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Private Equity Performance, Fund Size and Historical Investment

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Abstract

This paper discusses the performance pattern of US private equity fund from 2003 to 2013, measuring the effect of fund size and other fund characteristics as well as macroeconomic conditions on fund performance. The results shows that the number of historical investment decisively influences the performance of funds, and funds whose inception is at the peak of economic expansion seem to perform worse than those formed during other economic periods. Fund size effect is ambiguous in full sample specifications but appears to be concave with respect to return when we look at this relationship in segmentation. Overall, experience of investment plays an important role in continually improving the performance of the fund. More details of each investment within each fund are needed to further analyze the causality between fund total return, its investment characteristics and other unique factors.

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1. Introduction

Private equity investment is an increasingly popular investment avenue in the United States and unlike public financing, private equity investment needs specialized knowledge of the industry and corporation and more experienced professionals to handle the investment risk so that capital is reallocated to the most productive sectors of the economy. Figure 1 shows the number of deals for three major types of private equity investment, viz. buyout, venture and real estate. Venture capital investment deals increased from almost negligible to over 100 in the late 90s during the IT bubble period and further rose to 171 in 2015. Real estate and buyout also developed rapidly in the last two decades and were influenced greatly by the recent Great Recession around 2008 with real estate recovering more robustly in the following period. In 2014, exits from buyouts exceeded $450 billion and committed dry power reached a record of $1.2 trillion globally, including $452 billion earmarked for buyout alone.[1] Figure 2 shows size-weighted and equal-weighted net IIR for PE funds in my sample. It shows that PE performance steadily increased since 2005, from about 5% to above 20% at the peak of 2012 and then fell quickly to 10% in 2013, with slight crawling back in 2009. There is no apparent difference between size-weighted and equal-weighted measured performance except for the most recent year when performance of funds with big market cap deteriorated. One possible reason is that funds with big market cap are greatly affected by potential success or failure of some key buyout projects and therefore are more volatile than equal-weighted funds. Table 1 shows top 10 limited partners in United States. Private equity investors are principally institutional investors such as endowments and pension funds. These investors, called Limited Partners (LPs), commit a certain amount of capital to private equity funds, which are run by General Partners (GPs)

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[1] Global Private Equity Report 2015, Bain&Company

who manage the fund and make investment decisions (Phalippou and Zollo (2005)). The most powerful PE fund investors are investing from \$150 billion up to over \$515 billion with the largest partners investing in over 100 funds, indicating diversification effort made by LPs to spread the risk across different industries. This paper discusses the potentially most important factors that affect performance of funds and deepens our knowledge of the private equity industry.

2. Literature Review

Literature in this area has focused on the performance of private equity funds and characteristics of the fund and industry. Kaplan and Schoar (2005) investigate the performance and capital inflows of private equity partnerships. They find that average fund returns approximately equal the S&P 500 even though substantial heterogeneity exists across funds. In addition, better performing partnerships are more likely to raise follow-on funds and larger funds but the relationship is concave for the top performing funds. Indro et al. (1999) find that actively managed mutual funds have to attain a minimum fund size before they achieve sufficient returns to cover their costs and diminishing marginal returns to information activities exist when a mutual fund exceeds its optimal size. In other words, the relationship between fund size and their performance is concave. However, Phalippou and Zollo (2005) do not find evidence of a concave relationship between performance and fund size even with a similar regression specification. They find that fund performance co-varies positively with both business cycles and stock-market cycles and is exposed to tail risk. Also, they disclose that low performance is concentrated in small and inexperienced funds. Phalippou and Gottschalg (2009) show that average fund performance, after correcting for sample bias and overstated accounting values, underperforms -3.83% per year with respect to the S&P 500 when they include out of sample funds which do not have good exits. Harris, Jenkinson and Kaplan (2012) explore the relationship between absolute measures of performance IRRs and multiples of invested capital and performance relative to public markets and find that performance relative to public markets can be predicted well by a fund's multiple of invested capital and IRR. In addition,

their regression results suggest a concave relation between size and performance for VC funds, mostly driven by lower returns to small funds. Ljungqvist and Richardson (2003) provide several determining factors for excess returns of private equity fund including existing investment opportunities and competition amongst private equity funds. They also attribute the magnitude of excess returns to compensation for holding a 10-year illiquid investment. The recently published paper, Brown et al. (2015) examines private equity performance for buyout and venture funds using Burgiss, Cambridge Associates (CA), PitchBook, and Preqin. These four databases and buyout funds have outperformed public equities for long periods of time, which outperformed venture funds except in late 90s.

