THE PREDICTIVE POWER OF THE J-CURVE

Cyril Demaria
University of Sankt-Gallen, Switzerland.

Abstract. Dealing with a recurring low level of data quality, we approach the behavior of Private Equity Funds (PEFs) by using illiquidity as a factor of analysis. PEF cash-flows ("J-Curves") are the basis of the research. After identifying aggregated PEF return categories ("ideal-types"), individual J-Curves are compared with the ideal-types. The resulting model acts as a predictor of future performance of PEF, excluding first return categories; and then attributes a fund to a specific category with a certain level of confidence. This model could help reduce solvency costs associated with investing by PEFs, and support the on-going assessment of active PEFs.

Keywords: private equity (PE), venture capital (VC), leveraged buy-out (LBO), cash-flow, solvency ratio, J-curve

JEL classifications: G24; G28; G32

Introduction

Current and future solvency and prudential ratios use historical risk-return profiles of Private Equity Funds (PEF). Resulting ratios are artificially high (e.g. EDHEC, 2010; Studer and Wicki, 2010) for European insurance groups). Amending solvency and prudential ratios to take into account the specificities of investing in private equity is difficult, for four reasons.

First, the performance of PEFs is only known once these closed-end funds are liquidated, after 10 to 12 years. The temptation to use earlier measures of performance, notably internal rates of return (IRRs), should be avoided (Kocis *et al.*, 2009, Ch. 7; and Gottschalg, 2012). IRRs are based on quarterly net asset values (NAVs), interim valuations of PEFs mixing realized and unrealized returns, the latter being estimated by PEF managers themselves[1]. They are sensitive to early distributions (such as "dividend recaps[2]" in LBO), and to external events such as portfolio reevaluations to prepare a fund raising (Jenkinson *et al.*, 2013).

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[1] NAV calculations are defined by the professional associations in the International Private Equity and Venture Capital Valuation Guidelines (IPEV) that EVCA co-authored (2012), and the accounting standards such as IFRS (SFAS 157) and US GAAP (FASB 820, IAS 39). The NAV is the residual value of a PEF: related to the total invested capital; it provides a 'residual value to paid-in capital' (RVPI) ratio, which decreases as investments are realized (and hence account as DPI). The sum of DPI and RVPI forms the 'total value to paid-in capital' (TVPI), which is the multiple of the investment of the fund.

[2] LBO fund managers increase the debt of the holding of a given portfolio company to generate an anticipated profit distribution.

Higson and Stucke (2012) recommend using data from fully liquidated funds only, which is difficult in practice due to the time-lag involved. To address this difficulty, this research focuses on the profile of cumulated cash-flows of PEFs over their life times: the "J-curve" (Meyer and Mathonet, 2005). The definition of PEFs' J-Curves is important, as some misunderstandings on their inputs and signification have led some practitioners to reject it (Mulcahy *et al.*, 20123).

The second reason amending ratios is tough is that the analysis of PEFs is affected by a recurring lack of transparency (Higson and Stucke, 2012). Modern private equity investing (i.e., through funds) is recent. The activity started in the 1970s in the US for leveraged buy-outs (LBO) and venture capital (VC), in the 1990s for the rest of the developed world, and essentially after 2000 for remaining countries (Demaria, 2010, Chapters 1 & 2). Geographical markets hence exhibit different levels of maturity, and performances history is limited to thirty years of activity, at best. Data is dominated by US figures, which represent 60% of documented worldwide investments (Exhibit 1). Ljungvist and Richardson (2003) note that 91.1% of the 73 funds of their sample are based in the US (7.5% in Europe, 1.5% in Latin America). Though some American institutions, such as public pension funds, have the obligation to disclose the structure and the performance of their private equity portfolio under the Freedom of Information Act (and the jurisprudence *CalPERS vs San Jose Mercury News*, 2002), data remains scarce and patchy.

Exhibit 1. Geographical repartition of investments, by region, by deal number and by volumes of investments,

This table sums up all PE investments (excluding real estate) done between January 1, 2005 and December 31, 2010, as reported by Thomson ONE Banker4. All monetary numbers are in nominal U.S. dollars.

Company location by region	Nb. of investments	Fraction of investments (%)	Nb. of Companies	Fraction of companies (%)	Sum of Equity Invested (USD Mil)	Fraction of equity invested (%)
Americas	42 663	59.58	21 213	51.01	616 164.68	60.98
Europe	18 659	26.06	12 764	30.69	231 017.02	22.86
Asia	8 657	12.09	6 483	15.59	140 900.71	13.95
Pacific	1 241	1.73	773	1.86	17 934.23	1.77
Africa	383	0.53	354	0.85	4 381.49	0.43
TOTAL	71 603	100.00	41 587	100.00	1 010 398.13	100.00

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3 As a matter of fact these authors have computed IRRs instead of cash-flows to draw their curves, hence leading to a misunderstanding of the use of the J-Curve itself.

4 At the time of writing, only figures as of September 30, 2011 are known. In order to deliver complete years, we chose to limit our five years summary as of December 31, 2010.

A third reason for complications is that PEFs are subject to activity and performance "waves" (for US LBO: Higson and Stucke, 2012; for US VC: Robinson and Sensoy, 2011), materialized in an increase in funds raised, in investments and in company valuations; and a decrease of returns (Higson and Stucke, 2012; Harris et al., 2012). However, though fund flows are positively related to past performance, Kaplan and Schoar (2005; confirmed by Higson and Stucke, 2012, and Harris *et al.*, 2012) find no significant relation between performances and fund sizes (in LBO). While assets under management have increased from USD 10 billion in 1991 to 180 billion in 2000 (Kaplan and Schoar, 2005) and 3 trillion in 20125, PE returns have been decreasing (Higson and Stucke, 2012; Harris *et al.*, 2012).

The fourth challenge to amending solvency and prudential ratios is that PE exhibits a strong volatility of fund performances within a vintage year (VY), and from one VY to the other (Kaplan and Schoar, 2005).

To address these challenges, this research capitalizes on the fact that all PEFs exhibit a cash-flow pattern described as a J-curve. This constant will be used to approach PEF performance: illiquidity being a fundamental defining factor of private equity investing, this research will use J-curves to deepen the understanding of the sector. The first step is to identify categories of returns among J-curves ("ideal-types") so as to qualify their past, present and future behavior through modeling and projections.

The purpose of this paper is to analyze the behavior and performance of PEFs based on their reported cash-flows, in order to predict the performance of PEFs; and possibly support an effective calibration of solvency and prudential ratios for investors in private equity.

After setting the empirical framework and reviewing the literature, the data and the methodology adopted are presented. The results are then discussed followed by the limits of the findings and perspectives for further research.

Empirical Framework and Literature

Private equity fund organization and processes

PEFs are usually structured as closed-end limited partnerships with a lifespan of ten years (optionally extended by two times one year). PEF investors ("limited partners", or LPs) commit to these funds during the fundraising period. Commitments added up become the "fund size". The fund creation date defines its "vintage year" (VY), and is used to benchmark this fund with its peers applying the same strategy in the same geographical area. PEFs are managed by "general partners" (GPs), who draw down the capital ("capital calls" or "draw downs") to pay management fees and invest in (usually non listed) companies ("paid-in").

LPs usually commit 99% of the fund size, and the GP is expected to commit 1% of the fund size. Capital is called during the investment period of the fund (usually five years, optionally extended by one year). Once the investment period over, the fund stops new investments (it can reinvest in VC portfolio companies if needed) and starts its divestment period (the remaining five to seven years). At any time during the fund's life, the fund can sell a portfolio company and distribute the proceeds to investors ("distributions"). Depending on the limited partnership agreement (LPA), the GP can recycle some of the proceeds to invest

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5 See: "Private equity assets record USD 3 trillion" (http://www.preqin.com/item/private-equity-assets-hit-record-3-trillion/102/5477, last accessed 18/4/2013).

the fund up to 100%. If not, then the amount invested will be lower than the fund size (the difference being fees paid out).

Depending on the LPA, management fees are calculated as a proportion of the fund size (committed capital) or capital called in the investment period, and as a proportion of the net invested capital or the NAV during the divestment period. Management fees amount to between 1.5% to 3% per year (Gompers and Lerner, 1999): medians are 2.5% for VC funds and 2% for LBO funds (Robinson and Sensoy, 2012). Additional fees can be charged to the fund, including costs such as the set-up fee, the expense of due diligence to assess a potential portfolio company, auditing, fund administrator or custodian fees, and other additional expenses. To further align the interests of GPs and LPs, a performance fee (the "carried interest") is paid to GPs, calculated on the profit of the fund (usually 20%, though it can vary between 15 and 30% and depends on the GP's past performances (Robinson and Sensoy, 2012). Depending on the LPA, the carried interest can be paid deal-by-deal or on the overall performance of the fund, often after distributing to the LPs an annual preferred return rate of return (or "hurdle rate") of 6 to 8% calculated on the amounts drawn down. Once the hurdle rate paid, a pro-rata (or "catch-up") is paid to the GP. Further proceeds are then split between distributions and carried interest as agreed upon.

Poor available information

One cannot ignore the problems associated with private equity data in published studies. To study the PE sector, a first panel of studies worked with data from a single source, usually a PEF investor (Ljungvist and Richardson, 2003; Lerner *et al.*, 2007; Robinson and Sensoy 2012), or with harmonized databases maintained by service providers (Cambridge Associates (Exhibit 2) and Burgiss) sourced from their clients (LPs). It is difficult to generalize about these findings: though data gathered is coherent, as a direct result of the investment monitoring by LPs, PE investment strategies (and returns) depend on the type of investor, their total assets under management, the set-up, the localization (home-investing bias), the number of years of experience and know-how, preferences and approach to PE investing (Lerner *et al.*, 2007; Hobohm, 2010), as well as the legal structure, and regulatory constraints. For example, 60% of the LPs surveyed by Burgiss are public and corporate pension funds, and 20% are endowments and foundations (Harris *et al.*, 2012). Hence, Burgiss and Cambridge Associates cover the LP landscape only partially.

