Do Private Equity Funds Manipulate Reported Returns?

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Internet Appendix.

In this Appendix, we provide details and derivations of key variable and conduct additional empirical tests to better motivate our choices in the paper and demonstrate the robustness of our results.

IA.1. Headwinds to measuring valuation bias empirically

We start by explaining why simple measures such as average changes in IRR-to-date and PME-to-date can provide misleading metrics (where 'to-date' measures utilize the NAV at a particular date as though it were the final cash flow from a fund). Figure IA.1 illustrates the inconsistency of IRR-to-date for the purpose of measuring NAV bias by studying the cash flow and abnormal return patterns of two hypothetical funds (1 and 2). Fund 1 considers a hypothetical fund in existence from 1993 through 2003 and Fund 2 considers a different hypothetical fund in existence from 1998 through 2008. The value process in both cases is defined as, $FundValue_t = FundValue_{t-1}(1 + r_{S\&P500,t} + \alpha_t) + C_t - D_t$. That is, the fund's return over a period equals the return to the S&P 500 plus an abnormal return (α_t).

Panel A of IA.1 plots the alpha and the cash-flow patterns for both cases. For Fund 1, the alpha is fixed at 4% across all periods. Whereas for Fund 2, the alpha is initially 5% per period but than decays to zero over the life of the fund. Panel B plots the total return to the S&P 500 index over each hypothetical fund's life. Panel C plots the resulting PMEs-to-date and IRRs-to-date. These two cases show that IRR-to-date may provide completely misleading indications of when 'gaming' of fund NAVs could be taking place. Specifically, the fund with constant alpha (Fund 1) exhibits an apparent decline in IRR-to-date after the fund's fifth year. In contrast, the fund with declining alpha (Fund 2) shows an increasing IRR-to-date after the fund's fifth year. The PME-to-date analysis exhibits nearly similar patterns for each fund and therefore may not be informative either. These examples show the challenges of measuring interim abnormal performance for closed-in investment vehicles like buyout and venture funds. Consequently, we subsequently develop a method for identifying abnormal returns that unwinds the flattening effect that intermediate distributions have on the PME-to-date.

Next, we show how the intuitive approach of regressing the fund-level changes in NAVs on dummies measuring the time since fundraising is prone to revealing non-existent patterns in excess returns. Using our sample of funds discussed in the main text, we examine the finding of Jenkinson et al. (2013) with regards to the unrealized performance peaking around the quarter of a follow-on fund closing. Specification (1) in Panel A of Table IA.1 replicates the Jenkenson et al. methodology. Using their interpretation of the results, the evidence of NAV overstating around the new fund launch dates appears convincing. Just as in Table 3 of Jenkinson et al., quarters shortly before the new fund launch have significantly positive coefficients, suggesting abnormally positive growth rate in NAVs of the existing fund while GPs are seeking new capital commitments from investors. Meanwhile, the negative coefficients on years after fundraising indicate abnormally low growth rate in NAVs, consistent with the previously built-up upward valuation bias getting gradually unwound. We note also that the coefficient estimates on cash flows and market returns are also very similar to those in Jenkinson et al.

However, specification (2) and (1) of Panel A of Table IA.1 should raise concerns about consistency of these estimates. Dropping cash flows and market return should increase the noise in the disturbance (if no NAV overstating is indeed the null hypothesis of this statistical model). Instead, we see that the humped shape in the reported returns around the next fund launch gets more pronounced. To determine if these results are caused by mispecification of the Jenkinson et al. model, we apply their methodology to funds where the actual growth in NAV is replaced with a placebo based on public equity portfolios (defined in detail later in this appendix). The results of this experiment are reported in Panel B of Table IA.1. Similar to Panel A, we see that some coefficients are significantly positive in the quarters before launch of a new fund and some are significantly negative after the launch of a new fund in. Just as in Panel A, we see that the humped-shape returns trajectory gets more pronounced as we remove cash flow controls in specification (2), and then the market return in specification (3). These results indicate that the methodology of Jenkinson et al. is likely generating at least part of the pattern of excess returns they document.

The inconsistency of estimates in Table IA.1 arises from two sources: (i) a positive correlation between public market returns and private equity fund formation, and (ii) the correlation between cash flow measurement and the dependant variable. The former is essentially the result of insufficient risk adjustment. Specifically, controlling for contemporaneous market returns should be absorbing market risk, however, unlike the placebo series in Panel B, the actual fund quarterly returns are subject to appraisal smoothing as evidenced by a very low coefficient on the market return in Panel A (implying a beta of just 0.26). Thus, including just the contemporaneous market return results in an insufficient risk adjustment. As for (ii), section 5 discusses why this measurement error is present in the panel when the dependant variable is a function of fund-level NAVs (and how our analysis navigates this challenge). With such correlated events like PE fund distributions and fundraising, it is hard to assess the impact of this measurement error. For example, as one can see from specification (3) of Panel B, a dummy variable for the fourth (calendar) quarter is a significant explanatory variable for excess returns when the placebo series are not risk-adjusted. So the "Santa Clause Effect" that Jenkinson et al. document is also likely to be (at least partially) driven by the combination of (i) and (ii) rather than a tendency for PE funds to indeed report higher returns in the December quarter.

Even absent econometric biases, the interpretation of results in the framework of Jenkinson et al. is difficult because the fund (and time since inception) fixed effects obscure the inference about whether the abnormal returns are on average negative after fundraising. The negative coefficients in Table IA.1 only say that the changes in NAVs tend to be lower than the average of other periods. Meanwhile, as discussed in section 4.4.1, lower but still positive abnormal returns after fundraising, are consistent with many other alternative explanations besides the NAVs being overstated ahead of the launch of a follow-on fund.