Economists have also focused on this topic in other countries. Diller and Kaserer (2005) analyze the determinants of returns generated by private equity funds in Europe and find fund returns unrelated to stock market returns and negatively correlated with the growth rate of the economy. Overall, the impact of fund inflows in to the industry, market sentiment and GP's skills play an important role in fund performance. Kaplan and Strömberg (2008) specifically focus on the leveraged buyout industry in UK, and they find private equity fund returns tend to decline when more capital is committed to this asset class but capital commitments to private equity tend to decline when realized returns decline, hinting that private equity industry follows business cycle. Nowak, Knigge and Schmidt (2004) use a unique database—CEPRES from Germany—that provides high quality data on private equity fund. By constructing an investment timing concept in terms of fund cash flow and market valuation index, they show that investment timing has an impact on the performance of venture capital funds.

Overall, studies on private equity industry focuses mainly on the characteristics of portfolio investment and examine how they make investments that would affect fund performance, as well as the effects of accounting methods from different databases on fund performance. This paper discusses the role of past experience and how private equity funds responded to the Great Recession using the most recent data from Bloomberg. In addition, this paper segregates data samples into different fund aspect and applies regression techniques with enhanced granularity.

3. Empirical Analysis

3.1. Dataset

Bloomberg offers detailed information on private equity funds. I restrict the sample funds to United States PE market with the inception date between 2002-2013 and fund size over \$1 million. These restrictions give me a sample of 1165 observations. The dataset provides comprehensive information on fund characteristics and fund performance such as fund size, targeted size before inception, investment industry and strategy, inception date, number of historical investments and current investments, various performance measures including net IRR, investment multiples DPI, RVPI and MOIC as well as quartile ranking among all the PE funds in Bloomberg database. Macroeconomic variables, GDP growth rate and an indicator for the Great Recession are also included.

Table 2 shows that average of net IRR for 239 funds is 8.64% with 14.66 standard deviation. There is wide gap of fund performance with worst IRR of -73.6% and best one of 55.1%. Fund size ranges from USD 2 million to USD 21.7 billion. Three private equity performance multiples also show huge performance gap, with MOIC of one fund reaching 6.24 times. DPI and RVPI have less standard deviations but still show wide gap across different funds. The number of investments made by the funds indicates past history of the fund, among which the largest number of investments comes from New Enterprise Associates XII LP with 95 investments so far. Table 3 compares some key fund performance measures and information for venture capital private equity and buyout equity. Due to different business purposes, buyout funds need to raise more money to purchase a company's shares so as to gain a controlling interest in the targeted firm. The average fund size is 1.15 billion, which is significantly larger than 0.22 billion for venture funds which manage money from investors seeking private equity stakes in startup enterprises with strong growth potential. The performances of these two types are ambiguous. While DPI is significantly higher for buyout, RVPI is the opposite with MOIC very close to each other. For the number of ongoing investments, venture funds invest significantly more than buyout funds, probably because each investment need less money than a buyout investment. In

addition, it seems that buyout funds are able to raise more money than expected compared to venture funds.

3.2. Econometric model

Based on previous literature, I categorize the explanatory variables to two groups in general, macroeconomic variables and fund characteristics. Macroeconomic variables include GDP growth rate and great recession dummy variable, whereas fund characteristics include fund size, number of historical investment, various performance measures. Literature shows fund size is a key variable for fund performance. Indro et al. (1999) conclude that net returns are negative in the two smallest size groups; as fund size increases, net returns turn positive and increase. Also, the marginal net returns to active management become negative as the fund exceeds an optimal size. Phalippou and Zollo (2005) however do not find evidence of a concave relationship between performance and fund size but do find a positive relationship between size and performance documented in Kaplan and Schoar (2005). Ljungqvist and Richardson (2003) show that fund size and fund inflows are significant of excess IRRs in their specification and excess IRRs reach a maximum at fund sizes between $1.1 billion and $1.2 billion. In this paper, I include specifications in both log asset size term and its square term.