A second panel of studies uses commercial data from providers such as Thomson (Exhibit 2), which provide only a partial perspective on PE returns. Some database providers collect public information and voluntary disclosure from LPs. Thomson provides data on an aggregated basis to preserve the confidentiality of the underlying source. However, commercial databases are affected by biases (Higson and Stucke, 2012; Harris *et al.*, 2012) as funds sometimes provide incomplete cash-flows. One of the issues affecting the quality of data is the treatment of funds with no cash flow while still active (for which presumably the GP failed to report so NAVs were replicated from one quarter to the other). Thomson used to keep them on record, as a result of which the IRRs of these funds declined, hence mechanically lowering the returns (Stucke, 2011). Higson and Stucke (2012) argue that VYs 1980 to 1993 are reliable. This detail should strengthen our results6.
PE returns are usually reported net of fees. The difference between gross and net returns is due to management fees, the carried interest of the GP, and additional fees and expenses

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6 We have flagged 43 inconsistencies in Thomson's database, some of which were later removed by the database provider between August and November 2012.

necessary to the functioning of the PEF. However, if details are not provided, it is impossible to separate investments from expenses in the cash-flows of a fund; nor to differentiate distributions between refund and profits. Thomson ONE does not provide details on operational fees (e.g. transaction and monitoring), or on operational distributions (Board compensation, advisory), which can be split between LPs and GPS, or be fully allocated to LPs or to GPs, hence making it difficult to estimate. Only net data provided by LPs is communicated (the database provider does provide gross cash-flows) so errors and biases on reporting net cash-flows cannot be assessed.

Fund terms are increasingly negotiated between LPs and GPs[7]. Some GPs offer the choice between a 1% management fee and a 30% carried interest, and a classical 2%-20%. Others offer a progressive carried interest, or solutions to lower[8] the marginal cost of investing in PE. Given the increased diversity of the PEFs' terms and conditions (Banal-Estañol and Ippolito, 2012), it is methodologically more rigorous to work on gross returns.

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[7] See for example: Primack, Dan, "Random Ramblings", Term Sheet, *Fortune*, 05/06/2012 (http://finance.fortune.cnn.com/category/term-sheet/ - accessed 5/6/2012)

[8] Some fund managers offer co-investment programs to investors: see *Private Equity International*, The 'trouble' with preferential treatment, The Friday Letter, 03/07/2012 (http://www.privateequityinternational.com/Article.aspx?aID=0&article=68163 - accessed 9/7/2012)

Exhibit 2. Net returns of VC, "private equity" and LBO funds in the US and EMEA

This table provides average and median IRRs, and TVPIs of VC, "PE" and LBO funds for VYs 1980 to 2010, as reported by Cambridge Associates (as of June 30, 2012) and Thomson ONE Banker (as of December 31, 2011).

	Vintage year	US Venture Capital							
		Cambridge Associates				Thomson One			
		Sample	Average IRR (%)	Median IRR (%)	TVPI	Sample	Average IRR (%)	Median IRR (%)	Average TVPI
Fully realized*	1980	-	-	-	-	14	13.34	13.35	2.30
	1981	9	9.01	7.87	1.76	21	7.81	9.60	1.81
	1982	11	7.20	7.92	1.79	28	2.63	3.79	1.39
	1983	28	9.55	8.72	2.01	58	5.37	5.03	1.71
	1984	32	7.74	6.27	1.76	63	4.99	3.54	1.57
	1985	26	11.70	12.86	2.69	46	8.19	8.63	2.02
	1986	30	8.82	9.43	2.90	38	7.19	5.97	1.70
	1987	34	14.53	15.65	2.72	64	7.55	7.15	2.02
	1988	26	14.32	11.87	2.50	45	12.16	9.22	2.03
	1989	37	17.05	13.31	2.59	50	12.68	10.83	2.11
	1990	17	24.07	21.54	3.15	23	17.11	13.67	2.22
	1991	16	23.10	17.61	3.06	17	14.58	14.10	2.12
	1992	23	28.67	20.99	3.13	28	27.63	14.37	3.43
	1993	37	29.53	18.81	4.13	41	21.89	12.02	2.92
	1994	42	34.25	26.45	5.40	36	25.92	23.74	3.22
	1995	36	54.83	38.50	5.98	48	41.09	20.33	3.84
	1996	41	61.19	40.87	5.01	38	63.31	28.15	4.43
	1997	71	53.74	9.65	3.11	61	52.55	19.97	2.61
	1998	82	16.47	(0.45)	1.49	80	25.09	1.65	1.66
	1999	115	(3.59)	(3.41)	0.95	106	(4.27)	(5.12)	0.87
	2000	154	(3.00)	(2.40)	1.01	122	(2.74)	(2.66)	0.91
	2001	53	(1.14)	(0.21)	1.12	60	2.78	1.27	1.17
Active	2002	34	1.43	1.80	1.01	19	(0.42)	(1.49)	0.96
	2003	37	(0.45)	0.62	1.32	21	2.71	1.08	1.10
	2004	66	2.42	0.69	1.43	28	2.37	1.56	1.32

| | US Venture Capital | | | | | | | |
| | Cambridge Associates | | | | Thomson One | | | |
Vintage year	Sample	Average IRR (%)	Median IRR (%)	TVPI	Sample	Average IRR (%)	Median IRR (%)	Average TVPI
2005	61	1.54	2.86	1.20	23	4.90	4.32	1.26
2006	76	4.22	5.14	1.25	44	0.25	0.78	1.03
2007	61	11.04	7.91	1.36	24	8.09	8.15	1.33
2008	54	6.58	5.63	1.25	20	6.87	6.29	1.14
2009	19	5.14	10.11	1.32	13	7.14	5.35	1.08
Fully real. ave.	43.81	19.91	13.42	2.77	49.40	16.68	9.94	2.18
Active funds av.	51.00	3.99	4.35	1.27	24.00	3.99	3.26	1.15
All funds ave.	45.79	15.52	10.92	2.36	42.63	13.29	8.15	1.91

* Vintage years 2000 and 2001, though having reached their 10-year lifespan, might still be active and under life extension periods.

** Cambridge Associates mixes LBO, growth, energy and mezzanine funds in the same benchmark.

*** Simple average only.

Exhibit 2 (continued)

	Vintage year	US LBO							
		Cambridge Associates**				Thomson One			
		Sample	Average IRR (%)	Median IRR (%)	TVPI	Sample	Average IRR (%)	Median IRR (%)	Average TVPI
Fully realized*	1980	-	-	-	-	-	-	-	-
	1981	-	-	-	-	-	-	-	-
	1982	-	-	-	-	-	-	-	-
	1983	-	-	-	-	-	-	-	-
	1984	-	-	-	-	7	32.45	18.02	3.61
	1985	-	-	-	-	8	41.68	29.57	2.76
	1986	11	12.82	11.13	3.41	10	18.27	14.92	3.21
	1987	12	13.15	10.82	1.86	24	8.49	9.22	2.02
	1988	17	14.02	12.30	2.00	16	9.85	10.11	1.78
	1989	18	20.31	20.51	2.58	25	13.08	12.34	2.15
	1990	8	15.00	15.06	1.84	10	6.40	9.21	1.48
	1991	11	31.21	38.85	3.27	5	20.26	20.45	2.74
	1992	15	26.24	18.63	2.88	14	19.96	18.38	2.12
	1993	25	18.30	21.74	2.29	20	19.30	16.25	2.02
	1994	21	13.60	9.68	2.41	25	13.83	11.03	1.51
	1995	33	16.15	10.91	1.95	25	11.66	10.01	1.59
	1996	37	9.59	7.94	1.57	25	6.14	0.47	1.28
	1997	51	5.52	7.45	1.41	40	5.97	2.98	1.21
	1998	54	10.49	9.64	1.42	55	4.91	3.16	1.31
	1999	54	12.18	11.84	1.83	38	3.59	3.33	1.25
	2000	75	12.94	12.38	1.78	51	11.19	10.92	1.63
	2001	24	23.86	21.48	2.06	27	13.54	10.65	1.57
Active	2002	33	15.82	16.61	1.89	19	13.24	13.64	1.52
	2003	36	15.08	12.91	1.75	17	7.59	10.61	1.62
	2004	64	11.16	9.97	1.52	21	14.38	10.62	1.54
	2005	87	8.10	8.48	1.30	33	7.19	6.47	1.26

| | | US LBO | | | | | | |
| | | Cambridge Associates** | | | | Thomson One | | |
Vintage year	Sample	Average IRR (%)	Median IRR (%)	TVPI	Sample	Average IRR (%)	Median IRR (%)	Average TVPI
2006	77	9.79	8.29	1.21	35	5.15	3.90	1.15
2007	83	8.48	8.97	1.21	37	9.13	7.47	1.25
2008	66	10.49	9.79	1.19	29	13.19	12.73	1.26
2009	24	10.97	9.59	1.04	10	8.84	1.26	1.12
Fully real. ave.	29.13	15.96	15.02	2.16	23.61	14.48	11.72	1.96
Active funds av.	58.75	11.24	10.58	1.39	25.13	9.84	8.34	1.34
All funds ave.	39.00	14.39	13.54	1.90	24.08	13.05	10.68	1.77

*** (row label)

* Vintage years 2000 and 2001, though having reached their 10-year lifespan, might still be active and under life extension periods.

