007)    | 0.009<br>(0.009)    | 0.017*<br>(0.009)   |
| Interim Unrealized          | 0.027*<br>(0.013)                                  | 0.008<br>(0.010)     | 0.023*<br>(0.009)    | 0.027***<br>(0.007) | 0.030***<br>(0.007) |
| PE Firm FE                  | Yes                                                | Yes                  | Yes                  | Yes                 | Yes                 |
| $N$                         | 1,596                                              | 1,842                | 1,916                | 1,836               | 1,511               |
| $R^2$                       | 0.179                                              | 0.190                | 0.204                | 0.189               | 0.240               |
| Within- $R^2$               | 0.022                                              | 0.030                | 0.042                | 0.026               | 0.031               |

**(b)** VC

|                             | Quarterly Return Going Forward ( $\bar{r}_{i,t}$ ) |                     |                    |                     |                     |
|-----------------------------|----------------------------------------------------|---------------------|--------------------|---------------------|---------------------|
|                             | Year 1                                             | Year 2              | Year 3             | Year 4              | Year 5              |
| Interim Staleness Frequency | -0.146**<br>(0.045)                                | -0.209**<br>(0.067) | -0.177<br>(0.091)  | -0.216**<br>(0.070) | -0.206<br>(0.108)   |
| Interim Markdown Frequency  | -0.067<br>(0.079)                                  | -0.134<br>(0.081)   | -0.169<br>(0.102)  | -0.073<br>(0.100)   | -0.167<br>(0.132)   |
| Interim Realized            | 0.078<br>(0.044)                                   | 0.043***<br>(0.011) | 0.039**<br>(0.013) | 0.050*<br>(0.023)   | 0.011<br>(0.007)    |
| Interim Unrealized          | -0.021<br>(0.012)                                  | 0.014<br>(0.014)    | 0.010<br>(0.013)   | 0.041***<br>(0.008) | 0.035***<br>(0.009) |
| PE Firm FE                  | Yes                                                | Yes                 | Yes                | Yes                 | Yes                 |
| $N$                         | 1,145                                              | 1,187               | 1,297              | 1,188               | 1,062               |
| $R^2$                       | 0.133                                              | 0.137               | 0.091              | 0.163               | 0.076               |
| Within- $R^2$               | 0.011                                              | 0.013               | 0.004              | 0.038               | 0.011               |

**Note:** Each column uses information from interim reports up to the year indicated to predict geometric average quarterly returns going forward. This robustness table puts fixed effect on the PE firm managing the fund that has undertaken the investment.

**Table B8: Exit Quarter Regressions with PE Firm Fixed Effect****(a) Buyout**

|                             | Quarters to Exit ( $q_{i,t}$ ) |                     |                      |                      |                      |
|-----------------------------|--------------------------------|---------------------|----------------------|----------------------|----------------------|
|                             | (1)                            | (2)                 | (3)                  | (4)                  | (5)                  |
| Interim Staleness Frequency | 1.737**<br>(0.651)             | 3.653***<br>(0.679) | 3.536***<br>(0.773)  | 3.370**<br>(1.146)   | 4.278***<br>(1.050)  |
| Interim Markdown Frequency  | 0.147<br>(0.830)               | 3.014***<br>(0.769) | 1.910*<br>(0.920)    | 2.031<br>(1.138)     | 1.538<br>(1.255)     |
| Interim Realized            | -5.788***<br>(1.054)           | -2.204**<br>(0.682) | -1.181<br>(0.638)    | -1.417***<br>(0.352) | -1.227***<br>(0.183) |
| Interim Unrealized          | -0.925<br>(0.509)              | -0.786**<br>(0.262) | -0.941***<br>(0.273) | -0.964***<br>(0.234) | -0.376<br>(0.217)    |
| PE Firm FE                  | Yes                            | Yes                 | Yes                  | Yes                  | Yes                  |
| $N$                         | 1,596                          | 1,842               | 1,916                | 1,836                | 1,511                |
| $R^2$                       | 0.202                          | 0.212               | 0.215                | 0.223                | 0.210                |
| Within- $R^2$               | 0.027                          | 0.053               | 0.049                | 0.057                | 0.048                |