Two other variables that indicate popularity and sophistication of the funds are the number of historical investments and actual fund raised over targeted size ratio. Previous investments improve general partners' skills and knowledge necessary to make efficient and timely investment. The more excess funds that general partners raise, the more popular the fund is, indicating strong investor confidence in the fund future performance. Table 3 shows that venture capital has higher standard deviation of performance (1.02 versus 0.52 for venture funds and buyout fund in terms of MOIC). Therefore, I create a dummy variable for venture funds to measure the specific fund type effect on fund performance. Macroeconomic conditions can affect performance of the private equity industry greatly. Phalippou and Zollo (2005) conclude that fund performance increases significantly with average GDP growth rate and decreases with average level of interest rates. Diller and Kaserer (2009) find that private equity returns seem to be negatively correlated with overall economic development over the lifetime of

a fund. I include a dummy variable for the recent great recession to gauge if fund performance was dramatically hurt by economic recession. The main regression specification is the following.

Performance Measure$_i$ / Quartile Ranking$_i$ = α +1 * Fund Size$_i$ + $\beta2$ * Historical Performance$_i$ + $\beta3$ * Fund Raised over Targeted Ratio$_i$ +$\beta4$ * Historical Performance$_i$ +$\beta5$ * Historical Performance$_i$ + ε_i

4. Main Results

Table 4 shows the main result with MOIC as dependent variable in terms of performance measure. Contrary to previous literature (Kaplan and Schoar (2005), Indro et al. (1999)), fund size coefficient is not statistically significant for all five models, nor is fund size squared. However, coefficient for GDP growth rate is significant but interestingly negative, although it is marginal. This indicates that inception of fund at GDP growth rate of 1% or more decreases investment multiple by about 0.08. Considering the huge amount of investment in some funds, this can have significant effect on investment returns, a result which is consistent with Diller and Kaserer (2005). The number of historical performances is also strongly significant in all model specifications. Ten more investments in PE industry would potentially increase the investment multiple to 0.5, a large boost of return given the mean of MOIC is merely around 1.5. This further shows that experience and familiarity of this industry is crucial for right target of firms to take advantage of the potentials even after controlling for year fixed effects and strategy fixed effects. R-squared increases with no obvious coefficient change. Table 5 replaces MOIC with net IRR, another important performance measurement. GDP growth rate still plays critical role in shaping private equity industry performance and number of historical investments also strongly affects profit and loss of PE funds where an additional 10 more investments would potentially cause roughly 9% rise of IRR. Interestingly, the recession dummy variable is negative and significant, indicating that if the inception of the fund is during recession period, the fund will have weaker return later and explaining why the number of deals decreased sharply during the Great Recession. Controlling for year and strategy effects does affect these results much. Table 6 provides further robustness test by replacing MOIC with DPI, which measures money distributed to limited partners by the fund, relative to contributions, focusing on outcome of invested projects. While GDP growth rate no longer shows statistical significance, the

number of historical investment remains strongly significant. Fund size is marginally significant in the first model but its effect disappears after controlling for other factors. Mty previous regression result that initiation of PE fund during recession periods would be a good decision is now contradicted.