** Cambridge Associates mixes LBO, growth, energy and mezzanine funds in the same benchmark.

*** Simple average only.

Exhibit 2 (continued)

| | | EMEA VC | | | EMEA LBO | | | |
| | | Thomson One | | | Thomson One | | | |
Vintage year	Sample	Average IRR (%)	Median IRR (%)	Average TVPI	Sample	Average IRR (%)	Median IRR (%)	Average TVPI
1980	-	-	-	-	-	-	-	-
1981	3	7.08	6.44	1.84	-	-	-	-
1982	-	-	-	-	-	-	-	-
1983	4	9.69	9.61	2.02	-	-	-	-
1984	6	5.83	7.84	1.68	4	14.69	12.96	2.67
1985	16	0.94	4.65	1.45	-	-	-	-
1986	10	7.36	5.68	1.54	5	15.24	9.98	2.19
1987	8	4.71	3.69	1.41	7	8.55	4.76	1.62
1988	11	(5.50)	2.98	1.21	15	9.42	10.47	1.49
1989	20	1.66	4.65	1.75	10	6.76	9.90	1.34

Fully realized* (row label)

| | Vintage year | EMEA VC | | | | EMEA LBO | | | |
| | | Thomson One | | | | Thomson One | | | |
		Sample	Average IRR (%)	Median IRR (%)	Average TVPI	Sample	Average IRR (%)	Median IRR (%)	Average TVPI
	1990	14	10.78	8.10	2.51	12	7.19	6.46	1.37
	1991	11	2.12	1.97	1.34	15	11.96	10.77	1.62
	1992	6	12.30	15.56	1.91	7	19.95	21.07	2.14
	1993	11	4.78	0.21	1.45	8	21.58	8.75	1.81
	1994	16	6.48	6.67	1.85	14	25.83	23.71	2.03
	1995	13	1.31	(0.11)	1.05	11	22.47	8.78	1.91
	1996	18	25.33	5.27	2.04	18	11.29	9.04	1.52
	1997	35	11.01	2.53	1.60	26	16.04	7.43	1.76
	1998	33	6.72	(0.19)	1.46	25	7.02	6.71	1.45
	1999	57	5.01	(0.70)	1.02	36	12.90	13.12	1.74
	2000	93	(0.58)	(0.62)	0.98	35	17.40	17.53	2.24
	2001	62	(0.13)	(0.82)	1.05	21	17.77	18.85	1.84
Active	2002	34	(2.05)	(2.13)	0.88	23	22.35	13.61	1.87
	2003	41	(0.82)	(3.16)	0.98	19	11.23	6.91	1.52
	2004	45	0.98	(0.65)	1.03	18	14.12	6.08	1.48
	2005	38	(2.04)	(1.38)	1.03	34	2.17	1.99	1.06
	2006	39	0.15	(2.63)	1.12	38	(0.36)	1.54	1.03
	2007	54	(6.08)	(5.72)	0.86	31	(1.70)	(2.25)	1.00
	2008	55	(3.88)	(5.13)	0.95	26	0.36	(2.99)	1.01
	2009	36	(7.62)	(8.22)	0.89	13	6.38	2.35	1.16
	Fully real. ave.	22.35	5.90	4.20	1.57	15.82	14.47	11.78	1.81
***	Active funds av.	42.75	(2.67)	(3.63)	0.97	25.25	6.82	3.41	1.27
	All funds ave.	28.18	3.36	1.94	1.39	18.84	12.02	9.10	1.63

* Vintage years 2000 and 2001, though having reached their 10-year lifespan, might still be active and under life extension periods.

** Cambridge Associates mixes LBO, growth, energy and mezzanine funds in the same benchmark.

*** Simple average only.

Data and Methodology

Cash-flows of US and European VC and LBO funds are extracted over different periods to build average cash-flow curves. Data is available on a quarterly basis and aggregated. The first step is to analyze draw-down and distribution patterns of PEFs so as to understand their behavior. The second step is to characterize the evolution of cash-flow curves and assess their predictive power for the future outcome of PEFs. Only liquidated funds are used.

Draw-downs interpretation

Data blends fees and actual investments in draw-downs. This assumes an actual use of the capital, which is methodologically correct as our approach follows cash outflows. Net draw-downs cannot theoretically exceed 100% of the fund size.

Robinson and Sensoy (2012), declare that the expected investment pace for VC funds is 39%, 18%, 15%, 16% and 12% in years one through five, respectively. For LBO funds, it is 22%, 22%, 20%, 19% and 17%. Ljungvist and Richardson (2003) state that it takes six years on average for 90% of the committed capital to be called, which is coherent with standard investment periods of five years. The pace of draw downs is 16%, 20% and 20% of committed capital called in the first three years of operation. By year 10, on average, funds are called at 93.6%. Kaserer and Diller (2004) state that average European PEFs draw down 23% of total committed capital in the first year, and 60% within the first three years. The payback is after 7 years. Differences come from macro-economic conditions. Committed capital is not called up to 100% after five years, as some is needed to pay management fees (and in the case of VC funds, for follow-on rounds in existing investments).

Distributions interpretation

From the proceeds of liquidity events such as trade sales and initial public offerings, funds return the capital and then distribute capital gains to LPs (though stock distributions can happen - "distributions in-kind" - they are essentially cash distributions). Using only cash distributions can lower the outcome of the considered PEFs. In particular, data from VC funds from the decade 1980 shows substantial tail distributions after year 13. To prevent results from being affected by potential glitches in the data, a limit of fifteen years of PEFs activity has been set.

Data description and cycles identification

Data reported from Cambridge Associates and Thomson ONE (Exhibit 2) provide sample sizes, average and median IRRs, and average fund multiples ("total value to paid-in", or TVPI). If there are fewer than three funds in the sample, data are not provided. We have focused on the period prior to 2001 (fully liquidated funds). Thomson ONE provides VC and LBO data for the USA, and for Europe, Middle-East and Africa (EMEA). PE activity in the Middle-East and Africa started recently and should not significantly bias data for Europe. As Cambridge Associates provides data only for the US, and also separates VC from "PE" (that is to say LBO, mezzanine, energy and growth funds), it is used as a support to identify cycles.

The simple average IRR for US VC funds is 19.9% for Cambridge (1981-2001, with 920 funds reporting data) and 16.7% for Thomson (1980-2001, 1087 funds). Median IRRs are respectively for the same periods 13.4% and 9.9%. Average TVPIs are respectively 2.8x and 2.2x. Based on 447 EMEA VC funds (1981 and 1983-2001), Thomson provides an average

IRR of 5.9%, a median IRR of 4.2% and a TVPI of 1.6x. Based on this data and initial background, each VY is attributed to a return category. Exhibit 3 sums up the attribution mechanism.

Exhibit 3. Initial return categorization ("ideal-type") of average US and EMEA VC and LBO fund by VY through reading

These tables provide the results of the categorization of average US VC and LBO funds; and EMEA VC and LBO funds by VY, based on initial reading for fully realized funds based on average and median IRRs, and TVPIs for an attribution in one of the four ideal-type categories (low returns, medium returns, high returns and very high returns). Data reliability is put in perspective, notably for vintages identified as problematic (signaled by a minus sign). Outliers are signaled by an "O*" (or "O?" for those questioned).

	US VC				
Vintage year	Average IRR (%)	Median IRR (%)	Average TVPI	Initial category	Data reliable?
1981	Below av.	Below av.	1.4 to 2.1x	Medium	++
1982	Below av.	Below av.	1.4 to 2.1x	Medium	++
1983	Below av.	Below av.	1.4 to 2.1x	Medium	++
1984	Below av.	Below av.	1.4 to 2.1x	Medium	++
1985	Below av.	Below av.	1.4 to 2.1x	Medium	++
1986	Below av.	Below av.	1.4 to 2.1x	Medium	+
1987	Below av.	Below av.	1.4 to 2.1x	Medium	++
1988	Below av.	Below av.	1.4 to 2.1x	Medium	++
1989	Below av.	Below av.	1.4 to 2.1x	Medium	++
1990	**Above av.**	**Above av.**	**2.2 to 2.5x**	**High (0?)**	**++**
1991	**Above av.**	**Below av.**	**1.4 to 2.1x**	**Medium (O*)**	+
1992	Above av.	Above av.	2.6 to 4.4x	Very High	**++**
1993	Above av.	Above av.	2.6 to 4.4x	Very High	**++**
1994	Above av.	Above av.	2.6 to 4.4x	Very High	**+**
1995	Above av.	Above av.	2.6 to 4.4x	Very High	++
1996	Above av.	Above av.	2.6 to 4.4x	Very High	++
1997	Above av.	Above av.	2.6 to 4.4x	Very High	++
1998	**Above av.**	**Below av.**	**1.4 to 2.1x**	**Medium (O*)**	**++**
1999	Negative av.	Negative av.	Inf. to 1.2	Low	++
2000	Negative av.	Negative av.	Inf. to 1.2	Low	++

US VC					
Vintage year	Average IRR (%)	Median IRR (%)	Average TVPI	Initial category	Data reliable?
2001	**Below av.**	**Below av.**	**Inf. to 1.2**	**Low (O?)**	**++**

