

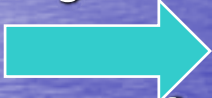
The Investment Behavior of Buyout Funds: Theory & Evidence

Alexander Ljungqvist, Matt Richardson
& Daniel Wolfenzon

Q Group Presentation: October 15th

STORY

Assume the optimal transaction is a buyout

- In a perfectly, competitive capital market
 - Capital flows freely into buyout funds which bid up the target's price. LPs earn normal rates of return; buyout funds are paid fees that cover actual & opportunity costs; any gains accrue to target shareholders.
 -  Can't say much about investment behavior.
- Does perfect, frictionless competition describe the buyout market?
 - Capital is sticky.
 - Takes time to raise capital given shocks to the credit and investment opportunity market.
 - Private equity capital (in the past at least) has been illiquid, limiting the supply of investors.

STORY

continued...

- If capital is sticky, then rents will partially transfer from target shareholders to *existing* buyout funds as their bargaining power increases until the supply of capital catches up.
- Because buyout funds now capture some rents, their investment behavior depends upon market conditions. We focus on two areas:
 1. If competition is weak, investment opportunities are good, or credit markets loose, buyout funds speed up investments and earn excess returns (with sticky capital markets).
 2. Buyout funds (to the extent possible) raise a fund every few years. What effect does this have?
 - If fund flows depend on ex post performance (they do), this creates an option-like payoff (beyond that contained in carry). Presumably, this flow-performance sensitivity is stronger for first-time funds given the lack of track record.
 - This leads to the following hypotheses:
 - First-time (or inexperienced) buyout funds are more likely to invest in riskier buyouts.
 - However, conditional upon initial success of the fund's investments, buyout funds (and especially first-time ones) become more conservative.
 - First-time buyout funds are less sensitive to market conditions like the degree of competition, investment opportunities or the credit market.
 - A corollary is that first-time funds will underperform experienced funds.
- Why would anyone invest in first-time funds?

Data

- LP provided detailed cash flow and investment data for 207 private equity funds (1981-2000), corresponding to 2,274 portfolio companies (through 2003). (See Table 1).
- Advantages of this sample:
 - No survivorship bias
 - No selective reporting
 - Large fraction of universe covered
 - LP not typical fund-of-fund investor, motivation primarily relationship driven
- Drawdown & Distribution Rates (See Figure 1)