Next, it is interesting to look at the segmentation of performance and study the potential factors that determine each level of performance. Table 7 trisects the dependent variable net IRR at 4.12% and 10.6%.[2] The results show that the best way for funds with poor returns to improve is to accumulate experience in investment by reaching more deals, as number of historical investment deals is statistically significant. For medium performing funds, expanding fund size seems to be a better solution, as the size is marginally significant at 10% level. In other words, raising $100 million more from investors would increase net IRR 4.42%, a considerable boost given that the mean of net IRR is only 8.64%. For good performing funds with over 10% annual return, fund performance is anti-cyclical except during the Great Recession period. And contrary to Phalippou and Zollo (2005), I find a negative relationship between fund size and performance, showing that marginal return of size turns negative if the fund is already in performing well. Continually improving managerial skill in portfolio management and market research is more important than simply expanding the fund size for the top performers. Next, I analyze this issue from a different angle and trisect the fund size at $120 million and $390 million as in Table 8. For small private equity funds with less than $120 million, past history of investment is crucial for further improvement and fund performance is anti-cyclical to macroeconomic conditions. For large-sized funds, experience is again critical in improving fund performance, so is the anti-cyclicality nature. For middle-sized funds, no variables are significant. Last, Table 9 studies the issue based on different strategies consisting of venture, buyout, real estate, fund of funds and others.[3] For venture and buyout funds, historical investment numbers persistently play an important role. In addition, both type of funds show anti-cyclical trend. However, venture funds initiated during the Great Recession suffered huge losses thereafter. Fund size works against performance for buyout

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[2] The reason that observation number is different is there are missing data in some independent variables. This situation is repeated in size trisection case in Table 8.
[3] Other strategies include debt, growth, real assets, coinvestment and secondary.

funds showing that small funds experience less volatility of subsequent performance from those mergers and acquisition deals.

Besides the performance measures we used above, Bloomberg offers quartile ranking for all PE funds that are recorded in its database. In my database, 27.68% of funds fall in the first quartile, 29.12% are in the second quartile, 22.91% are in the third quartile and 20.29% in the fourth quartile. They are almost evenly distributed in terms of quartile ranking. We then create a dummy variable with first quartile equal to one and other quartiles zero so as to measure what factors would make funds more likely to be the first tiers. The result in Table 10 shows fund size and its square-term are both significant in all regression specifications and follow a concave curve with respect to returns. The higher the fund is within a certain range, the more likely that the fund is in first quartile. However, being too big also hurts funds' chances. With both strategy and year fixed effect controlled, number of historical investment is only significant at 15% level. Macro-variables also become insignificant, probably due to year fixed effects. However, dummy variable for 2009 (not shown in the table) is strongly significant with negative coefficient 14.83, showing fund performance deteriorated during the Great Recession period.

5. Conclusion

This paper discusses private equity fund performance and factors that affect their performance. Regression results show that previous fund investment experience critically affects the final outcome of the investment. There seems to be a quadratic concave function between fund size and return but the result is not robust, as is the fund raised over fund targeted size ratio. Macroeconomic conditions play an important role through GDP growth rate, but contrary to Phalippou and Zollo (2005), I find private equity funds set up in expansion period fail to beat funds initialized during economic downturn period except during the Great Recession when the stagnated economy severely hurt investment deals. In other words, it was not an opportune time to make investment during either the recession period or the peak of the expansion while initial recovery period investment or later expansion period investment offers funds the best performance. Segmentation analysis based on net IRR and fund size yields similar results.

Weidig and Mathonet (2004) define private equity as providing "equity capital to enterprises not quoted on a stock market. Private equity can be used to develop new products and technologies, to expand working capital, to make acquisitions, or to strengthen a company's balance sheet." Private equity investment provides precious value and catalyst to the market economy in light of capital and managerial experience to the companies. They monitor the progress of firms, sit on boards of directors and offer advice to daily firm management (Gompers and Lerner (2016)). It is a perfect indicator of the extent to which investors feel confident about the future of the economy and market return. Given more granular data, future work needs to further study what criteria limited partners use, how different funds with the sample general partners correlated with each other in terms of performance and whether market sentiments play an important role in long time investment as public stock market shows. In addition, it is worth noting that there are several private equity databases providing information on this market, and not just Bloomberg, which this paper uses. This includes Venture Economics, Thomson Venture Economics and others. Brown et al. (2015) discuss four databases and yield similar performance estimates across the data sets, but there are many other sources. Identifying similarities and differences between them would help us better understand reasons behind different research outcome.