US LBO					
Vintage year	Average IRR (%)	Median IRR (%)	Average TVPI	Initial category	Data reliable?
1981	-	-	-	-	
1982	-	-	-	-	
1983	-	-	-	-	
1984	Above av.	Above av.	2.8 to 3.6x	Very high	+
1985	Above av.	Above av.	2.8 to 3.6x	Very high	++
1986	Above av.	Above av.	2.8 to 3.6x	Very high	++
1987	Below av.	Below av.	1.8 to 2.0x	Medium (O*)	-
1988	Below av.	Below av.	1.8 to 2.0x	Medium	++
1989	**Below av.**	**Above av.**	**2.0 to 2.8x**	**High (O*)**	**++**
1990	Below av.	Below av.	1.2 to 1.7x	Low	++
1991	Above av.	Above av.	2.0 to 2.8x	High	++
1992	Above av.	Above av.	2.0 to 2.8x	High	++
1993	Above av.	Above av.	2.0 to 2.8x	High	-
1994	Below av.	Below av.	1.8 to 2.0	Medium	++
1995	Below av.	Below av.	1.8 to 2.0	Medium	-
1996	Below av.	Below av.	1.2 to 1.7	Low	++
1997	Below av.	Below av.	1.2 to 1.7	Low	++
1998	Below av.	Below av.	1.2 to 1.7	Low	++
1999	Below av.	Below av.	1.2 to 1.7	Low	++
2000	Below av.	Below av.	1.8 to 2.0	Medium	+
2001	**Below av.**	**Below av.**	**1.2 to 1.7**	**Medium (O*)**	**+**

EMEA VC					
Vintage year	Average IRR (%)	Median IRR (%)	Average TVPI	Initial category	Data reliable?
1981	Above av.	Above av.	1.6 to 1.9x	High	+
1982	-	-	-	-	
1983	**Above av.**	**Above av.**	**1.9 to 2.5x**	**High (O*)**	**++**
1984	Above av.	Above av.	1.6 to 1.9x	High	+
1985	**Below av.**	**Above av.**	**1.3 to 1.6x**	**Medium (O*)**	**++**
1986	**Above av.**	**Above av.**	**1.3 to 1.6x**	**High (O*)**	**++**
1987	Below av.	Below av.	1.3 to 1.6x	Medium	++
1988	Below av.	Below av.	0.9 to 1.3x	Low	++
1989	**Below av.**	**Above av.**	**1.6 to 1.9x**	**High (O*)**	**++**
1990	Above av.	Above av.	1.9 to 2.5x	Very High	++
1991	Below av.	Below av.	1.3 to 1.6x	Medium	++
1992	Above av.	Above av.	1.9 to 2.5x	Very High	-
1993	Below av.	Below av.	1.3 to 1.6x	Medium	++
1994	Above av.	Above av.	1.6 to 1.9x	Very High (O*)	+
1995	Below av.	Below av.	0.9 to 1.3x	Low	++
1996	Above av.	Above av.	2.0 to 2.5x	Very High	++
1997	**Above av.**	**Below av.**	**1.6 to 1.9x**	**High (O*)**	**+**
1998	**Above av.**	**Negative av.**	**1.3 to 1.6x**	**Medium (O*)**	**++**
1999	Below av.	Negative av.	0.9 to 1.3x	Low	+
2000	Negative av.	Negative av.	0.9 to 1.3x	Low	++
2001	Negative av.	Negative av.	0.9 to 1.3x	Low	+

EMEA LBO					
Vintage year	Average IRR (%)	Median IRR (%)	Average TVPI	Initial category	Data reliable?
1981	-	-	-	-	
1982	-	-	-	-	
1983	-	-	-	-	
1984	Above av.	Above av.	2.2 to 2.7x	High (O*)	+
1985	-	-	-	-	
1986	Above av.	Below av.	1.8 to 2.2x	High (O*)	-
1987	Below av.	Below av.	1.4 to 1.8x	Medium	++
1988	Below av.	Below av.	1.4 to 1.8x	Medium	-
1989	Below av.	Below av.	1.3 to 1.4x	Low	++
1990	Below av.	Below av.	1.3 to 1.4x	Low	-
1991	Below av.	Below av.	1.4 to 1.8x	Medium	++
1992	Above av.	Above av.	1.8 to 2.2x	Very high	++
1993	Above av.	Below av.	1.8 to 2.7x	High (O*)	++
1994	Above av.	Above av.	1.8 to 2.2x	Very high (O*)	++
1995	Above av.	Below av.	1.8 to 2.2x	High (O*)	+
1996	Below av.	Below av.	1.4 to 1.8x	Medium	-
1997	Above av.	Below av.	1.5 to 1.8x	Medium (O*)	++
1998	Below av.	Below av.	1.4 to 1.8x	Medium (O*)	+
1999	Below av.	Above av.	1.4 to 1.8x	Medium (O*)	++
2000	Above av.	Above av.	2.2 to 2.7x	Very high	++
2001	Above av.	Above av.	1.8 to 2.7x	High	-

Some outliers appear and are assigned temporarily to a category for further testing. While gathering data, the quality of the output varied. A score was assigned to it.

Data processing and methodology

Based on the four categories above, the first step was to create our "ideal-types" profiles of cash-flows by aggregating J-curves of fully realized PEFs. The resulting statistical patterns will be used to benchmark actual and future funds. These cash-flows are boom/bust agnostic (they are not influenced by the Internet boom/bust for VC, nor the 2004-2008 boom for LBO); they are by definition normalized, as they aggregate each vintage year's J-curves with the same weight (i.e., regardless the amounts invested and distributed).

We then analyzed the four ideal-types identified and their usefulness as a predictor of this performance. Correlation tests have been used to qualify the ideal-types, identify representative vintages and challenge the outliers identified.

First step: data retrieval
From the PE section of Thomson ONE we have retrieved the quarterly cash-flows ("cash-flow summary") of VC and LBO funds in USA and EMEA (all flows are retrieved in USD), for all funds in each separate VY available through 2009 (after that date funds are not mature enough to provide meaningful cash-flows). The operation was repeated to filter out the top quartile funds (some VY do not count three funds or more and are hence unavailable). Thomson provides sample sizes, funds capitalization (cumulated fund size of the sample), takedowns (capital calls) and total distributions. Quarterly "cumulative returns" from inception were then retrieved, providing IRRs (average, capital weighted average, pooled average) calculated by Thomson (used only to cross-check our own IRR calculations).

Second step: sorting data
Exhibit 2 provides the average net performance from Thomson: sample size, capital-weighted average IRR and the capital-weighted average TVPI. This breakdown has been done for each VY for US VC (1981-2009) and LBO (1984-2009), and EMEA VC (1981-2009) and LBO (1984-2009). The operation was repeated for top quartile funds (unreported). Realized funds (up to 2001) have been separated from the unrealized funds (2002-2009).

Third step: data aggregation in fund categories (ideal-types) and graphical illustration
Each VY is then allocated to one of the four categories identified above. An average cash-flow curve for each category has been generated as well as another for the overall realized sample. These operations were then repeated for top quartile funds. Graphical illustrations (after computing data on a basis 100) have been generated with cumulated distributions, cumulated takedowns and cumulated DPI to illustrate the "J-curve" phenomenon, for the overall sample, then for each "ideal-type" and for each of the partially unrealized vintage years. Graphical illustrations are reported as Exhibits 6 and 7 for US venture capital funds (first with the average and the different categories, then with the average, a low returns scenario – as a matter of illustration - and the unrealized vintages); Exhibits 8 and 9 for US LBO funds (first with the average and the different categories, then with the average, a medium returns scenario – as a matter of illustration - and the unrealized vintages); Exhibits 10 and 11 for EMEA venture capital funds (first with the average and the different categories, then with the average, a low returns scenario – as a matter of illustration - and the unrealized vintages); Exhibits 12 and 13 for EMEA LBO funds (first with the average and the different categories, then with the average, a very high returns scenario – as a matter of illustration - and the unrealized vintages). Atypical behaviors, which could affect results, have been duly noted (see below).

Fourth step: determining the potential predictive power of the J-curve of performances
A correlation table for average and top quartile funds was then set. These correlations are based on the cash-flows (J-curves) for the average 1980-2001, the different ideal-types and for each vintage (including those beyond 2001). Results are presented in Exhibit 4 to 7 for average funds.

Though often criticized, correlation tests are in this case the most effective tool to use: directionality is not a matter of discussion, correlation tests are robust and not sensitive to high variability in the quality of input data (some of the cash-flows provided by Thomson are incomplete). More sophisticated econometric techniques would be richer, assuming that

accessible input data would be as well. As this is not the case (no information on the size of funds or industry focus or any additional data is provided along performance data is provided by Thomson), we directly accounted for the region of origin and investment strategy.

To test in-sample and out-of-sample periods, we ran correlations (unreported) with the VY 1985 of US VC funds paired with average US VC funds aggregated or by vintage (excluding VY 1985 from the paired data). The purpose was to identify its representativeness as the "medium" return "idea-type", and to test it with fully realized and partially unrealized funds. The test was run with top quartile funds and bottom quartile funds of the VY 1985. The same reasoning was applied to VY 1990 ("high" performance scenario) for average, top and bottom quartile US VC funds; with VY 1995 ("very high" performance9); and VY 2000 ("low" performance).

Exhibit 17 sums up the findings, and applies the predictive performance model to unrealized funds aggregated by VYs.

Fifth step: assessment of the reliability of the J-Curves to predict future performances
The last step was to determine when the correlations start to have a predictive role and to assess how reliable these predictions can be. We tested whether the "ideal-type" assessment of the final quarter of each year (Exhibit 18) reflects the final performance for each VY, in each strategy and in each geographical area. We then assessed the spread with the closest category of return, first if the end of quarter performance matched with the final performance, and then if it did not. This step replaced the usual concept of confidence intervals and provided probabilities which match the value-at-risk framework employed by the solvency and prudential ratio calculation.