IA.2. Key Variable Definitions

Without loss of generality, assume that fund cash flows occur in the end of each period t. We start by considering the Kaplan and Schoar (2005) Public Market Equivalent index

$$PME = \frac{\sum_{t=0}^{T-1}\{D_t \prod_{\tau=t}^{T-1} R_{\tau+1}\} + D_T}{\sum_{t=0}^{T-1}\{C_t \prod_{\tau=t}^{T-1} R_{\tau+1}\} + C_T}, \tag{I.1}$$

where D_t and C_t are, respectively, the fund distributions and capital calls end of period t while R_τ is public market gross return over period τ. While PME is typically calculated using all cash flows associated with a fund (i.e., the full life of a fund), our analysis requires the use of an interim measure of performance. Consequently, we define a measure of performance from fund inception through an interim date that is analogous to PME. Intuitively, we think of it as a measure of PME-to-date for any time $t*$, $0 < t* < T$. To construct the measure we simply consider the stated net asset value (NAV) at date $t*$ as a terminal distribution and ignore all subsequent cash flows. Thus, we can define PME-to-date at time $t*$ as

$$\begin{aligned} PME_{t*} &= \frac{\sum_{t=0}^{t*-1}\{D_t \prod_{\tau=t}^{t*-1} R_{\tau+1}\} + D_{t*} + NAV_{t*}}{\sum_{t=0}^{t*-1}\{C_t \prod_{\tau=t}^{t*-1} R_{\tau+1}\} + C_{t*}} \\ &= \frac{\sum_{t=0}^{t*-1}\{D_t \prod_{\tau=t}^{t*-1} R_{\tau+1}\} + D_{t*}}{\sum_{t=0}^{t*-1}\{C_t \prod_{\tau=t}^{t*-1} R_{\tau+1}\} + C_{t*}} + \frac{NAV_{t*}}{\sum_{t=0}^{t*-1}\{C_t \prod_{\tau=t}^{t*-1} R_{\tau+1}\} + C_{t*}} \end{aligned} \tag{I.2}$$

To simplify the notation, we can rewrite I.2 as:

$$PME_t = PME_t^{exNav} + \frac{NAV_t}{fv_t(C)}, \tag{I.3}$$

so that $fv_t(C)$ represents the time t future value of all capital calls calculated using the public market returns from the respective date of each capital call while PME_t^{exNav} is the PME-to-date value as of time t if NAV is assumed to be 0.

The change in PME-to-date from the previous period can be thought of as a product of the abnormal fund return over the period t and the ratio of NAV_t to the future value of cumulative capital calls to date. This is the case because, absent capital calls at t, it follows from I.1 and I.2 that:[1]

[1] The assumption that $C_t = 0$ applies through equation I.7 only and does not affect the intuition. If we drop this assumption, (I.3) will in addition have $-(C_t \cdot PME_{t-1}^{exNav})(fv_{t-1}R_t + C_t)$ on the right-hand (as the denominator of PME_t^{exNav} is not just a R_t scale of PME_{t-1}^{exNav} in this case) while (I.7) will have three additional terms: $C_t/fv_t(C) \quad + (k_t - 1)PME_{t-1}^{exNav} \quad + (R_t^{nav} - R_t)NAV_{t-1}/fv_t(C)$, where $k_t = fv_{t-1}(C)R_t/fv_t(C) \in (0,1)$ (e.g. for $t = 3$, $k_t = [(C_1R_2 + C_2)R_3]/[C_1R_2R_3 + C_2R_3 + C_3]$. The first

$$PME_t^{exNav} = PME_{t-1}^{exNav} \cdot \frac{R_t}{R_t} + \frac{D_t}{fv_t(C)}$$
$$= PME_{t-1}^{exNav} + \frac{D_t}{fv_t(C)} \tag{I.4}$$

where we are adding the ratio of period t distributions to the period t value of cumulative capital calls to-date to PME_{t-1}^{exNav}. Because we can express reported return, R_t^{nav}, as a solution to

$$NAV_t = NAV_{t-1}R_t^{nav} - D_t + C_t, \tag{I.5}$$

the change in PME from $t-1$ to t can written as

$$\Delta PME_t = PME_t^{exNav} - PME_{t-1}^{exNav} + \frac{NAV_t}{fv_t(C)} - \frac{NAV_{t-1}}{fv_{t-1}(C)}$$
$$= \frac{D_t}{fv_t(C)} + \frac{NAV_t}{fv_t(C)} - \frac{NAV_{t-1}}{fv_{t-1}(C)} \cdot \frac{R_t}{R_t} = \frac{D_t}{fv_t(C)} + \frac{NAV_t}{fv_t(C)} - \frac{NAV_{t-1}R_t}{fv_t(C)}$$
$$= \frac{NAV_t + D_t - NAV_{t-1}R_t}{fv_t(C)}. \tag{I.6}$$

After substituting NAV_t from I.5 into I.6, a change in PME can be witten as

$$\Delta PME_t = (R_t^{nav} - R_t)\frac{NAV_{t-1}}{fv_t(C)}. \tag{I.7}$$

The intuition behind this expression is that the excess return of the fund (as a difference between fund return as implied by NAV-change and the public market return) gets scaled down by the prior-period NAV as a percent of paid-in-capital adjusted for the market returns. Thus, keeping the mean and variance of excess return unchanged, one would observe a leveling-out in abnormal performance (as measured by PME-to-date) once a fund starts distributions, as the ratio of $NAV_{t-1}/fv_t(C)$ will typically drift downwards. That is, ΔPME_t will keep the sign but trend toward 0 over time, all else the same.[2] The same leveling-out will occur to the money-multiple ($TVPI$) which can be thought of as a special case of PME-to-date where R_τ is assumed to equal 1 for all τ.