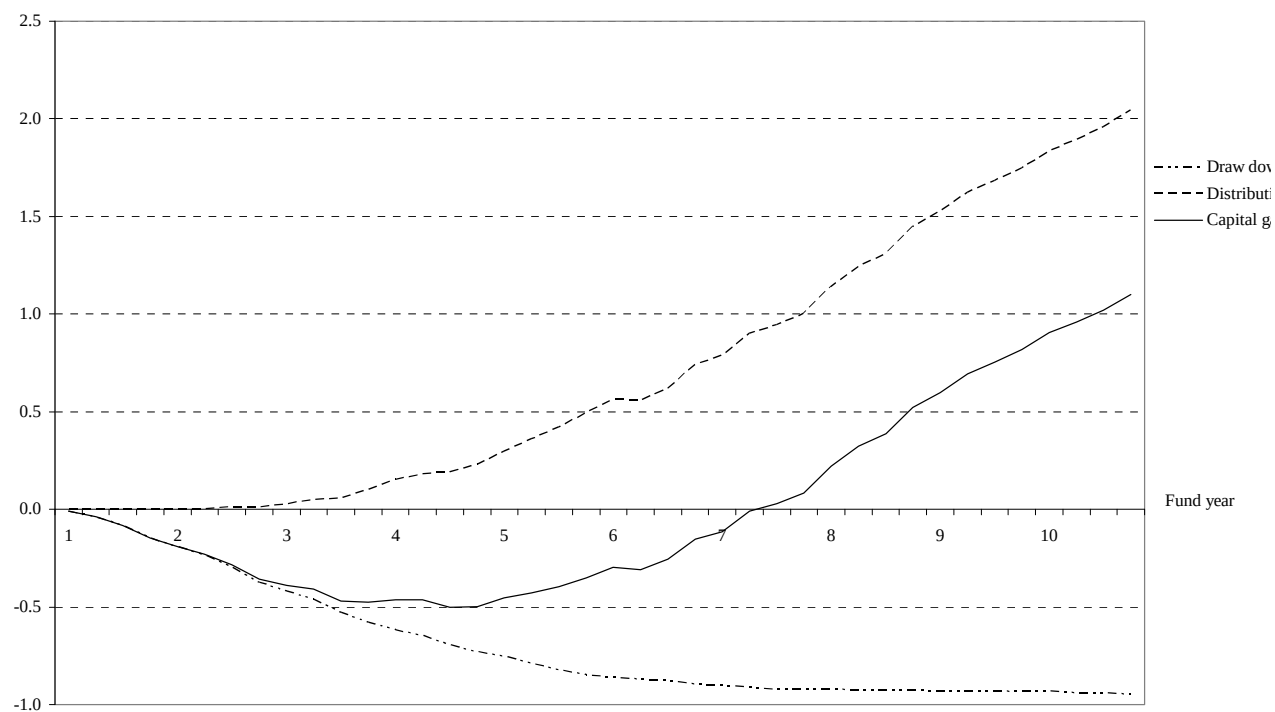
Table 1. Summary Statistics

The sample consists of 207 private equity (buyout) funds raised between 1981 and 2000 (the ‘vintage years’). We refer to the 53 buyout funds raised before 1993 as ‘mature’ funds. Fund size is the capital committed by investors to a fund in all closings, as reported by Venture Economics and corrected by us where needed using partnership reports prepared by the fund managers. Total fund size is the aggregate amount raised by all sample funds. The ‘VE universe’ refers to all funds raised in the relevant sample period according to Venture Economics. All monetary numbers are in nominal U.S. dollars.

	1981 to 2000	1981 to 1993
Number of funds	207	53
Fund size (committed capital, \$m)		
Total	170,917	32,055
Mean	829.7	604.8
Median	423.5	265.0
Type of fund (according to LP’s internal classification, in % of total)		
Small/Mid-Sized Buyout	48.4	36.4
Large Buyout	22.6	30.3
Buyout	16.1	27.3
Mezzanine	6.5	6.1
Growth Equity	2.6	
Private Equity	1.9	
Late Stage VC/Buyout	1.3	
Distressed Buyout	0.6	
Type of fund (according to Venture Economics, in % of total)		
Buyout	87.4	94.3
Generalist Private Equity	2.4	5.7
Mezzanine	4.8	
Venture Capital	4.8	
Other Private Equity	0.5	
% of VE universe covered (by capital)	35.0	31.4
First-time funds (as % of funds by number)	30.0	39.6
Age of partnership in fund vintage year		
Mean	9.4	7.1
Median	7.0	6.0

Figure 1. Draw down and distribution rates by fund year

The figure shows average quarterly cumulative draw downs for each year of a fund's life (counted from 1 to 10), divided by committed capital; average quarterly cumulative distributions divided by committed capital; and quarterly net capital gains (the difference between distributions and draw downs).



Methodology

- Goal is to relate timing of a fund's draw downs to various proxies – controls and our factors (investment opportunity, credit market conditions, competitive environment)
- Statistical methodology used is duration (or hazard) model – measure the effect on the time between fund raised and drawing down K% of capital (or probability of drawing down next \$).
- Factor proxies mirror previous authors' choices.
 - Investment opportunities: public market multiples of corresponding industry.
 - Competition: amount of capital committed to buyout funds in year the fund was raised; a Herfindahl index of concentration of uninvested capital by buyout funds in its industry in that quarter.
 - Yield spread on corporate bonds (conditions on credit rating).