Analysis and Findings

Analysis of the paid-in to committed capital (PIC) ratios

Calculations and analysis on (Exhibits 4 and 5) are based on:
- 1073 realized US VC funds (VYs 1981-2001), representing USD 181.7 bil. committed and 164.4 bil. paid-in. The net PIC is 0.90. The average fund size is 169.3 mil. (from a minimum average size of 33.4 mil. in 1981 to 470.6 mil. in 2001). This average fund size increases to USD 197.6 mil. if we include the funds of VYs 2002-2009 (leading to a total of 1265 funds, 249.9 bil. committed, 213.9 bil. paid-in).
- 425 realized US LBO funds (VYs 1984-2001), representing USD 292.2 bil. committed and 266.8 bil. paid-in. The net PIC is 0.91. The average fund size is 687.7 mil. (min: 171.5 mil. in 1985, max: 1161.5 mil. in 2001). Average fund size increases to USD 1174.6 mil. when we include VYs 2002-2009 (626 funds, 735.3 bil. committed, 612.1 bil. paid-in).
- 447 realized EMEA VC funds (VYs 1981-2001), representing USD 29.1 bil. committed and 22.7 bil. paid-in. The net PIC is 0.78. The average fund size is 65.2 mil. (min: 15.6 mil. in 1981, max: 99.3 mil. in 2000). The average fund size increases to USD 69.7 mil. when we include VYs 2002-2009 (789 funds, 54.9 bil. committed, 41.5 bil. paid-in).

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9 1996 and 1997 could qualify as well: their correlations are lower with the "Very High" returns category (0.93) but more distinctive with other return categories.

- 269 realized EMEA LBO funds (VYs 1984-2001), representing USD 88.9 bil. committed and 77.6 bil. paid-in. The net PIC is 0.87. The average fund size is 330.4 million (min: 16.0 mil. in 1984, max: 809.9 mil. in 2001). The average fund size increases to USD 691.0 mil. when VYs 2002-2009 (471 funds, 249.9 bil. committed, 213.9 bil. paid-in) are included.

The comparatively small number of EMEA funds accounted for necessitates a certain caution in our analysis and conclusions. Significant differences appear between the US and EMEA funds. The first is the PIC difference for VC (0.90 net in the US, 0.78 in EMEA): either because of different fund covenants or because of longer investment periods, EMEA VC funds have a lower PIC. This might explain their lower performances as compared with US funds, which have a more active reinvestment policy of early proceeds10. US and EMEA LBO funds have rather similar PIC. The second difference lies in fund sizes: US average fund sizes are more than double that of EMEAs. The relative weight of fixed costs is higher for EMEA funds so a proportion of EMEA funds may not be economically viable.

Exhibit 4. Net paid-in to committed ratios for US VC and LBO funds (1981-2001 and 1984-2001) and EMEA VC and LBO funds (1992-2001)

This table provides the committed capital, average fund sizes, paid-in and paid-in/committed (PIC) ratio for US VC and LBO funds; and EMEA VC and LBO funds from Thomson ONE Banker database (1981-2009).

| | Vintage year | US Venture Capital | | | | |
		Sample	Total committed	Average fund size	Paid-in	PI/C (net)
Fully realized*	1981	21	701.44	33.40	690.47	0.98
	1982	28	1 119.72	39.99	963.48	0.86
	1983	58	2 521.04	43.47	2 405.00	0.95
	1984	63	2 553.13	40.53	2 397.38	0.94
	1985	46	1 441.36	31.33	1 390.30	0.96
	1986	38	2 621.64	68.99	2 505.89	0.96
	1987	64	2 816.49	44.01	2 710.84	0.96
	1988	45	2 400.35	53.34	2 318.40	0.97
	1989	50	3 989.77	78.95	3 891.16	0.98
	1990	23	1 433.08	62.31	1 299.16	0.91
	1991	17	836.28	49.19	838.54	1.00
	1992	28	2 488.25	88.86	2 438.39	0.98
	1993	41	3 234.06	78.88	2 949.31	0.91

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10 Venture capital funds are allowed to reinvest in their portfolio companies even after the end of the investment period.

	Vintage year	US Venture Capital				
		Sample	Total committed	Average fund size	Paid-in	PI/C (net)
	1994	36	4 660.01	129.44	4 427.88	0.95
	1995	48	4 594.92	95.72	4 205.92	0.92
	1996	38	4 988.69	131.28	4 671.07	0.94
	1997	61	9 426.45	154.53	8 868.91	0.94
	1998	80	18 606.36	232.58	17 158.86	0.92
	1999	106	32 793.82	309.37	29 684.69	0.91
	2000	122	50 267.59	412.03	43 065.30	0.86
	2001	60	28 234.16	470.57	25 514.20	0.90
Active	2002	19	4 531.11	238.48	3 030.98	**0.67**
	2003	21	5 177.48	246.55	4 864.27	0.94
	2004	28	9 256.61	330.59	7 907.48	0.85
	2005	23	6 829.59	296.94	4 795.89	0.70
	2006	44	25 174.61	572.15	19 618.60	0.78
	2007	24	6 174.40	257.26	4 002.40	0.65
	2008	20	7 572.94	378.65	3 747.58	0.49
	2009	13	3 495.83	268.91	1 601.26	0.46
	Total realiz.	1073	181 698		164 394	
	Av. realiz.			169.33		0.90
	Total all	1265	249 911		213 963	
	Av. all			197.56		0.86

Exhibit 4 (continued)

	Vintage year	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
			US LBO			
Fully realized*	1981	-	-	-	-	-
	1982	-	-	-	-	-
	1983	-	-	-	-	-
	1984	7	1 662.43	237.49	1 660.00	**1.00**
	1985	8	1 372.09	171.51	1 285.25	0.94
	1986	10	1 876.57	187.66	1 750.44	0.93
	1987	24	12 454.11	518.92	13 306.89	**1.07**
	1988	16	8 448.70	528.04	8 156.23	0.97
	1989	25	5 628.12	335.12	5 274.41	0.90
	1990	10	2 652.26	265.23	2 401.37	0.91
	1991	5	1 439.98	288.00	1 292.66	0.90
	1992	14	4 378.17	312.73	4 171.24	0.95
	1993	20	9 688.50	484.42	10 017.64	**1.03**
	1994	25	10 855.95	434.24	9 831.23	0.91
	1995	25	18 913.27	756.53	19 033.33	**1.01**
	1996	25	11 451.85	458.07	11 077.51	0.97
	1997	40	32 537.01	813.43	31 653.02	0.97
	1998	55	54 065.35	978.99	50 014.37	0.93
	1999	38	30 638.44	806.27	27 561.62	0.90
	2000	51	53 778.32	1 054.47	51 075.29	**0.76**
	2001	27	31 359.25	1 161.45	27 303.40	**0.87**
Active	2002	19	17 448.74	918.35	15 289.60	0.88
	2003	17	20 669.31	1 215.84	19 633.17	0.95
	2004	21	21 407.18	1 019.39	18 262.24	0.85
	2005	33	50 379.02	1 526.64	45 943.77	0.91

		US LBO			
Vintage year	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
2006	35	114 324.79	3 266.42	109 205.67	0.96
2007	37	121 534.01	3 284.70	86 226.24	0.71
2008	29	73 481.07	2 637.27	38 743.69	0.51
2009	10	20 757.54	2 075.75	11 943.46	0.58
Total realiz.	425	292 281		266 865	
Av. realiz.			687.72		0.91
Total all	626	735 283		612 113	
Av. all			1 174.57		0.83

* Vintage years 2001, though having reached their 10-year lifespan, might still be active and under life extension periods.

** In bold, the higher DPI for a given vintage year is highlighted between the funds DPI and the index DPI

Exhibit 4 (continued)

		EMEA Venture Capital			
	Vintage year	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
Fully realized*	1981	3	46.78	15.59	26.16	**0.56**
	1982	-	-	-	-	-
	1983	4	88.55	22.14	84.11	0.95
	1984	6	152.37	25.39	114.38	**0.75**
	1985	16	402.49	25.16	323.81	0.80
	1986	10	250.23	25.02	227.24	0.91
	1987	8	477.29	59.66	458.68	0.96
	1988	11	556.22	50.57	499.45	0.90
	1989	20	780.17	39.01	688.32	0.88
	1990	14	673.91	48.14	624.48	0.93

	Vintage year	EMEA Venture Capital				
		Sample	Total committed	Average fund size	Paid-in	PI/C (net)
	1991	11	484.27	44.02	422.19	0.87
	1992	6	193.76	62.29	211.48	**1.09**
	1993	11	294.34	26.76	280.14	0.95
	1994	16	689.52	43.09	476.45	**0.69**
	1995	13	1 280.91	98.53	1 055.00	0.82
	1996	18	749.92	41.66	599.63	0.80
	1997	35	1 722.36	49.21	1 290.63	**0.75**
	1998	33	2 367.35	71.74	2 178.28	0.92
	1999	57	3 785.90	66.42	2 214.46	**0.58**
	2000	93	9 238.53	99.34	7 500.55	0.81
	2001	62	4 893.96	78.93	3 413.11	**0.70**
Active	2002	34	931.56	27.40	867.97	0.93
	2003	41	2 549.62	62.19	2 245.47	0.88
	2004	45	2 616.93	58.15	2 142.14	0.82
	2005	38	3 295.32	86.72	2 675.88	0.81
	2006	39	6 566.79	168.38	4 365.75	0.66
	2007	54	5 937.23	109.95	4 439.83	0.75
	2008	55	3 070.35	54.37	1 619.31	0.53
	2009	36	866.94	24.08	511.51	0.59
	Total realiz.	447	29 127		22 688	
	Av. realiz.			65.16		0.78
	Total all	789	54 962		41 556	
	Av. all			69.66		0.76

* Vintage years 2001, though having reached their 10-year lifespan, might still be active and under life extension periods.