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Figure 1 Number of deals for each type of private equity fund
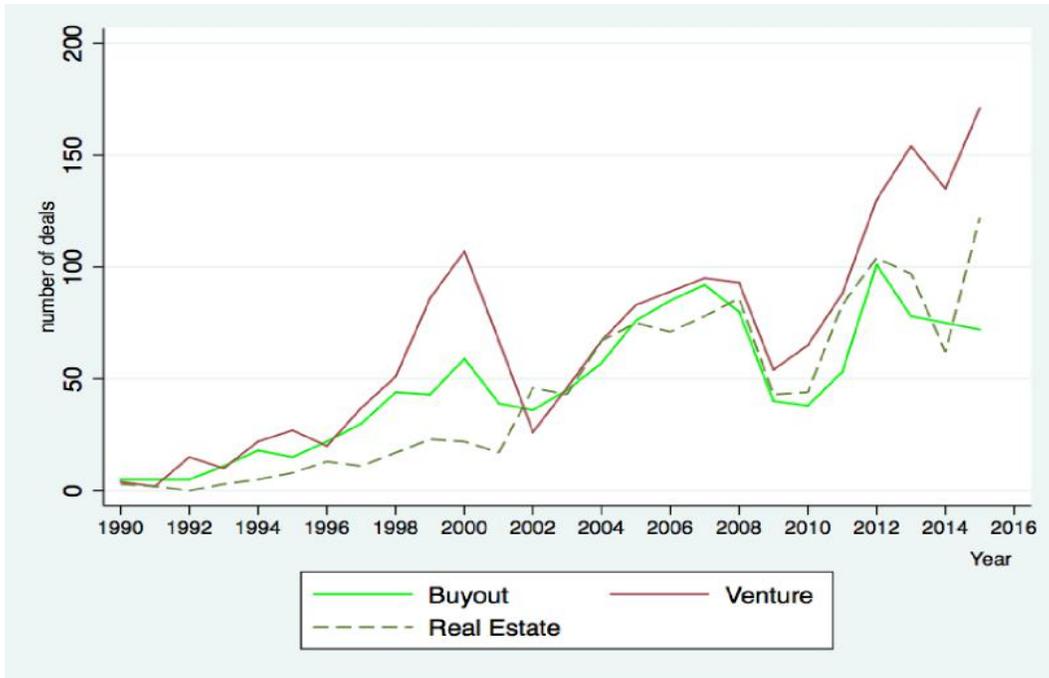
Figure 2 weighted and equal-weighted net IRR
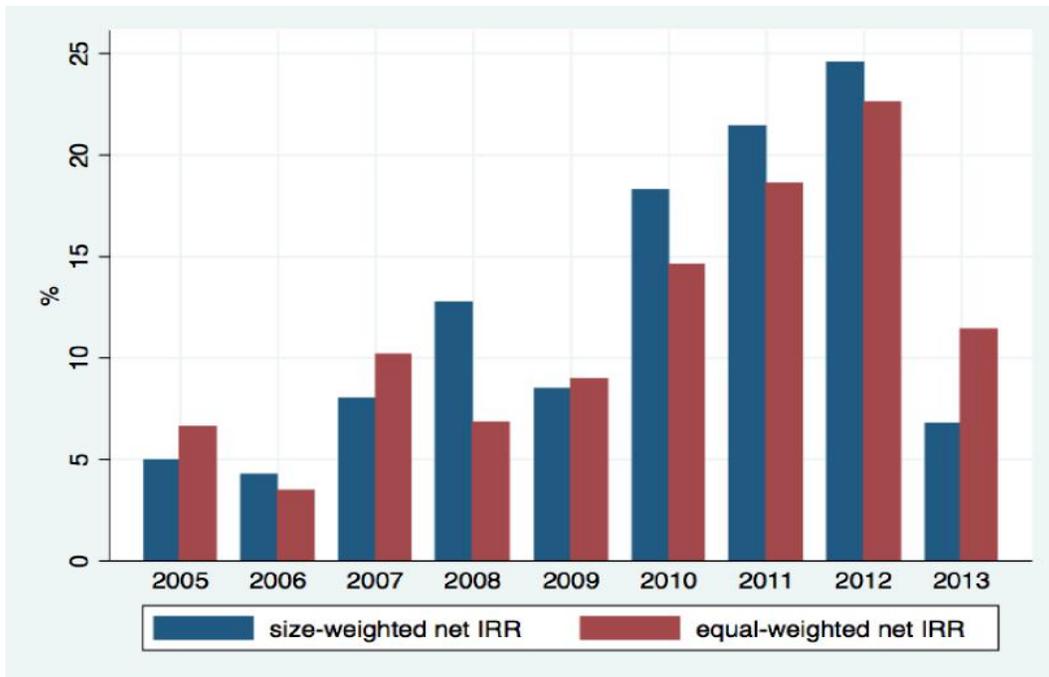
Table 1 Top 10 Limited Partners in United States