**(b) VC**

|                             | Quarters to Exit ( $q_{i,t}$ ) |                      |                      |                      |                      |
|-----------------------------|--------------------------------|----------------------|----------------------|----------------------|----------------------|
|                             | Year 1                         | Year 2               | Year 3               | Year 4               | Year 5               |
| Interim Staleness Frequency | -0.677<br>(1.018)              | 1.771<br>(1.000)     | 1.851<br>(1.779)     | 0.780<br>(2.586)     | 5.197**<br>(1.757)   |
| Interim Markdown Frequency  | -3.051*<br>(1.181)             | -0.804<br>(1.852)    | -1.358<br>(2.600)    | -2.736<br>(3.938)    | 0.300<br>(2.936)     |
| Interim Realized            | -1.238<br>(0.835)              | -1.650***<br>(0.440) | -1.583***<br>(0.413) | -2.023***<br>(0.470) | -0.569***<br>(0.142) |
| Interim Unrealized          | 0.123<br>(0.359)               | 0.093<br>(0.261)     | 0.390<br>(0.266)     | 0.345<br>(0.179)     | 0.085<br>(0.153)     |
| PE Firm FE                  | Yes                            | Yes                  | Yes                  | Yes                  | Yes                  |
| $N$                         | 1,145                          | 1,187                | 1,297                | 1,188                | 1,062                |
| $R^2$                       | 0.201                          | 0.203                | 0.157                | 0.194                | 0.203                |
| Within- $R^2$               | 0.005                          | 0.015                | 0.019                | 0.023                | 0.030                |

**Note:** Each column uses information from interim reports up to the year indicated to predict how many more quarters to exit remain for each investment. This robustness table puts fixed effect on the PE firm managing the fund that has undertaken the investment.

**Table B9:** Exit Multiple Below 1**(a)** Buyout

|                             | Exit Multiple < 1   |                      |                      |                      |                      |
|-----------------------------|---------------------|----------------------|----------------------|----------------------|----------------------|
|                             | (1)                 | (2)                  | (3)                  | (4)                  | (5)                  |
| Interim Staleness Frequency | 0.114***<br>(0.025) | 0.257***<br>(0.028)  | 0.314***<br>(0.029)  | 0.386***<br>(0.032)  | 0.359***<br>(0.038)  |
| Interim Markdown Frequency  | 0.157***<br>(0.034) | 0.316***<br>(0.038)  | 0.428***<br>(0.040)  | 0.523***<br>(0.044)  | 0.512***<br>(0.055)  |
| Interim Realized            | -0.068<br>(0.050)   | -0.098***<br>(0.021) | 0.001<br>(0.006)     | -0.021***<br>(0.005) | -0.093***<br>(0.010) |
| Interim Unrealized          | -0.025**<br>(0.008) | -0.035***<br>(0.006) | -0.035***<br>(0.006) | 0.001*<br>(0.000)    | -0.026***<br>(0.005) |
| (Intercept)                 | 0.168***<br>(0.020) | 0.124***<br>(0.021)  | 0.098***<br>(0.020)  | 0.044*<br>(0.020)    | 0.155***<br>(0.028)  |
| <i>N</i>                    | 1,651               | 1,916                | 2,022                | 1,953                | 1,686                |
| <i>R</i> <sup>2</sup>       | 0.027               | 0.090                | 0.104                | 0.104                | 0.155                |

**(b)** VC

|                             | Exit Multiple < 1    |                      |                      |                      |                      |
|-----------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                             | (1)                  | (2)                  | (3)                  | (4)                  | (5)                  |
| Interim Staleness Frequency | 0.149**<br>(0.050)   | 0.198**<br>(0.062)   | 0.314***<br>(0.063)  | 0.443***<br>(0.067)  | 0.479***<br>(0.069)  |
| Interim Markdown Frequency  | 0.146<br>(0.081)     | 0.267*<br>(0.105)    | 0.404***<br>(0.101)  | 0.675***<br>(0.114)  | 0.634***<br>(0.105)  |
| Interim Realized            | -0.056***<br>(0.014) | -0.093***<br>(0.022) | -0.136***<br>(0.020) | -0.148***<br>(0.022) | -0.048***<br>(0.009) |
| Interim Unrealized          | -0.037*<br>(0.016)   | -0.077***<br>(0.012) | -0.031***<br>(0.005) | -0.008***<br>(0.002) | -0.010***<br>(0.002) |
| (Intercept)                 | 0.484***<br>(0.054)  | 0.521***<br>(0.061)  | 0.383***<br>(0.059)  | 0.214***<br>(0.062)  | 0.176**<br>(0.063)   |
| <i>N</i>                    | 1,216                | 1,285                | 1,408                | 1,315                | 1,235                |
| <i>R</i> <sup>2</sup>       | 0.028                | 0.069                | 0.091                | 0.095                | 0.096                |

**Note:** Each column uses information from interim reports up to the year indicated to predict whether the exit multiple will be below 1.