When analyzing a cross-section of funds, the ΔPME_t is a useful metric since it effectively represents a weighting scheme for fund returns. The weight is proportional to the sensitivity of the performance-to-date

term is positive and tends to be large when $k_t \ll 1$, the second term has a negative sign and cancels out with the first term when $PME_{t-1}^{exNav} = 1$. The sign on the third term is negative while the magnitude increases in the first term too. We study the implications of this measurement error via a simulation.

[2] Again, with net-negative cash flows in period t the expression get less clear but the intuition remains the same: ΔPME_t tends to be positive so long as $R^{nav} - R$ is positive. In simulation (section IA.2.1), we verify that the additional terms (when C_t are positive) do no affect the inference about the path of the PME to-date pooled over a cross-section of funds.

to NAV. Multiplying the cross-sectional mean ΔPME_t by mean $NAV_{t-1}/fv_t(C)$ removes the downward bias due to the scale effect and obtains the average fund returns weighted by the fraction of unrealized NAVs in the market-return-adjusted sum of capital calls-to-date. The same re-weighting can be applied to mean money-multiple changes. Similarly, weighted-ΔPME_t nests mean fund NAV-returns and excess returns ($R_t^{nav} - R_t$) as special cases with $NAV_{t-1}/fv_t(C)$ being equal across funds in both cases (and market returns being zero in the former).

We design a Monte-Carlo experiment to study the time-series properties of weighted PME-to-date. We draw a fund's β from two normal distributions, $N(1, 0.125)$ and $N(2, 0.166)$ whereas α's come from a common distribution, $N(0.05, 0.05)$. Here α and β are in the context of the standard market model. The same Poisson process drives all cash flows independent of market and idiosyncratic shocks to returns. Figure IA.2 suggests that a misspecification of fund-level β does not confound inference about the question of interest, i.e., the trajectory of cross-sectional mean abnormal returns. Also, it follows that if more successful funds (higher α) tend to not distribute capital as fast as their less successful peers, WPME should be convex in time since inception under the null hypothesis of constant lifetime excess returns. This is because funds with higher excess returns tend to have relatively higher ratios of residual NAV-to-capital as fund life progresses. Introducing heteroscedasticity and reasonable correlations in the data generating process does not change these conclusions.

IA.2.1. Monte Carlo Experiment

Because our weighted PME change measure of returns has not been utilized in previous studies, we conduct a series of Monte-Carlo experiments and examine how this measure of excess returns compares to simpler measures based on raw returns and money-multiples (that we show to be its special cases). For this exercise, we assume that fund i asset value at time t ($V_{i,t}$) evolves as:

$$V_{i,t} = V_{i,t-1} exp\left\{\alpha_i + \beta_i r_{m,t} + e_{i,t}\right\},$$

where $\alpha_i = \bar{\alpha} + e_\alpha$ is the abnormal return for fund i; $\beta_i = \overline{\beta_{H(L)}} + e_{H(L)}$ is the level of systematic (factor) risk for fund i; $r_{m,t} = \mu + e_{m,t}$ is the net return on the market index; $e_{(\cdot)}$ are all independently drawn from a normal distribution $N(0, \sigma^2_{(\cdot)})$. For our experiments we let $\mu = 0.04\, per\, annum$ and $\bar{\alpha} = 0.05\, per\, annum$. The specification for β_i allows us to have funds with low risk ($\overline{\beta_L} = 1.0$) or high risk $\overline{\beta_H} = 2.0$). We set the standard deviations of $e_{(\cdot)}$ al follows: $\sigma_i = \sigma_m = 0.300\, per\, annum$; $\sigma_L = 0.125$; $\sigma_H = 0.167$; $\sigma_\alpha = 0.05$.

At time t fund i distributions, D_{it}, and contributions, C_{it}, are independent Poisson processes. The parameters of the cash flow process are calibrated so they closely match the cross-sectional moments of actual funds cash flows in our sample. Specifically, we set

$$D_s = V_s \varphi \eta_{ds} \; if \; s > \lfloor f_d \cdot T \rfloor$$
$$C_s = \varphi \eta_{cs} \; if \; s < \lfloor f_c \cdot T \rfloor,$$

where we set $T = 300$ as a fund? maximum life in bi-weekly intervals, $\eta_{(\cdot)}$ are independent Poisson distributions $Pois(\lambda_{(\cdot)})$ with $\lambda_d = 0.1$ and $\lambda_c = 0.07$. We let $f_c = 0.5$, $f_d = 0.3$, and $\varphi = 0.2$.

For our experiment we draw 30 paths of market returns, $r_{m,t}$, at a daily frequency. For each market path we draw 40 α_i and β_i, half with a mean of $\overline{\beta_L}$ and half with $\overline{\beta_H}$. Given the set of α_i and β_i, we draw 40 paths of idiosyncratic returns at a daily frequency, and 40 paths of distributions and contributions at a bi-weekly frequency. We then construct the series of quarterly NAVs and cash flows for each market path. Finally, we compute PMEs-to-date for the simulated funds and average ΔPME_q and $NAV_{q-1}/fv_q(C)$ across all (30×40) market paths and funds. Results are presented in Figure IA.2 and discussed in Appendix AIA.2.