Limited Partner	Entity Type	Total Assets ($M)	#PE Funds
American General Life Insurance Co	Insurance Company	515581.0	--
Metropolitan Life Insurance Co	Insurance Company	377828.4	155
California Public Employees' Retirement System	Government Pension	315783.0	376
Teachers Insurance & Annuity Association of America	Insurance Company	262634.0	321
Lincoln National Life Insurance Co	Insurance Company	213625.1	104
New York State Common Retirement Fund	Government Pension	197882.4	358
California State Teachers' Retirement System	Government Pension	181294.0	429
Jackson National Life Insurance Co	Insurance Company	174606.0	143
MetLife Insurance Co USA	Insurance Company	164718.8	225
Florida Retirement System	Government Pension	157261.7	429

Source: Bloomberg

Table 2 Descriptive statistics

Fund raised/targeted size is calculated as the total fund size actually rose by the limited partners divided by the targeted size when the fund was established. Historical investments and current investments record the number of investments that limited partners make. DPI is the ratio of money distributed to limited partners by the fund, relative to contributions (paid-in capital). RVPI is calculated by dividing the fund's residual value by paid-in capital. MOIC stands for multiple on invested capital, also known as total value to paid-in (TVPI) multiple. It is calculated by dividing the fund's cumulative distributions and residual value by the paid-in capital. It gives a potential investor insight into the fund's performance by showing the fund's total value as a multiple of its cost basis. It does not take into account the time value of money, which is a major difference from internal rate of return (IRR) measure. QTL is quartile ranking for the fund among all the funds in the Bloomberg private equity database.

Variable	N	Mean	Std Dev	Minimum	Maximum
Net IRR %	239	8.637	14.558	-73.6	55.1
Fund size ($billions)	540	0.673	1.836	0.002	21.7
Fund raised/targeted size	540	0.953	0.214	0.086	1.813
Historical investments	540	3.050	4.501	0	31
Current investments	540	6.028	8.462	0	64
Total investments	540	9.078	12.007	0	95
DPI	223	0.867	0.626	0	4.83
RVPI	208	0.712	0.538	0	5.01
MOIC	227	1.558	0.762	0.04	6.24
VC dummy	540	0.513	0.5	0	1
QTL	217	2.318	1.112	1	4
GDP growth rate %	540	5.648	1.451	-3.2	7.1

Table 3 Statistics for venture and buyout PEs

Fund raised/targeted size is calculated as the total fund size actually raised by the limited partners divided by the targeted size when the fund was established. Historical investments and current investments record the number of investments that limited partners make. DPI is the ratio of money distributed to limited partners by the fund, relative to contributions (paid-in capital). RVPI is calculated by dividing the fund's residual value by paid-in capital. MOIC stands for multiple on invested capital, also known as total value to paid-in (TVPI) multiple. It is calculated by dividing the fund's cumulative distributions and residual value by the paid-in capital. It gives a potential investor insight into the fund's performance by showing the fund's total value as a multiple of its cost basis. It does not take into account the time value of money, which is a major difference from internal rate of return (IRR) measure. ***,**,* denote significance at 1 percent, 5 percent and 10 percent respectively for the t-test of mean difference between buyout and venture variables.