Table 4. The Determinants of Draw Down Rates

	Time- varying?	Draw-down: 70% (1)	Draw-down: 80% (2)	Draw-down: 90% (3)
Investment opportunities				
value-weighted mean industry book/market ratio	yes	0.702** <i>0.291</i>	0.852*** <i>0.300</i>	1.035***¹ <i>0.343</i>
... X (dummy=1 if first-time fund)	yes	-0.160 <i>0.147</i>	-0.255* <i>0.145</i>	-0.362** <i>0.161</i>
Competition for deal flow				
log real fund inflows, same vintage year	no	0.342*** <i>0.121</i>	0.187 <i>0.131</i>	0.080 <i>0.119</i>
Herfindahl industry concentration index	yes	-0.384* <i>0.213</i>	-0.532** <i>0.227</i>	-0.806** <i>0.370</i>
Cost of capital				
BAA corporate bond premium over riskfree rate (in %)	yes	0.292** <i>0.120</i>	0.255** <i>0.130</i>	0.081 <i>0.156</i>
Fund characteristics				
log age of GP partnership in vintage year	no	-0.010 <i>0.043</i>	-0.025 <i>0.042</i>	-0.074 <i>0.052</i>
log real fund size	no	-0.002 <i>0.029</i>	-0.008 <i>0.034</i>	0.001 <i>0.038</i>
Market conditions				
quarterly return on Nasdaq Composite Index (in %)	yes	-0.002 <i>0.002</i>	-0.003 <i>0.002</i>	0.000 <i>0.003</i>
Diagnostics				
Pseudo- R^2		33.9 %	30.1 %	21.4 %
Likelihood ratio test: all coeff. = 0 (χ^2)		427.4***	191.4***	193.3***
Number of funds		206	206	206
Number of right-censored observations		86	94	109
Number of observations (time at risk)		2,550	2,776	3,080

1. Improving investment opportunities by one standard deviation (i.e., book-to-market), there is a 2.3 quarter decrease in time it takes to invest 90% of capital.

Flip Side - Investment Returns

- Fund's payoff should be a function of its investment decisions.
- If rents accrue to buyout funds due to sticky capital under these favorable conditions, then it should show up in performance.
- Regress the geometric return on investment for each portfolio company on similar controls and factors as in the investment decision analysis.

Table 6. Determinants of investment returns

Vintage years:	1981 to 1993	1981 to 1994	1981 to 1995	1981 to 1996	1981 to 1997	1981 to 1998
Investment opportunities at time of investment						
value-weighted mean industry book/market ratio	-3.634** <i>1.709</i>	-5.665*** <i>1.315</i>	-6.068** <i>1.896</i>	-7.191** <i>1.965</i>	-9.824*** <i>1.310</i>	-7.693** <i>2.506</i>
... X (dummy=1 if first-time fund)	0.168 <i>0.613</i>	-0.599 <i>0.901</i>	-1.329 <i>1.120</i>	-1.368 <i>1.017</i>	-1.468 <i>0.912</i>	-1.490 <i>1.187</i>
Competition for deal flow at time of investment						
log real fund inflows	0.067 <i>0.863</i>	-3.198*** <i>0.285</i>	-4.035*** <i>0.521</i>	-4.622*** <i>0.422</i>	-4.896*** <i>0.371</i>	-4.695*** <i>0.303</i>
Herfindahl industry concentration index	-0.009 <i>0.014</i>	0.034*** <i>0.003</i>	0.040*** <i>0.003</i>	0.049*** <i>0.004</i>	0.057*** <i>0.004</i>	0.056*** <i>0.006</i>
Cost of capital at time of investment						
BAA corporate bond premium over riskfree rate	0.591 <i>1.209</i>	-1.902*** <i>0.469</i>	-2.716*** <i>0.506</i>	-3.793*** <i>0.618</i>	-3.667*** <i>0.522</i>	-3.693*** <i>0.448</i>
Fund characteristics						
log age of GP partnership in vintage year	0.615 <i>0.459</i>	0.837* <i>0.404</i>	0.418 <i>0.468</i>	0.356 <i>0.368</i>	0.198 <i>0.294</i>	0.253 <i>0.268</i>
log real fund size	0.194 <i>0.323</i>	0.060 <i>0.205</i>	0.555*** <i>0.139</i>	0.336* <i>0.153</i>	0.256 <i>0.213</i>	0.113 <i>0.216</i>
log real investment cost	0.522** <i>0.210</i>	0.224 <i>0.120</i>	0.118 <i>0.183</i>	0.046 <i>0.165</i>	0.019 <i>0.138</i>	0.069 <i>0.071</i>
fund year in which investment was made (1 to 10)	-0.158 <i>0.186</i>	-0.110 <i>0.059</i>	0.053 <i>0.075</i>	0.235*** <i>0.044</i>	0.315*** <i>0.050</i>	0.385*** <i>0.045</i>
Market conditions at time of investment						
quarterly return on Nasdaq Composite Index (in %)	2.111 <i>3.862</i>	0.082 <i>2.027</i>	-1.699 <i>0.886</i>	-0.506 <i>1.668</i>	-0.725 <i>1.246</i>	-0.134 <i>1.142</i>
Adjusted R^2	3.9 %	13.3 %	18.6 %	26.1 %	35.9 %	39.8 %
Wald test: all coeff. = 0 (F)	6.4***	17.8***	14.6***	29.5***	59.5***	79.9***
No. of portfolio companies	426	571	655	807	1,011	1,273