IA.3. A proxy for NAV bias change

Central to our analysis is the idea that reported NAV can be a biased estimate of the true value. We next formulate our specific measure of the NAV bias that we examine in our empirical tests in section 5. We start by defining V_t as the true (unbiased) asset value at the end of period t and Γ_t as a gross valuation bias such that reported $NAV_t \equiv V_t \cdot \Gamma_t$. We next define the gross abnormal return in period t as $R_t^{\varepsilon} = exp\{\delta \cdot \varepsilon_t\}$ where δ is a constant (for a given fund) and ε_t is a mean-zero random error arbitrary distributed. If we further define $R_{\beta,t}$ as gross return due to risk factor (market) exposure β then,

$$V_t + D_t = V_{t-1} R_t^{\varepsilon} R_{\beta,t} + C_t. \tag{I.8}$$

Recalling that D_t and C_t are, respectively, the fund distributions and capital calls at t, we define the evolution of the gross valuation bias as $\Gamma_t = \Gamma_{t-1} e^{g(\cdot)}$. Substituting this definition into I.8 yields the following NAV identity:

$$NAV_t = NAV_{t-1} R_t^{\varepsilon} R_{\beta,t} e^{g(\cdot)} + \Gamma_{t-1} e^{g(\cdot)} (C_t - D_t). \tag{I.9}$$

We assume that returns $R_{\beta,t+1}$ and ε_{t+1} are unpredictable. We would like to estimate per period change in bias, $g_i(\cdot)$, for each fund (henceforth we add subscript i to each variable) from the following model:

$$log \left[\frac{NAV_{i,t}}{NAV_{i,t-1} R_{\beta_i,t} - \frac{\Gamma_{i,t-1}}{R^{\varepsilon} i,t} (D_{it} - C_{it})} \right] = g(\cdot)_{i,t} + \delta_i + \varepsilon_{i,t}. \tag{I.10}$$

Since we have relatively few observations per fund and do not know β_i and $\Gamma_{i,t-1}/R^{\varepsilon}_{i,t}$, a feasible alternative to estimating I.10 is an average effects linear panel model:

$$\widetilde{\Delta bias}_{it} \equiv log\left[\frac{NAV_{i,t}}{NAV_{i,t-1}R_{\beta=1,t} - D_{it} + C_{it}}\right] = \gamma' X_{i,t} + \delta_i + \eta_i + \varepsilon_{i,t} + \zeta_{i,t}, \tag{I.11}$$

where η_i and $\zeta_{i,t}$ are (additional to δ_i and $\varepsilon_{i,t}$) fund fixed effects and disturbance shocks that arise due to the mismeasurement of the left-hand side and the misspecification of the right-hand side of I.11 relative to I.10.[3] We note that the measurement error also constrains the set of covariates $X_{i,t}$ to not be contemporaneously correlated with market returns and fund cash flows, D_{it} and C_{it}.

Unlike in I.10, the expression in the logarithm in I.11 is not guaranteed to be positive. Therefore, in our implementation we Winsorize the values at the 2% level which results in all arguments for the log being greater than zero in our sample. In addition, we drop fund-quarters where ending Net Asset Values represent less than 2% of capital committed, and fund-quarters where the previous available report was more than one quarter ago.

To verify that I.11 is a sensible estimator of γ, the average bias loading on the covariates of interest, we also use a placebo dependent variable constructed as follows:

$$\widetilde{\Delta placebo}^{\{FF100\}}_{it} \equiv log\left[\frac{NAV_{it}R_{\{FF100\},t}}{NAV_{it}R_{\beta=1,t} - (R_{\{FF100\},t} - R_{\beta=1,t})(D_{ti} - C_{it})}\right] \tag{I.12}$$

where $R_{\{FF100\},t}$ is the return in period t of a public equity portfolio constructed from Fama-French 100 U.S. Equity Research Portfolios (henceforth, FF100). We randomly select a subset of the FF100 portfolios and take average returns for these to generate a placebo return series for a specific fund. Once assigned, the portfolio remains the same across all periods for the given fund. For buyout funds we limit our selection to the subset of FF100 that includes only the 25 highest Book-to-Market portfolios out of the 50 lowest market value portfolios and scale (lever) each return series by a factor of 2 (by taking gross returns squared).

For venture funds we select returns from the 25 lowest Book-to-Market portfolios out of the 50 smallest market value portfolios. In the random placebo portfolio matching, we only condition on placebo to-date returns for a given fund being in the same tercile among its peers as the actual fund IRR as of the 28^{th} quarter since inception.[4] Peers are funds incepted in the same or adjacent vintage years and having the same strategy (Buyout, Early Stage Venture, Biotech Venture, Other Venture).

We arrive at the expression for $\widetilde{\Delta placebo}^{\{FF100\}}_{it}$ by substituting $NAV_{it}/R_{\{FF100\},t}$ for NAV_{it-1} in I.11 in order to obtain the growth in NAVs from the previous period that would have occurred if $R_{\{FF100\},t}$ had

[3] i.e. $log\left[\frac{NAV_{i,t}}{NAV_{i,t-1}R_{\beta_i,t} - \frac{\Gamma_{i,t-1}}{R^{\varepsilon}_{i,t}}(D_{it} - C_{it})}\right] = log\left[\frac{NAV_{i,t}}{NAV_{i,t-1}R_{\beta=1,t} - 1(D_{it} - C_{it})}\right] + \eta_i + \zeta_{i,t}$

[4] or the last quarter in the sample for funds younger than 28 quarters as of the sample end date, December 2011

been the return generating process. In addition, I.12 allows us to test whether the cash flow dependency of the disturbance term in I.11 is sufficiently attenuated by controlling for concurrent cash flows. Just as for $\widetilde{\Delta bias_{it}}$, we Winsorize the right-hand side of the expression at the 2% level before taking the log.

Fig. IA.1. Why not simply plot IRRs since inception?