Variable	Venture			Buyout		
	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.
Fund Size ($bil)	277	0.22	0.32	263	1.15***	2.53
MOIC	93	1.57	1.02	134	1.55	0.52
DPI	94	0.73	0.72	129	0.97***	0.52
RVPI	86	0.89	0.72	122	0.58***	0.30
Net IRR	103	6.96	17.89	136	9.91	11.32
Hist. investment	277	2.86	4.90	263	3.25	4.04
Current investment	277	7.09	10.10	263	4.91***	6.12
Raised/Target size	277	0.94	0.20	263	0.97*	0.23

Table 4 Regression based on MOIC

Independent Variables	Dependent variable: MOIC				
	1	2	3	4	5
Intercept	2.27	2.27	1.91	1.39	1.14
	(0.60)	(0.60)	(0.65)	(0.73)	(0.71)
GDP growth rate	-0.08***	-0.08***	-0.08***	0.03***	-0.09***
	(0.03)	(0.03)	(0.03)	(0.10)	(0.03)
Fund size	-0.03	-1.52	-0.01	-0.01	0.01
	(0.03)	(2.78)	(0.03)	(0.03)	(0.03)
Fund size-squared		0.75			
		(1.39)			
Historical Investment #	0.05***	0.05***	0.04***	0.04***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Fund raised over targeted ratio			0.06	0.11	0.01
			(0.17)	(0.17)	(0.03)
VC dummy			0.13	0.15	0.56*
			(0.09)	(0.09)	(0.30)
Recession Dummy		-0.00	-0.01		
		(0.28)	(0.28)		
Year FE	NO	NO	NO	YES	NO
Strategy FE	NO	NO	NO	NO	YES
R-squared	0.09	0.09	0.09	0.13	0.13
Observations	405	405	405	405	405

Table 5 Regression based on net IRR

Independent	Dependent variable: Net IRR				
Variables	1	2	3	4	5
Intercept	16.10	18.31	19.29	6.15	5.98
	(2.13)	(2.16)	(3.14)	(5.06)	(4.63)
GDP growth rate	-1.77***	-2.15***	-2.15***	0.99	-1.92***
	(0.56)	(0.59)	(0.59)	(1.97)	(0.57)
Fund size	-0.08	2.67	-0.19	-0.07	0.04
	(0.58)	(5.53)	(0.64)	(0.67)	(0.67)
Fund size-squared		-1.37			
		(7.77)			
Historical	0.92***	0.94***	0.94***	0.91***	0.77***
Investment #	(0.17)	(0.17)	(0.18)	(0.18)	(0.20)
Fund raised over			1.41	2.22	2.07
targeted ratio			(3.32)	(3.36)	(3.32)
VC dummy			-0.40	-0.03	6.93
			(1.76)	(1.80)	(6.50)
Recession dummy		-10.37*	-10.11*		
		(5.33)	(5.36)		
Year FE	NO	NO	NO	YES	NO
Strategy FE	NO	NO	NO	NO	YES

Table 6 Regression based on DPI

Independent Variables	Dependent variable: DPI				
	1	2	3	4	5
Intercept	-0.85	-1.22	-0.74	-1.25	-0.59
	0.95	(0.92)	(0.99)	(1.17)	(1.14)
GDP growth rate	-0.03	0.06	-0.17	0.14	-0.01
	(0.04)	(0.04)	(0.13)	(0.15)	(0.04)
Fund size	0.09*	-4.41	0.03	0.04	0.04
	(0.05)	(4.17)	(0.05)	(0.05)	(0.05)
Fund size-squared		2.25			
		(2.09)			
Historical	0.05***	0.05***	0.05***	0.06***	0.06***
Investment #	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Fund raised over			0.53**	0.44*	0.35
targeted ratio			(0.26)	(0.27)	(0.27)
VC dummy			-0.17	-0.18	0.11
			(0.13)	(0.14)	(0.47)
Recession dummy		2.33***	2.42***		
		(0.40)	(0.40)		
Year FE	NO	NO	NO	YES	NO
Strategy FE	NO	NO	NO	NO	YES
R-squared	0.07	0.15	0.16	0.11	0.12
Observations	396	396	396	396	396