** In bold, the higher DPI for a given vintage year is highlighted between the funds DPI and the index DPI

Exhibit 4 (continued)

	Vintage year	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
			EMEA LBO			
Fully realized*	1981	-	-	-	-	-
	1982	-	-	-	-	-
	1983	-	-	-	-	-
	1984	4	64.04	16.01	38.86	**0.61**
	1985	-	-	-	-	-
	1986	5	176.08	35.22	178.25	**1.01**
	1987	7	416.29	58.47	402.44	0.97
	1988	15	1 878.17	125.21	859.24	**0.46**
	1989	10	2 155.84	215.58	1 803.48	0.84
	1990	12	2 067.93	172.33	2 359.01	**1.14**
	1991	15	1 204.21	80.28	1 114.01	0.93
	1992	7	799.96	114.28	654.46	0.82
	1993	8	874.44	109.31	695.95	0.80
	1994	14	2 789.64	199.26	2 411.51	0.86
	1995	11	1 917.14	174.29	1 398.64	**0.73**
	1996	18	6 510.89	361.72	3 765.82	**0.58**
	1997	26	10 567.48	406.44	9 220.75	0.87
	1998	25	13 726.14	549.04	10 490.83	**0.76**
	1999	36	11 550.83	320.86	11 325.81	0.98
	2000	35	15 166.83	433.34	13 743.23	0.91
	2001	21	17 007.99	809.90	17 156.29	**1.01**
Active	2002	23	9 865.95	428.95	9 809.75	0.99
	2003	19	8 505.63	447.66	6 844.40	0.80
	2004	18	16 066.74	892.60	12 520.40	0.78

Vintage year	EMEA LBO				
	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
2005	34	47 455.08	1 395.74	48 257.95	**1.02**
2006	38	49 269.89	1 296.58	40 493.83	0.82
2007	31	44 7088.86	1 444.80	34 162.80	0.76
2008	26	47 046.15	1 809.47	24 355.05	0.52
2009	13	13 592.36	1 045.56	4 398.47	0.32
Total realiz.	269	88 873		77 618	
Av. realiz.			330.38		0.87
Total all	471	325 464		258 461	
Av. all			691.01		0.79

* Vintage years 2001, though having reached their 10-year lifespan, might still be active and under life extension periods.

** In bold, the higher DPI for a given vintage year is highlighted between the funds DPI and the index DPI

Exhibit 5. Net paid-in to committed ratios, for top quartile US VC and LBO funds (1981-2001 and 1986-2001), and EMEA VC and LBO funds (1993-2001)

This table provides the committed capital, average fund sizes, paid-in and paid-in/committed (PIC) ratio for top quartile US VC and LBO funds; and EMEA VC and LBO funds from Thomson ONE Banker database (1981-2009).

| | Vintage year | Sample | US Venture Capital | | | |
			Total committed	Average fund size	Paid-in	PI/C (net)
Fully realized*	1981	6	335.52	55.92	356.64	**1.06**
	1982	7	341.78	48.82	313.38	0.92
	1983	15	735.77	49.05	719.24	0.98
	1984	16	729.80	45.61	658.87	0.90
	1985	12	341.77	24.48	341.81	1.00
	1986	10	1 592.24	159.22	1 498.80	0.94
	1987	16	1 078.08	67.38	1 022.15	0.95
	1988	12	1 294.87	107.91	1 247.77	0.96
	1989	13	723.48	55.65	706.17	0.98
	1990	6	551.32	91.88	532.14	0.97
	1991	4	200.16	50.04	202.04	**1.01**
	1992	7	865.05	123.58	806.48	0.93
	1993	11	1 251.44	113.77	1 177.31	0.94
	1994	9	3 029.61	336.62	2 937.48	0.97
	1995	12	1 403.68	116.97	1 329.33	0.95
	1996	10	1 163.00	116.30	1 089.18	0.94
	1997	16	2 329.63	145.60	2 241.63	0.96
	1998	20	3 704.77	185.24	3 530.35	0.95
	1999	27	7 140.70	264.47	6 402.59	0.90
	2000	31	18 856.47	608.27	16 991.42	0.90
	2001	15	11 910.31	794.02	11 001.16	0.92
Active	2002	5	723.13	144.63	542.84	0.75
	2003	6	1 125.02	187.50	1 070.13	0.95

	US Venture Capital				
Vintage year	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
2004	7	2 821.82	403.12	2 428.93	0.86
2005	6	1 558.83	259.81	1 390.32	0.89
2006	11	7 581.20	689.20	6 512.72	0.86
2007	6	1 584.55	264.09	1 222.04	0.77
2008	5	933.75	186.75	454.32	0.49
2009	4	1 482.30	370.58	832.05	0.56
Total realiz.	275	59 579		55 105	
Av. realiz.			216.65		0.92
Total all	325	77 390		69 559	
Av. all			238.12		0.90

* Vintage years 2001, though having reached their 10-year lifespan, might still be active and under life extension periods.

** In bold, the higher DPI for a given vintage year is highlighted between the funds DPI and the index DPI

Exhibit 5 (continued)

		US LBO			
Vintage year	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
1981	-	-	-	-	-
1982	-	-	-	-	-
1983	-	-	-	-	-
1984	-	-	-	-	-
1985	-	-	-	-	-
1986	3	957.20	319.07	765.15	0.80
1987	7	3 371.55	481.65	3 564.26	**1.06**
1988	5	2 170.40	434.08	2 162.13	1.00
1989	7	2 578.35	368.34	1 802.71	**0.70**

Fully realized*

		US LBO			
	Vintage year	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
	1990	-	-	-	-	-
	1991	-	-	-	-	-
	1992	4	1 486.53	371.63	1 469.58	0.99
	1993	6	3 132.00	522.00	3 092.84	0.99
	1994	7	4 894.60	699.23	4 109.56	0.84
	1995	7	3 820.36	545.77	2 991.35	**0.78**
	1996	7	3 313.57	473.37	3 243.35	0.98
	1997	10	13 415.82	1 341.58	13 891.97	**1.04**
	1998	15	6 092.65	406.17	5 819.36	0.96
	1999	10	9 858.40	985.84	9 135.55	0.93
	2000	14	20 227.22	1 444.80	16 472.69	0.81
	2001	7	7 779.50	1 111.36	7 504.61	0.96
Active	2002	5	3 416.39	683.28	3 609.62	**1.06**
	2003	5	9 318.60	1 863.72	7 780.53	0.83
	2004	6	6 373.20	1 062.20	5 985.02	0.94
	2005	9	19 618.09	2 179.79	18 547.75	0.95
	2006	9	12 697.00	1 410.78	12 008.21	0.95
	2007	10	19 283.50	1 928.35	13 494.88	0.70
	2008	7	6 104.01	872.00	3 423.68	0.56
	2009	-	-	-	-	-
	Total realiz.	109	82 491		76 025	
	Av. realiz.			756.80		0.92
	Total all	160	159 301		140 874	
	Av. all			995.64		0.88

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Exhibit 5 (continued)

	Vintage year	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
			EMEA Venture Capital			
Fully realized*	1981	-	-	-	-	-
	1982	-	-	-	-	-
	1983	-	-	-	-	-
	1984	-	-	-	-	-
	1985	-	-	-	-	-
	1986	-	-	-	-	-
	1987	-	-	-	-	-
	1988	-	-	-	-	-
	1989	-	-	-	-	-
	1990	-	-	-	-	-
	1991	-	-	-	-	-
	1992	-	-	-	-	-
	1993	3	104.21	34.74	94.88	0.91
	1994	4	212.87	53.22	202.92	0.95
	1995	4	873.13	218.28	738.81	0.84
	1996	4	192.23	48.06	161.42	0.84
	1997	9	652.04	72.45	489.85	**0.75**
	1998	8	393.66	49.21	369.39	0.94
	1999	14	468.43	33.46	306.61	**0.65**
	2000	22	1 119.37	50.88	811.21	**0.72**
	2001	15	676.12	45.07	650.13	0.96
Active	2002	7	225.81	32.26	224.99	1.00
	2003	10	578.99	57.90	556.87	0.96
	2004	12	1 340.55	111.71	992.00	0.74
	2005	10	447.99	44.80	419.22	0.94

	Vintage year	EMEA Venture Capital				
		Sample	Total committed	Average fund size	Paid-in	PI/C (net)
	2006	10	4 071.89	407.19	2 787.68	0.68
	2007	14	1 188.23	84.87	805.66	0.68
	2008	14	1 507.45	101.95	537.40	0.36
	2009	9	171.73	19.08	95.17	0.55
	Total realiz.	83	4 692		3 825	
	Av. realiz.			56.53		0.82
	Total all	169	14 224		10 244	
	Av. all			84.17		0.72

* Vintage years 2001, though having reached their 10-year lifespan, might still be active and under life extension periods.