This figure illustrates the inconsistency of IRR-to-date for the purpose of NAV bias assessment by studying two hypothetical cash-flow and abnormal return patterns (i.e., funds) described in Appendix AIA.2. Panel A plots the alpha and the cash-flow patterns for both cases. Panel B plots the total return to the S&P 500 index over each hypothetical fund's life (rescaled to 1.0 at inception). Panel C plots the resulting PMEs-to-date and IRRs-to-date.

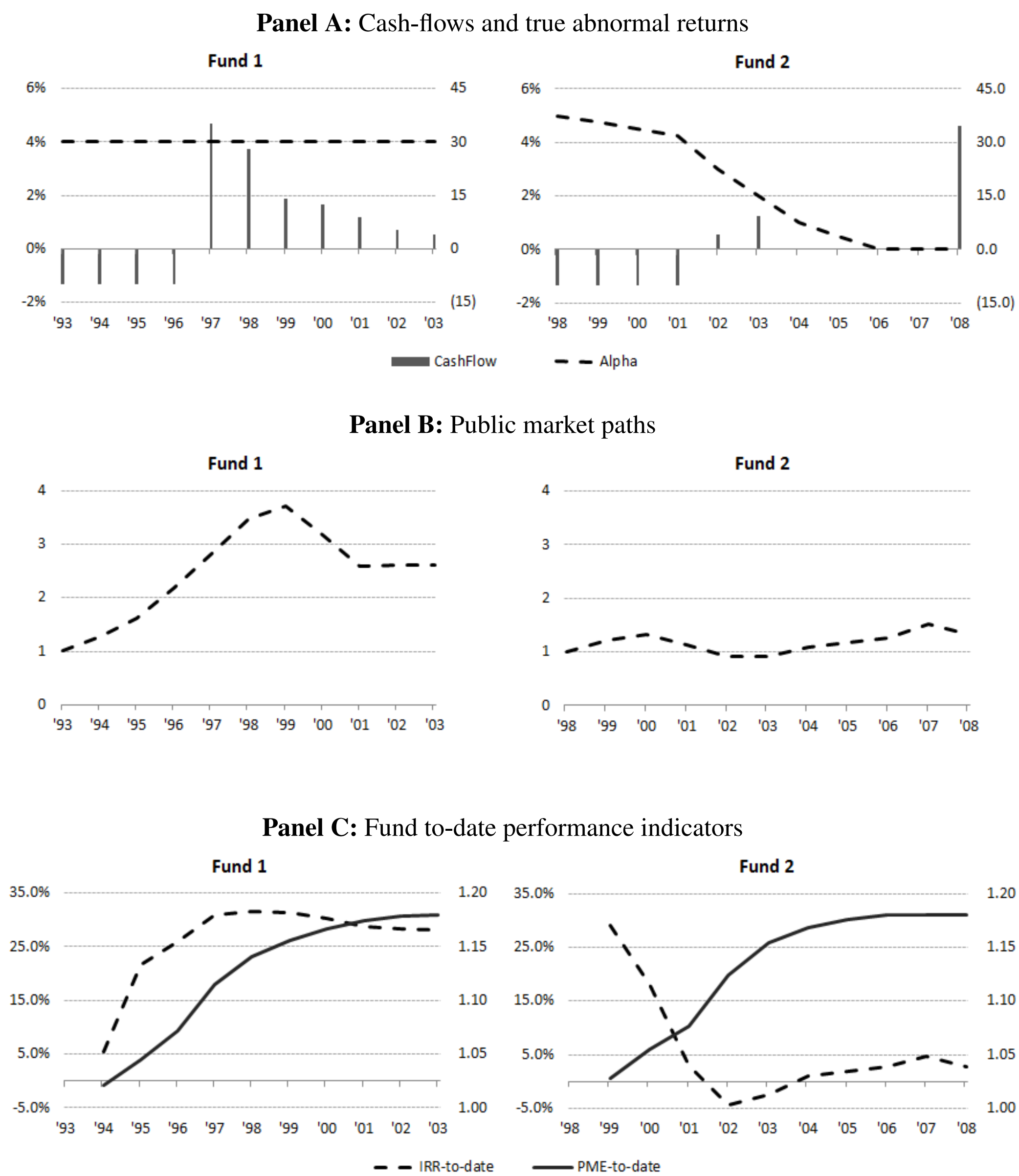
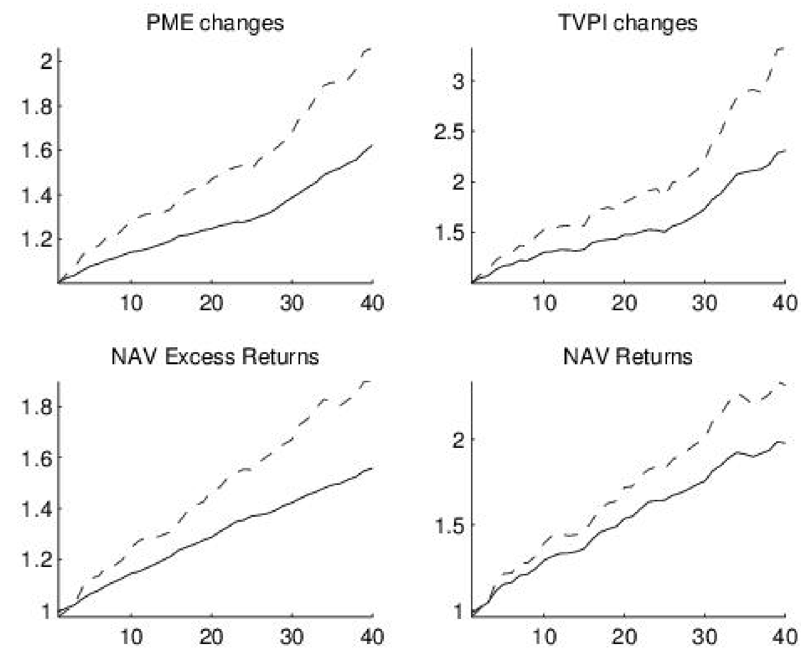