**Table B10: Exit Multiple Above 3****(a) Buyout**

|                             | Exit Multiple $\geq 3$ |                      |                      |                      |                      |
|-----------------------------|------------------------|----------------------|----------------------|----------------------|----------------------|
|                             | (1)                    | (2)                  | (3)                  | (4)                  | (5)                  |
| Interim Staleness Frequency | -0.060*<br>(0.029)     | -0.195***<br>(0.032) | -0.233***<br>(0.032) | -0.243***<br>(0.032) | -0.132***<br>(0.034) |
| Interim Markdown Frequency  | -0.148***<br>(0.039)   | -0.322***<br>(0.044) | -0.417***<br>(0.043) | -0.486***<br>(0.044) | -0.359***<br>(0.049) |
| Interim Realized            | -0.006<br>(0.058)      | 0.159***<br>(0.024)  | 0.005<br>(0.006)     | 0.041***<br>(0.005)  | 0.143***<br>(0.009)  |
| Interim Unrealized          | 0.047***<br>(0.010)    | 0.057***<br>(0.007)  | 0.064***<br>(0.007)  | -0.000<br>(0.000)    | 0.042***<br>(0.004)  |
| (Intercept)                 | 0.309***<br>(0.023)    | 0.345***<br>(0.024)  | 0.375***<br>(0.022)  | 0.445***<br>(0.020)  | 0.252***<br>(0.025)  |
| <i>N</i>                    | 1,651                  | 1,916                | 2,022                | 1,953                | 1,686                |
| <i>R</i> <sup>2</sup>       | 0.025                  | 0.090                | 0.125                | 0.096                | 0.230                |

**(b) VC**

|                             | Exit Multiple $\geq 3$ |                     |                      |                      |                      |
|-----------------------------|------------------------|---------------------|----------------------|----------------------|----------------------|
|                             | (1)                    | (2)                 | (3)                  | (4)                  | (5)                  |
| Interim Staleness Frequency | 0.020<br>(0.040)       | -0.055<br>(0.048)   | -0.172***<br>(0.049) | -0.190***<br>(0.054) | -0.191***<br>(0.055) |
| Interim Markdown Frequency  | -0.013<br>(0.065)      | -0.190*<br>(0.082)  | -0.349***<br>(0.078) | -0.455***<br>(0.092) | -0.390***<br>(0.083) |
| Interim Realized            | 0.055***<br>(0.011)    | 0.092***<br>(0.017) | 0.130***<br>(0.016)  | 0.148***<br>(0.018)  | 0.067***<br>(0.007)  |
| Interim Unrealized          | 0.058***<br>(0.013)    | 0.095***<br>(0.009) | 0.038***<br>(0.004)  | 0.011***<br>(0.002)  | 0.013***<br>(0.002)  |
| (Intercept)                 | 0.108*<br>(0.043)      | 0.125**<br>(0.048)  | 0.280***<br>(0.046)  | 0.354***<br>(0.050)  | 0.350***<br>(0.050)  |
| <i>N</i>                    | 1,216                  | 1,285               | 1,408                | 1,315                | 1,235                |
| <i>R</i> <sup>2</sup>       | 0.034                  | 0.115               | 0.142                | 0.111                | 0.147                |

**Note:** Each column uses information from interim reports up to the year indicated to predict whether the exit multiple will be above 3.

**Table B11:** Exit Multiple in the Bottom 25% of Cohort**(a)** Buyout

|                             | Exit Multiple in Bottom 25% |                      |                      |                      |                      |
|-----------------------------|-----------------------------|----------------------|----------------------|----------------------|----------------------|
|                             | (1)                         | (2)                  | (3)                  | (4)                  | (5)                  |
| Interim Staleness Frequency | 0.142***<br>(0.027)         | 0.267***<br>(0.030)  | 0.269***<br>(0.030)  | 0.307***<br>(0.032)  | 0.303***<br>(0.036)  |
| Interim Markdown Frequency  | 0.181***<br>(0.037)         | 0.334***<br>(0.041)  | 0.461***<br>(0.041)  | 0.452***<br>(0.044)  | 0.479***<br>(0.053)  |
| Interim Realized            | -0.043<br>(0.054)           | -0.108***<br>(0.023) | 0.002<br>(0.006)     | -0.019***<br>(0.005) | -0.075***<br>(0.010) |
| Interim Unrealized          | -0.019*<br>(0.009)          | -0.039***<br>(0.007) | -0.038***<br>(0.006) | 0.000*<br>(0.000)    | -0.020***<br>(0.004) |
| (Intercept)                 | 0.192***<br>(0.022)         | 0.172***<br>(0.022)  | 0.126***<br>(0.021)  | 0.068***<br>(0.020)  | 0.103***<br>(0.026)  |
| <i>N</i>                    | 1,651                       | 1,916                | 2,022                | 1,953                | 1,686                |
| <i>R</i> <sup>2</sup>       | 0.028                       | 0.089                | 0.099                | 0.076                | 0.126                |