First-time Versus Experienced Funds

- Two features
 - Investment sensitivity
 - Dummy variable in Table 4 shows some evidence of less sensitivity for first-time funds.
 - More direct test compares sensitivity before and after successes. Should be similar for experienced GPs; different for first-time funds. (Table 5).
 - Measure success by fund having positive IRR with significant capital remaining.
 - Risk-taking
 - Want to test whether first-time funds invest in riskier buyouts than experienced funds.
 - Want to investigate life-cycle pattern of risks that a fund takes.

Table 5. Change in Investment Sensitivities by Fund Age

	Draw-down: 70%			Draw-down: 80%			Draw-down: 90%		
	before	after	difference	before	after	difference	before	after	difference
first-time funds	0.494 <i>0.031</i>	0.981 <i>0.000</i>	0.487 <i>0.018</i>	0.572 <i>0.047</i>	0.914 <i>0.006</i>	0.342 <i>0.147</i>	0.664 <i>0.000</i>	0.995 <i>0.000</i>	0.331 <i>0.013</i>
older funds	0.713 <i>0.000</i>	- <i>0.223</i>	-0.960 <i>0.000</i>	0.870 <i>0.003</i>	- <i>0.327</i>	-1.195 <i>0.000</i>	1.107 <i>0.000</i>	0.222 <i>0.287</i>	-0.885 <i>0.000</i>
difference	- 0.219 <i>0.254</i>	- 1.228 <i>0.000</i>	1.447 <i>0.000</i>	- 0.298 <i>0.054</i>	- 1.239 <i>0.000</i>	1.537 <i>0.000</i>	-0.442 <i>0.000</i>	0.774 <i>0.000</i>	1.216 <i>0.000</i>

Risk-Taking by First-Time Funds

- Analysis #1 (Table 7)
 - Compute standard deviation of ex post log returns in a given year as an estimate (albeit noisy) of ex ante volatility in that year.
 - Holding controls and factors constant, investigate whether first-time funds make riskier investment choices.
- Analysis #2 (Table 8)
 - “Life cycle” pattern in risk taking suggests that funds should become more conservative after good performance (to lock-in next fund), and this should be stronger for first-time funds.
 - Methodology:
 - Compute standard deviation of ex post log returns in first five years versus next five years.
 - Two proxies for interim performance:
 - The number of exits.
 - Fraction of committed capital distributed to investors.