Fig. IA.2. Average fund performance paths: simulated data

This figure reports results of the Monte Carlo Experiment described in section IA.2.1 to suggest a null hypothesis appropriate for average fund to-date performance as measured by the proposed metric: weighted-PME cumulative changes. A change in a given quarter is a weighted average of PME-to-date changes from the previous period across the simulated funds for a given quarter since inception. The weights are ratios of NAV to cumulative capital calls since inception adjusted for market returns. The simulated funds differ by their market betas and abnormal returns. Fund cohorts have different market return paths as well. The solid line represents the mean over 600 funds drawn from a distribution with a high mean β. The dashed line stands for the mean over 600 funds drawn from a distribution with a low mean β. The top-right panel reports weighted money-multiple cumulative changes while bottom-left(right) panel reports mean NAV excess(raw) returns. All are shown to be a special case of the NAV-weighted PME change in Appendix AIA.2.



Quarters since inception

Table IA.1

NAV-based returns and Fundraising quarter effects

This table reports the parameter estimates a panel regression model of quarterly changes of PE fund NAVs as a function of time periods around the quarter a follow-on fund was raised by the same GP. For example, *I(4th quarter before NF)* is a dummy variable that is equal to zero unless fund i had a follow-on fund started making investments 5 quarters after quarter t. The sample includes all buyout and venture capital non-missing NAV fund-quarters. Distributions and capital calls during quarter t are present as additional explanatory variables in specification (1) while market return in quarter t is included in specifications (1) and (2). All specifications also include a dummy denoting 4^{th} quarter (i.e. ending in December), quarter since fund inception fixed effects, and fund fixed effects. In Panel A, the dependant variable is a change in fund NAV from quarter $t-1$ to t. In Panel B, NAV_t values are replaced with the following placebo counterpart: $NAV_t \cdot R_t^{pla} - NetDistribution_t$, where R_t^{pla} is a gross return of style- and size-matched public equity portfolio. Public equity portfolios returns are constructed using subsets of Fama-French 100 U.S. Equity research portfolios as described in section IA.3. NAVs, capital calls, and distributions are normalized by the fund size. t-statistics reported in parentheses are robust to heteroskedasticity and autocorrelation, */**/*** denotes significance at 10/5/1% confidence level.

	Panel A: Fund returns			**Panel B:** Placebo returns		
	(1)	(2)	(3)	(1)	(2)	(3)
Cash in	1.040***			0.957***		
	(39.98)			(22.02)		
Cash out	−0.503***			−0.372***		
	(−7.82)			(−3.14)		
Market return	0.271***	0.262***		1.078***	1.073***	
	(15.10)	(14.50)		(50.26)	(48.24)	
I(Fourth calendar quarter)	0.0040*	0.0041*	0.0116***	0.0050	0.0053	0.0372***
	(1.84)	(1.69)	(4.68)	(1.00)	(1.00)	(6.89)
I(5th quarter before NF)	0.0058	0.0085	0.0105	−0.0009	0.0023	0.0117
	(0.63)	(0.81)	(0.99)	(−0.06)	(0.17)	(0.82)
I(4th quarter before NF)	0.0246***	0.0262***	0.0273***	−0.0023	0.0007	0.0073
	(2.71)	(2.71)	(2.82)	(−0.16)	(0.05)	(0.51)
I(3rd quarter before NF	0.0329***	0.0341***	0.0347***	0.0031	0.0059	0.0152*
	(3.57)	(3.88)	(3.93)	(0.16)	(0.31)	(1.73)
I(2nd quarter before NF)	0.0308**	0.0305**	0.0305**	0.0366**	0.0386**	0.0408**
	(2.27)	(2.15)	(2.13)	(2.09)	(2.22)	(2.29)
I(1st quarter before NF)	0.0212*	0.0183	0.0147	0.0345*	0.0339*	0.0211
	(1.93)	(1.56)	(1.25)	(1.68)	(1.75)	(1.07)
I(Next fund start quarter *[∼ NF]*)	0.0034	0.0185	0.0126	0.0033	−0.0081	−0.0308
	(0.66)	(1.40)	(0.95)	(0.15)	(−0.37)	(−1.39)
I(1st year after NF)	0.0110	−0.0132**	−0.0169***	0.0217**	0.0020	−0.0105
	(1.48)	(−2.05)	(−2.58)	(2.35)	(0.28)	(−1.45)
I(2nd year after NF)	0.0029	−0.0187**	−0.0230***	0.0073	−0.0103	−0.0246***
	(0.43)	(−2.53)	(−3.03)	(0.80)	(−1.46)	(−3.38)
I(3rd year after NF)	−0.0095**	−0.0204***	−0.0250***	0.0030	−0.0105*	−0.0261***
	(−2.26)	(−3.97)	(−4.81)	(0.44)	(−1.74)	(−4.39)
I(4th year after NF)	−0.0068*	−0.0167***	−0.0178***	−0.0085	−0.0203***	−0.0229***
	(−1.71)	(−5.25)	(−5.62)	(−1.41)	(−4.09)	(−4.79)
I(5th year after NF)	−0.0048*	−0.0129***	−0.0116***	−0.0083*	−0.0160***	−0.0095**
	(−1.66)	(−3.89)	(−3.53)	(−1.70)	(−3.32)	(−2.07)
I(6th year after NF)	−0.0038	−0.0072**	−0.0061*	−0.0089*	−0.0139***	−0.0086*
	(−1.18)	(−2.13)	(−1.81)	(−1.76)	(−2.68)	(−1.75)
Controls	Fund fixed effects, Life-quarter fixed effects					
Observations	56,602	56,602	56,602	56,602	56,602	56,602
R-squared (%)	17.6	2.0	1.1	8.0	5.0	0.5