Table 7 Regression based on different groups of net IRR

Independent Variables	Dependent variable: Net IRR		
	1	2	3
	net IRR < 4.12%	net IRR in between	net IRR >10.6%
Intercept	7.81	1.17	46.21
	(26.55)	(2.95)	(14.15)
GDP growth rate	0.65	-0.08	-2.13***
	(1.23)	(0.13)	(0.59)
Fund size	-1.08	0.24*	-1.23*
	(1.25)	(0.13)	(0.66)
Historical	1.14**	0.001	-0.003
Investment #	(0.47)	(0.038)	(0.198)
VC dummy	-5.10	1.71	12.87
	(8.60)	(1.22)	(8.37)
Recession dummy	13.25	-2.09	-11.46**
	(13.24)	(1.28)	(4.62)
Strategy FE	YES	YES	YES
R-squared	0.10	0.14	0.23
Observations	118	139	135

Table 8 Regression based on fund size

Independent Variables	Dependent variable: Net IRR		
	1	2	3
	Size<120M	Size is in between	Size>390M
Intercept	40.15	46.07	8.34
	(77.80)	(80.77)	(20.84)
GDP growth rate	-6.40**	-3.42	-2.43**
	(2.45)	(1.08)	(0.64)
Fund size	-0.46	-1.57	0.26
	(4.19)	(4.10)	(0.93)
Historical	5.07**	1.13	0.53***
Investment #	(2.06)	(0.54)	(0.19)
VC dummy	-2.50	10.97	8.31
	(15.88)	(12.41)	(6.44)
Recession dummy	-42.11**		-5.53
	(19.70)		(5.17)
Strategy FE	YES	YES	YES
R-squared	0.39	0.17	0.18
Observations	45	114	233

Table 9 Regression based on different strategy

Independent Variables	Dependent variable: Net IRR				
	1	2	3	4	5
	Venture	Buyout	Real Estate	Fund of Funds	Others
Intercept	-48.25	59.72	0.72	-7.87	18.87
	(46.34)	(18.90)	(37.22)	(28.78)	(14.74)
GDP growth rate	-4.10**	-3.09***	-3.13	1.40	-2.83***
	(1.89)	(0.83)	(1.52)	(1.60)	(0.71)
Fund size	3.40	-1.82**	0.88	0.49	0.14
	(2.36)	(0.91)	(1.87)	(1.30)	(0.73)
Historical Investment #	0.86*	0.63**	2.18	-2.15	0.70***
	(0.50)	(0.25)	(1.35)	(5.40)	(0.20)
Fund raised over targeted ratio	12.41	2.72	0.39	-2.62	0.89
	(13.62)	(5.04)	(7.79)	(5.79)	(4.38)
Recession dummy	-31.99**	-11.40			-16.50**
	(13.40)	(8.57)			(6.42)
R-squared	0.17	0.13	0.10	0.03	0.10
Observations	98	134	91	36	287

Table 10 Logistic regression based on quartile performance

Independent Variables	Dependent variable: Dummy_1stQuartile				
	1	2	3	4	5
Intercept	-50.33	-51.81	-52.79	-52.73	-53.38
	(18.23)	(18.20)	(18.24)	(18.33)	(18.37)
GDP growth rate					0.17
					(0.31)
Fund size	4.49**	4.67**	4.67**	4.77***	4.78***
	(1.82)	(1.82)	(1.82)	(1.83)	(1.83)
Fund size-squared	-0.09**	-0.10**	-0.10**	-0.11**	-0.11**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Historical		0.03	0.03	0.03	0.03
Investment #		(0.02)	(0.02)	(0.02)	(0.02)
Fund raised over targeted				-0.21	-0.20
ratio				(0.41)	(0.41)
VC dummy			0.98		
			(1.09)		
Recession dummy					0.39
					(1.20)
Strategy FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
ROC	0.76	0.77	0.77	0.77	0.77
Observations	429	429	429	429	429

ROC, receiver operating characteristics, is a graphical plot that illustrates the performance of a binary classifier system.
Number above the 0.5 represents good classification results and good distinguishing power from independent variables.