** In bold, the higher DPI for a given vintage year is highlighted between the funds DPI and the index DPI

Exhibit 5 (continued)

	Vintage year	EMEA LBO				
		Sample	Total committed	Average fund size	Paid-in	PI/C (net)
Fully realized*	1981	-	-	-	-	-
	1982	-	-	-	-	-
	1983	-	-	-	-	-
	1984	-	-	-	-	-
	1985	-	-	-	-	-
	1986	-	-	-	-	-
	1987	-	-	-	-	-
	1988	-	-	-	-	-
	1989	-	-	-	-	-

	EMEA LBO				
Vintage year	Sample	Total committed	Average fund size	Paid-in	PI/C (net)
1990	-	-	-	-	-
1991	-	-	-	-	-
1992	-	-	-	-	-
1993	3	398.83	132.94	278.46	**0.70**
1994	4	1 271.78	317.94	1 294.52	**1.02**
1995	3	1 160.15	386.72	710.68	**0.61**
1996	5	2 986.81	597.36	1 227.00	**0.41**
1997	7	2 784.91	397.84	2 545.72	0.91
1998	7	8 114.15	1 159.16	6 822.67	0.84
1999	10	2 555.23	255.52	2 182.86	0.85
2000	9	4 464.39	496.04	4 388.94	0.98
2001	6	11 208.47	1 868.08	12 162.80	**1.09**
2002	6	3 932.65	655.44	3 462.05	0.88
2003	5	2 410.80	482.16	2 701.73	**1.12**
2004	4	2 496.84	624.21	2 773.79	**1.11**
2005	9	8 549.22	949.91	8 315.50	0.97
2006	10	8 725.48	872.55	7 959.61	0.91
2007	8	11 462.32	1 432.79	7 640.69	0.67
2008	5	1 922.72	384.54	1 061.29	0.55
2009	4	7 862.60	1 965.65	1 952.17	0.25
Total realiz.	54	34 944		31 613	
Av. realiz.			647.12		0.90
Total all	105	82 307		67 480	
Av. all			783.88		0.82

(The rows 2002–2009 are grouped under the side label "Active".)

* Vintage years 2001, though having reached their 10-year lifespan, might still be active and under life extension periods.

** In bold, the higher DPI for a given vintage year is highlighted between the funds DPI and the index DPI

A look at the gross PIC helps to identify atypical behaviors of VYs (which might not be properly accounted for in terms of paid-in, hence introducing biases in our cash-flow analysis). Management fees have little chance to exceed 20% of the fund size. As a fund can only be invested up to 100%, net PICs should be between 0.8-1.0. US VC fits within these brackets[11] (average net PIC is 0.90 for realized funds and 0.86 for unrealized funds). This is consistent with Ljungvist and Richardson (2003) who found a 0.94 PIC over 1981-1992. US LBO 1987, 1993 and 1995 are above 1.0 while US LBO 2000 is at 0.7612. These vintages should be handled with caution. The average net PIC is 0.91 for realized funds and 0.83 (net for unrealized funds, consistent with Ljungvist and Richardson, 2003).

For EMEA, VC exhibits one VY above 1.0 (1992) and six below 0.8 (1981, 1984, 1994, 1997, 1999, 2001)13. LBO funds exhibit three vintages with a net PIC above 1.0 (1986, 1990 and 2001); and five vintages with a net PIC below 0.80 (1984, 1988, 1995, 1996, 1998)14. Though some of the VYs are to be taken with caution, there is no systematic bias of performance identifiable (out- or under-performance) with PIC above or below thresholds.

Graphical analysis of the J-Curves

Following up on the categorization of returns, we drew the J-Curves of US VC funds for the average and four ideal-types (Exhibit 6), and then selected an ideal-type (low returns) and the current partially unrealized VYs (Exhibit 7). All flows were re-scaled on a basis 100 for that purpose. The operation was then repeated for US LBO funds (Exhibits 8 and 9), EMEA VC funds (Exhibits 10 and 11), EMEA LBO funds (Exhibits 12 and 13).

First predictor of performance: the time to break-even

Looking at Exhibit 6, the five curves exhibit different shapes. The average curve (1980-2001) shows that the maximum cumulated draw-down is actually slightly more than 40% of the committed capital, and crosses the x-axis in Q2 Year 8. The maximum cumulated draw-down for the "very high" returns curve is 55% and the curve crosses the x-axis in Q3 Year 5. The maximum cumulated draw-down for the "high" returns curve is 60% and the curve crosses the x-axis in Q1 Year 7. The "medium" returns curve exhibits a cumulated draw-down of close to 75% and crosses the x-axis in Q4 Year 9. The "low" returns curve reaches an 80% draw-down and never recovers. These shapes are rather distinctive and signal that the cash-flows of performing and underperforming VYs differ significantly.

The best VYs are those that exhibit a faster recovery of the J-Curve and that cross the x-axis early. As seen, the "very high" returns curve bottoms in Year 4, the "high" returns curve crosses in Year 5, the "medium" returns curve crosses in Year 5 and the "low" returns curve bottoms in Year 8. That the best VYs are bottoming in Year 4 or 5 shows that the holding period of the assets is indeed lower than the expected five years and should be three to four

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11 For US VC top quartile funds, the net PIC of two vintages years (1981 and 1991) appear above 1.00. These two years have to be treated with caution.

12 For US LBO top quartile funds, the net PIC is below 0.8 for 1989 and 1995; and above 1.00 for 1987 and 1997.

13 For EMEA VC top quartile funds, the net PIC of three vintages falls below 0.8: 1997, 1999 and 2000.

14 For EMEA LBO top quartile funds, the net PIC of three vintages falls below 0.8 (1993, 1995 and 1996) and two are above 1.00 (1994 and 2001).

years. Being so distinct, these ideal-type curves could be a potential predictor for the returns of unrealized curves. We turn to Exhibit 7 to compare current VYs with the average and "low" returns curves. None of these curves actually crosses the x-axis. VYs 2002, 2003, 2004, 2005 and 2007 have bottomed respectively in Year 7 for the first four and Year 5 for 2007. Predicting the results by interpreting the graphical interpretation alone is rather difficult.

Exhibit 6. Cumulated cash-flows curves of US VC funds for the 1980-2001, medium, high, very high and low returns periods
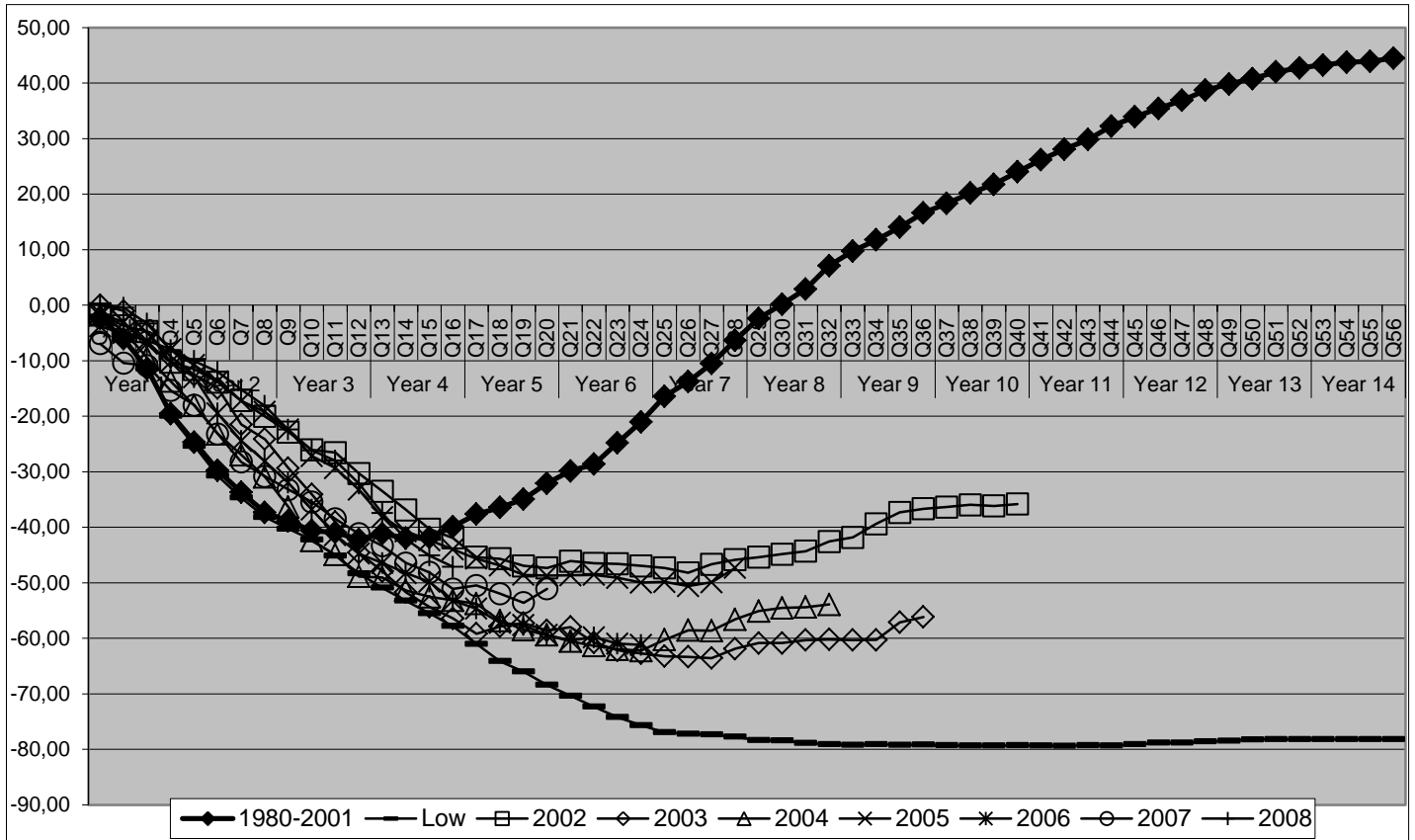
The figure provides five cumulated cash-flow curves, based on data reported by Thomson ONE Banker15 (rescaled on a basis 100), excluding outliers. Four ideal-types are identified: "high" returns (VYs 1980 and 1990), "medium" returns (VYs 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989), "low" returns (VYs 1999, 2000, 2001) and "very high" returns (VY 1992, 1993, 1994, 1995, 1996, 1997).
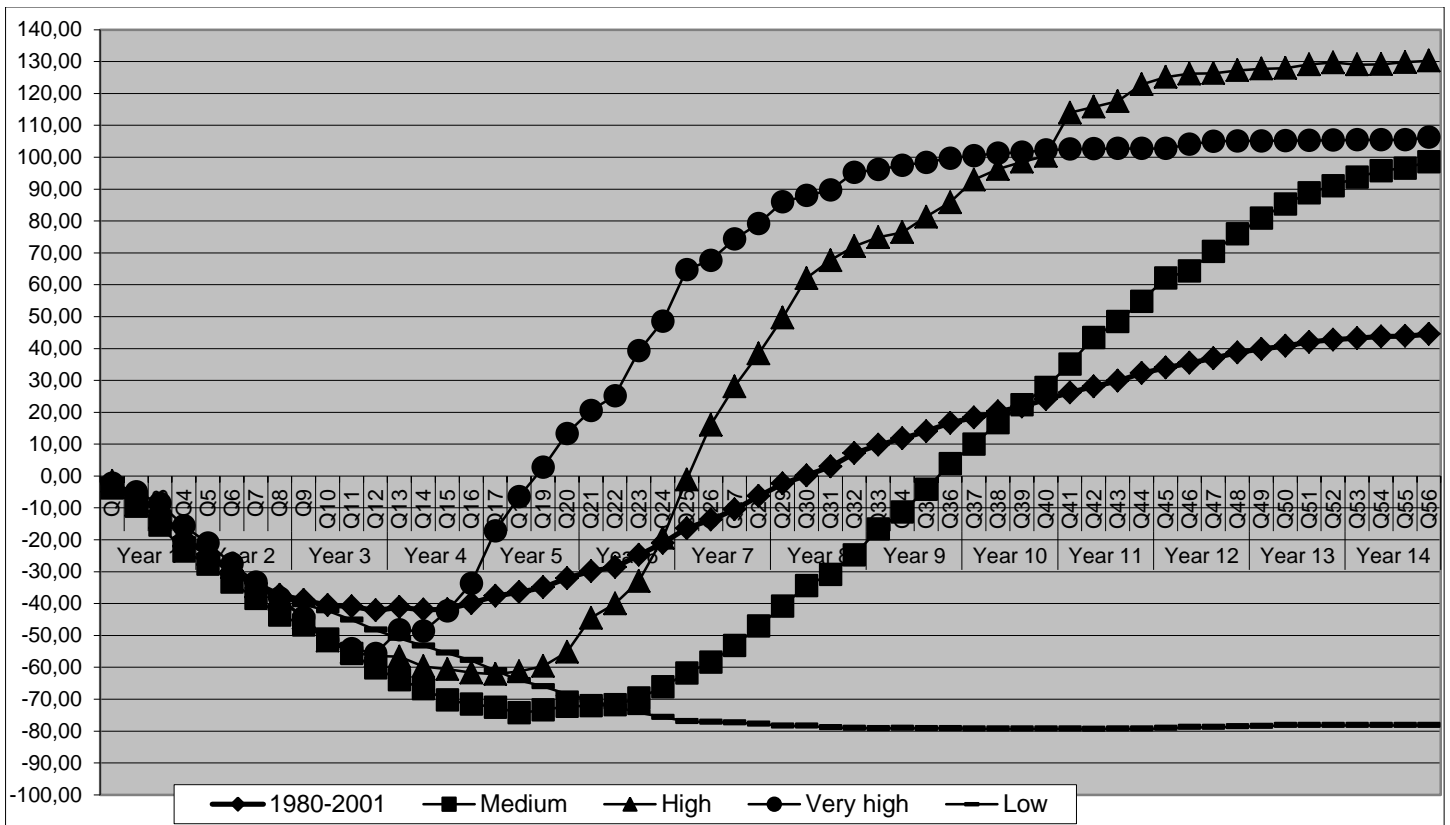
Exhibit 7. Cumulated cash-flows curves of US VC funds for the 1980-2001 and low returns periods; and years 2002, 2003, 2004, 2005, 2006, 2007 and 2008