Table IA.2

Performance tercile transition probabilities: *PME*

This table reports transition probabilities between interim and final performance terciles. We define performance based on *PME-to-Date* within each fund peer group (vintage year and strategy). Panel A reports results for buyout funds and Panel B reports results for venture funds. Only the funds that have raised a follow-on fund within ten years since inception are included. The first row of each panel reports the probability of being in the respective to-date tercile at the end of a fund's life (*Final*), conditional on being in the bottom to-date tercile in the quarter preceding the follow-on fund's first capital call (*At Fundraising*). Similarly, the second (third) row reports Final performance tercile conditional on being in the middle (top) performance tercile *At Fundraising*. The last row of each panel reports the unconditional distribution of funds across *Final* terciles, while the last column reports how many funds were in each fundraising tercile and the respective fraction in the total number of funds in this analysis. The peer group is all funds of the same strategy incepted within one year from the fund vintage year. Since follow-on fundraising occurs at a different time for each of the funds and fund life varies, neither *At Fundraising* nor *Final* terciles need to have an equal number of funds.

Panel A: Buyout

		Final				
		Btm	Mid	Top	Fund Count	
At Fundraising	Btm	61.2%	26.9%	11.9%	67	(18.8%)
	Mid	36.9%	42.3%	20.8%	130	(36.5%)
	Top	13.2%	25.2%	61.6%	159	(44.7%)
	All	30.9%	31.7%	37.4%	356	(100%)

Panel B: Venture

		Final				
		Btm	Mid	Top	Fund Count	
At Fundraising	Btm	56.7%	31.3%	11.9%	67	(21.8%)
	Mid	32.0%	43.2%	24.8%	125	(35.8%)
	Top	10.4%	21.6%	68.1%	214	(42.4%)
	All	26.8%	31.0%	42.2%	355	(100%)

Table IA.3

Performance quartile transition probabilities: *IRR*

This table reports transition probabilities between interim and final performance *quartiles*. We define performance based on IRR-to-date within each fund peer group (vintage year and strategy). Panel A reports results for buyout funds and Panel B reports results for venture funds. Only the funds that have raised a follow-on fund within ten years since inception are included. The first row of each panel reports the probability of being in the respective to-date quartile at the end of a fund's life (*Final*), conditional on being in the bottom to-date quartile in the quarter preceding the follow-on fund's first capital call (*At Fundraising*). Similarly, the second (third) row reports Final performance quartile conditional on being in the middle (top) performance quartile *At Fundraising*. The last row of each panel reports the unconditional distribution of funds across *Final* quartiles, while the last column reports how many funds were in each fundraising quartile and the respective fraction in the total number of funds in this analysis. The peer group is all funds of the same strategy incepted within one year from the fund vintage year. Since follow-on fundraising occurs at a different time for each of the funds and fund life varies, neither *At Fundraising* nor *Final* quartiles need to have an equal number of funds.

Panel A: Buyout

		Final					
		Btm	3rd	2nd	Top	Fund Count	
At Fundraising	Btm	55.0%	20.0%	17.5%	7.5%	40	(11.2%)
	3rd	40.7%	34.1%	16.7%	6.6%	91	(25.6%)
	2nd	16.4%	22.7%	40.0%	20.9%	110	(30.9%)
	Top	12.2%	9.6%	22.6%	55.6%	115	(32.3%)
	All	25.6%	21.1%	26.4%	27.0%	356	(100%)

Panel B: Venture

		Final					
		Btm	3rd	2nd	Top	Fund Count	
At Fundraising	Btm	48.1%	27.3%	20.8%	3.9%	77	(15.1%)
	3rd	33.0%	36.5%	20.9%	9.6%	115	(22.5%)
	2nd	18.5%	23.8%	29.1%	28.5%	151	(29.6%)
	Top	7.2%	11.4%	23.9%	57.5%	167	(32.8%)
	All	22.5%	23.1%	24.3%	30.0%	510	(100%)

Table IA.4
Additional summary statistics

This table reports summary statistics for the variables defined and used in section 5 of the main text. Section IA.3 provides details on variable construction.

Panel A: Buyout sample

	mean	sd	min	p5	p25	p50	p75	p95
$\widetilde{\Delta bias\_it}\vert\beta = 1$	0.0069	0.19	−3.11	−0.19	−0.066	−0.004	0.087	0.26
$\widetilde{\Delta bias\_it}\vert\beta = 1.7$	−0.0047	0.25	−4.10	−0.28	−0.11	−0.021	0.12	0.32
$\widetilde{\Delta bias}_{it}^{placebo}\vert\beta = 1$	−0.0061	0.36	−1.07	−0.65	−0.23	0.015	0.23	0.58
$\widetilde{\Delta bias}_{it}^{placebo}\vert\beta = 1.7$	−0.015	0.34	−0.95	−0.60	−0.24	−0.003	0.21	0.54
FundTiming	1.26	0.38	0	0.56	1.01	1.32	1.56	1.79
Excess FundTiming	1.35	0.39	0	0.56	1.01	1.39	1.66	1.91
PeerChasing	0.004	0.13	−0.30	−0.22	−0.086	0	0.086	0.22
Residual PeerChasing	−0.078	0.20	−1.35	−0.43	−0.18	−0.061	0.036	0.22
Placebo PeerChasing	0.005	0.087	−0.98	−0.11	−0.028	0.007	0.044	0.13
Distributions /NAV	0.059	0.25	0	0	0	0	0.038	0.26
Capital Calls /NAV	0.12	6.07	0	0	0	0.0094	0.072	0.27
Distributions/Fund size	0.030	0.079	0	0	0	0	0.025	0.16
Capital Calls/Fund size	0.031	0.052	0	0	0	0.0054	0.042	0.14
Calender year of the quarter	2004.7	5.24	1987	1994	2002	2006	2009	2011