**(b)** VC

|                             | Exit Multiple in Bottom 25% |                     |                     |                      |                     |
|-----------------------------|-----------------------------|---------------------|---------------------|----------------------|---------------------|
|                             | (1)                         | (2)                 | (3)                 | (4)                  | (5)                 |
| Interim Staleness Frequency | 0.183***<br>(0.045)         | 0.277***<br>(0.058) | 0.292***<br>(0.059) | 0.276***<br>(0.063)  | 0.315***<br>(0.064) |
| Interim Markdown Frequency  | 0.058<br>(0.074)            | 0.134<br>(0.098)    | 0.236*<br>(0.096)   | 0.195<br>(0.107)     | 0.258**<br>(0.097)  |
| Interim Realized            | -0.024<br>(0.013)           | -0.039<br>(0.021)   | -0.056**<br>(0.019) | -0.071***<br>(0.021) | -0.022*<br>(0.009)  |
| Interim Unrealized          | -0.014<br>(0.015)           | -0.028*<br>(0.011)  | -0.011*<br>(0.004)  | -0.003<br>(0.002)    | -0.003<br>(0.002)   |
| (Intercept)                 | 0.147**<br>(0.049)          | 0.111<br>(0.057)    | 0.056<br>(0.056)    | 0.066<br>(0.059)     | 0.024<br>(0.058)    |
| <i>N</i>                    | 1,216                       | 1,285               | 1,408               | 1,315                | 1,235               |
| <i>R</i> <sup>2</sup>       | 0.025                       | 0.041               | 0.037               | 0.036                | 0.037               |

**Note:** Each column uses information from interim reports up to the year indicated to predict whether the exit multiple will be in the bottom 25% of its cohort (i.e., other investments that began in the same quarter).

**Table B12:** Exit Multiple in the Top 25% of Cohort**(a)** Buyout

|                             | Exit Multiple in Top 25% |                      |                      |                      |                      |
|-----------------------------|--------------------------|----------------------|----------------------|----------------------|----------------------|
|                             | (1)                      | (2)                  | (3)                  | (4)                  | (5)                  |
| Interim Staleness Frequency | -0.006<br>(0.027)        | -0.072*<br>(0.030)   | -0.077*<br>(0.031)   | -0.159***<br>(0.032) | -0.105**<br>(0.035)  |
| Interim Markdown Frequency  | -0.114**<br>(0.037)      | -0.184***<br>(0.041) | -0.277***<br>(0.042) | -0.424***<br>(0.044) | -0.370***<br>(0.050) |
| Interim Realized            | 0.026<br>(0.054)         | 0.160***<br>(0.023)  | 0.006<br>(0.006)     | 0.040***<br>(0.005)  | 0.135***<br>(0.009)  |
| Interim Unrealized          | 0.046***<br>(0.009)      | 0.055***<br>(0.007)  | 0.059***<br>(0.006)  | -0.000<br>(0.000)    | 0.039***<br>(0.004)  |
| (Intercept)                 | 0.218***<br>(0.022)      | 0.214***<br>(0.023)  | 0.254***<br>(0.021)  | 0.388***<br>(0.020)  | 0.262***<br>(0.025)  |
| <i>N</i>                    | 1,651                    | 1,916                | 2,022                | 1,953                | 1,686                |
| <i>R</i> <sup>2</sup>       | 0.024                    | 0.065                | 0.088                | 0.079                | 0.201                |

**(b)** VC

|                             | Exit Multiple in Top 25% |                     |                      |                      |                      |
|-----------------------------|--------------------------|---------------------|----------------------|----------------------|----------------------|
|                             | (1)                      | (2)                 | (3)                  | (4)                  | (5)                  |
| Interim Staleness Frequency | -0.021<br>(0.044)        | -0.044<br>(0.055)   | -0.213***<br>(0.056) | -0.191**<br>(0.060)  | -0.246***<br>(0.061) |
| Interim Markdown Frequency  | -0.079<br>(0.072)        | -0.085<br>(0.093)   | -0.384***<br>(0.089) | -0.340***<br>(0.102) | -0.429***<br>(0.092) |
| Interim Realized            | 0.039**<br>(0.013)       | 0.069***<br>(0.020) | 0.110***<br>(0.018)  | 0.129***<br>(0.020)  | 0.043***<br>(0.008)  |
| Interim Unrealized          | 0.052***<br>(0.014)      | 0.086***<br>(0.011) | 0.035***<br>(0.004)  | 0.010***<br>(0.002)  | 0.013***<br>(0.002)  |
| (Intercept)                 | 0.213***<br>(0.047)      | 0.183***<br>(0.054) | 0.387***<br>(0.052)  | 0.398***<br>(0.056)  | 0.449***<br>(0.055)  |
| <i>N</i>                    | 1,216                    | 1,285               | 1,408                | 1,315                | 1,235                |
| <i>R</i> <sup>2</sup>       | 0.021                    | 0.068               | 0.099                | 0.073                | 0.093                |

**Note:** Each column uses information from interim reports up to the year indicated to predict whether the exit multiple will be in the top 25% of its cohort (i.e., other investments that began in the same quarter).