Table 7. Determinants of portfolio risk

	Vintage years:	1981 to 1993	1981 to 1994	1981 to 1995	1981 to 1996	1981 to 1997	1981 to 1998
Fund characteristics							
dummy=1 if first-time fund		2.120**	1.715***	1.142*	1.239**	0.025	1.023***
		<i>0.918</i>	<i>0.663</i>	<i>0.636</i>	<i>0.633</i>	<i>0.401</i>	<i>0.374</i>
log real fund size		-0.444***	-0.377***	-0.413***	-0.382***	-0.378***	-0.361***
		<i>0.082</i>	<i>0.070</i>	<i>0.064</i>	<i>0.049</i>	<i>0.044</i>	<i>0.044</i>
Investment opportunities in fund-year							
value-weighted mean industry book/market ratio		-4.645***	-1.733**	-1.846***	-1.844***	-2.174***	-1.646***
		<i>0.734</i>	<i>0.711</i>	<i>0.628</i>	<i>0.473</i>	<i>0.433</i>	<i>0.374</i>
... X (dummy=1 if first-time fund)		-2.751**	-2.218**	-1.704*	-1.801*	-0.224	-1.599**
		<i>1.324</i>	<i>1.047</i>	<i>1.022</i>	<i>1.020</i>	<i>0.687</i>	<i>0.653</i>
Competition for deal flow in fund-year							
log real fund inflows		1.068***	0.807***	0.537***	0.522***	0.304***	0.083
		<i>0.126</i>	<i>0.112</i>	<i>0.104</i>	<i>0.085</i>	<i>0.078</i>	<i>0.074</i>
Herfindahl industry concentration index		-6.671***	-7.807***	-6.933***	-5.610***	-5.704***	-3.993***
		<i>1.085</i>	<i>1.167</i>	<i>1.157</i>	<i>0.985</i>	<i>0.981</i>	<i>1.090</i>
Cost of capital in fund-year							
BAA corporate bond premium over riskfree rate		1.671***	0.757***	0.160	-0.008	-0.232**	-0.677***
		<i>0.252</i>	<i>0.233</i>	<i>0.213</i>	<i>0.142</i>	<i>0.118</i>	<i>0.107</i>
Market conditions in fund-year							
quarterly return on Nasdaq Composite Index (in %)		-1.809**	-1.696**	-0.512	-0.307	-0.143	0.520
		<i>0.754</i>	<i>0.682</i>	<i>0.661</i>	<i>0.511</i>	<i>0.472</i>	<i>0.429</i>
Adjusted R^2		21.2 %	15.5 %	12.8 %	12.8 %	11.1 %	9.9 %
Wald test: all coeff. = 0 (F)		63.0***	52.6***	42.2***	32.7***	28.0***	26.2***
No. of fund-years		266	344	393	439	511	588

Table 8. Changes in portfolio risk

	Vintage years:	1981 to 1993	1981 to 1994	1981 to 1995	1981 to 1996	1981 to 1997	1981 to 1998
Fund characteristics							
log real fund size		1.107*** <i>0.108</i>	1.014*** <i>0.104</i>	0.841*** <i>0.092</i>	0.573*** <i>0.068</i>	0.351*** <i>0.048</i>	0.286*** <i>0.039</i>
Performance in first-half of fund life							
number of exits		-0.052*** <i>0.011</i>	-0.102*** <i>0.019</i>	-0.083*** <i>0.017</i>	-0.059*** <i>0.014</i>	-0.041*** <i>0.013</i>	-0.026** <i>0.010</i>
... X (dummy=1 if first-time fund)		-0.529*** <i>0.074</i>	-0.319*** <i>0.051</i>	-0.261*** <i>0.048</i>	-0.205*** <i>0.044</i>	-0.108*** <i>0.035</i>	-0.122*** <i>0.035</i>
fraction of committed capital distributed to LPs		-1.950*** <i>1.122</i>	-2.535** <i>1.208</i>	-2.825** <i>1.244</i>	-2.398** <i>1.210</i>	-2.658** <i>1.160</i>	-2.505** <i>1.134</i>
... X (dummy=1 if first-time fund)		-15.725* <i>6.669</i>	-4.857 <i>3.111</i>	-2.165 <i>2.571</i>	1.107 <i>2.408</i>	-0.587 <i>2.316</i>	-0.394 <i>2.244</i>
Adjusted R^2		35.2 %	31.3 %	30.0 %	28.9 %	26.7 %	26.8 %
Wald test: all coeff. = 0 (F)		24.5***	24.8***	25.1***	26.7***	27.2***	31.1***
No. of funds		50	65	77	89	111	139

Conclusions

- What factors explain the investment behavior of buyout funds?
 - In a framework with sticky capital, theory suggests funds should try to exploit favorable conditions in the investment and credit markets. Evidence suggests this is the case.
 - Counteracting this “optimal” behavior is the incentive for funds to generate high current returns in hope of raising a follow-on fund, especially for first-time funds. Again, evidence is consistent with this proposition.
- These findings can jointly explain why (i) experienced funds earn excess returns and first-time funds earn below average returns, and (ii) why LPs invest with first-time funds.