Panel B: Venture sample

	mean	sd	min	p5	p25	p50	p75	p95
$\widetilde{\Delta bias\_it}\vert\beta = 1$	−0.017	0.16	−2.05	−0.22	−0.089	−0.026	0.050	0.22
$\widetilde{\Delta bias\_it}\vert\beta = 1.7$	−0.043	0.24	−2.12	−0.39	−0.18	−0.062	0.066	0.38
$\widetilde{\Delta bias}_{it}^{placebo}\vert\beta = 1$	−0.0099	0.30	−0.78	−0.50	−0.21	−0.0064	0.19	0.48
$\widetilde{\Delta bias}_{it}^{placebo}\vert\beta = 1.7$	−0.036	0.31	−0.85	−0.55	−0.25	−0.037	0.17	0.48
FundTiming	1.25	0.40	0	0.56	0.92	1.32	1.56	1.83
Excess FundTiming	1.36	0.40	0	0.56	1.10	1.45	1.70	1.91
PeerChasing	−0.0060	0.12	−0.30	−0.21	−0.084	−0.0013	0.072	0.20
Residual PeerChasing	−0.059	0.19	−1.77	−0.39	−0.14	−0.038	0.045	0.21
Placebo PeerChasing	0.0041	0.057	−0.77	−0.069	−0.019	0.0016	0.026	0.083
Distributions NAV	0.035	0.17	0	0	0	0	0	0.18
Capital Calls NAV	0.058	0.087	0	0	0	0.0069	0.093	0.24
DistributionsFundsize	0.022	0.10	0	0	0	0	0	0.11
Capital CallsFundsize	0.027	0.040	0	0	0	0.0042	0.049	0.10
Calendar year of the quarter	2003.2	6.06	1986	1991	2001	2004	2008	2011

Table IA.5

Fund timing and peer-chasing: additional specifications

This table reports the parameter estimates a linear regression model estimated separately for buyout (Panel A) and venture (Panel B) funds. The dependant variable measures risk- and cash flow-adjusted changes in NAV for quarter t that is constructed to be unpredictable under the null of reported NAVs being unbiased estimators of true asset values. The market beta of the fund assets is assumed to be 1.7 [2.4] in specifications (6) and (7) for buyout [venture] subsample and 1 everywhere else. Explanatory variables of interest include *FundTiming* which is the natural log of one plus time spent to-date without a follow-on fund in excess of two years, *PeerChasing* which is the difference between fund i reported Internal Rate of Return to-date for the calendar quarter corresponding to $t-1$ quarter of fund i life and its peers as measured by the median IRR-to-date across all funds of the same strategy incepted within one year from fund i vintage year. Specifications (4), (5) and (7) also include the interaction of *FundTiming* and *PeerChasing* variables. All specifications include fund fixed effects, all except (1) include fund distributions and capital calls over the current quarter scaled by the end of quarter NAVs. Specifications (3) and (5) through (7) include year-quarter fixed effects, others have year and quarter fixed effects instead. t-statistics reported in parentheses are robust to heteroskedasticity and autocorrelation, */**/*** denotes significance at 10/5/1% confidence level.

	$\beta = 1$					$\beta = 1.70B/2.4V$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Buyout							
FundTiming	0.060***	0.059***	0.080***	0.038**	0.057***	0.076***	0.053**
	(2.78)	(3.13)	(4.22)	(2.02)	(3.00)	(3.63)	(2.57)
PeerChasing	−0.198***	−0.202***	−0.205***	0.123**	0.131**	−0.202***	0.117**
	(−5.95)	(−6.31)	(−6.51)	(2.31)	(2.55)	(−5.46)	(2.09)
FundTiming × PeerChasing				−0.295***	−0.304***		−0.289***
				(−6.22)	(−6.61)		(−5.62)
Observations	12,150	12,150	12,150	12,150	12,150	12,150	12,150
R-squared	0.046	0.094	0.237	0.098	0.242	0.420	0.423
RMSE	0.184	0.172	0.158	0.172	0.158	0.180	0.180
Panel B: Venture							
FundTiming	0.029**	0.026*	0.051***	0.018	0.043***	0.054***	0.046***
	(2.08)	(1.89)	(3.62)	(1.34)	(3.08)	(3.78)	(3.26)
PeerChasing	−0.151***	−0.168***	−0.175***	0.068*	0.045	−0.180***	0.037
	(−7.91)	(−8.53)	(−9.18)	(1.79)	(1.21)	(−9.21)	(0.99)
FundTiming × PeerChasing				−0.217***	−0.202***		−0.200***
				(−6.88)	(−6.52)		(−6.29)
Observations	15,124	15,124	15,124	15,124	15,124	15,124	15,124
R-squared	0.110	0.118	0.305	0.121	0.309	0.607	0.608
RMSE	0.136	0.135	0.120	0.135	0.120	0.124	0.124
Controls in Both Panels:							
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cash Flows	No	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	No	No	No
Quarter FE	Yes	Yes	No	Yes	No	No	No
Year-Qtr FE	No	No	Yes	No	Yes	Yes	Yes