The figure provides nine cumulated cash-flow curves: the period 1980-2001, "low" returns (VYs 1990, 2000, 2001); active VYs 2002, 2003, 2004, 2005, 2006, 2007 and 2008, and is based on data from Thomson ONE Banker (re-scaled on a basis 100).

Looking at Exhibit 8, a few differences appear for US LBO. "Very high" returns and "Low" return curves bottom in the same region (slightly below -60%), while "High" returns bottom in the region of –55% and "Medium" returns at around –45%. Consistent with US VC, the shorter the time to cash-flow break-even, the better the performance is: Year 5 for "Very high" returns, Year 7 for "High", Year 8 for "Medium" / "Low".

Exhibit 8. Cumulated cash-flows curves of US LBO funds for the 1984-2001, very high, medium, high and low returns periods

The figure provides five cumulated cash-flow curves, based on data reported by Thomson ONE Banker16 (re-scaled on a basis 100), excluding outliers. Four ideal-types are identified: "high" returns (VYs 1989, 1991, 1992, 1993), "medium" returns (VYs 1988, 1994, 1995, 2000, 2001), "low" returns (VYs 1990, 1996, 1997, 1998, 1999) and "very high" returns (VY 1984, 1985, 1986).
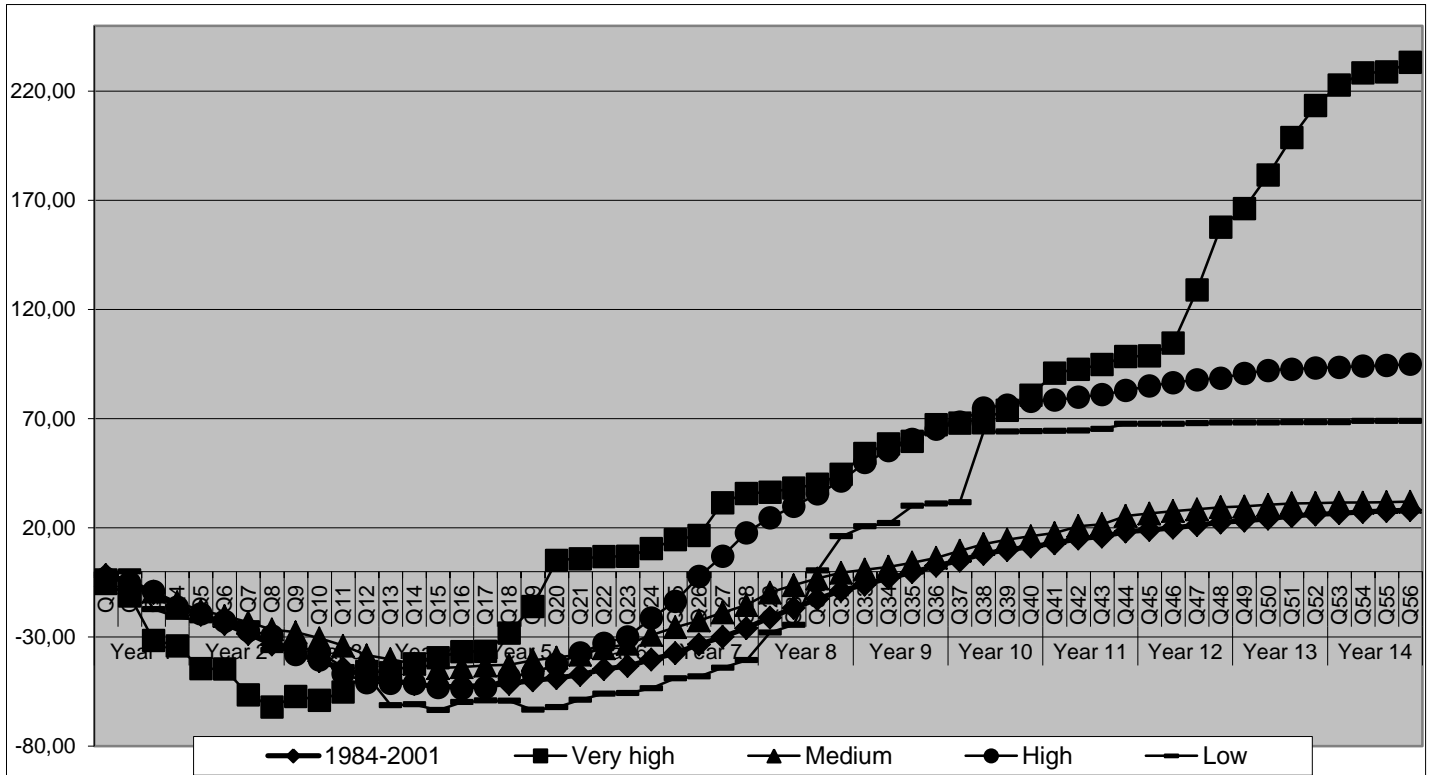
Ideal-type categories need to be adapted to each market

US LBO curves exhibit specific features, such as sudden recoveries of their cash-flows (for example, Q17 to Q20 and Q46 to Q48 for "Very High" returns; and Q37 to Q38 for "Low" returns). These might be related to refinancing opportunities ("dividend recaps").

Interestingly, the shape of the "Low" returns J-Curve is closer to higher returns than to "Medium". The performance of "Medium" being better than "Low", this illustration belies the identification of a VY by simply reading the graphical interpretation. Turning to Exhibit 9, VYs 2002 and 2003 can be visually compared with the ideal-types, but other VYs are more difficult to compare.

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16 As of December 31, 2011.

Exhibit 9. Cumulated cash-flows curves of US LBO funds for the periods 1984-2001 and medium returns period; and years 1990, 1996-1999, 2002, 2003, 2004, 2005, 2006, 2007 and 2008

The figure provides nine cumulated cash-flow curves: the period "1984-2001", "low" returns (VYs 1990, 1996, 1997, 1998, 1999), active VYs 2002, 2003, 2004, 2005, 2006, 2007 and 2008, and is based on data from Thomson ONE Banker (re-scaled on a basis 100).
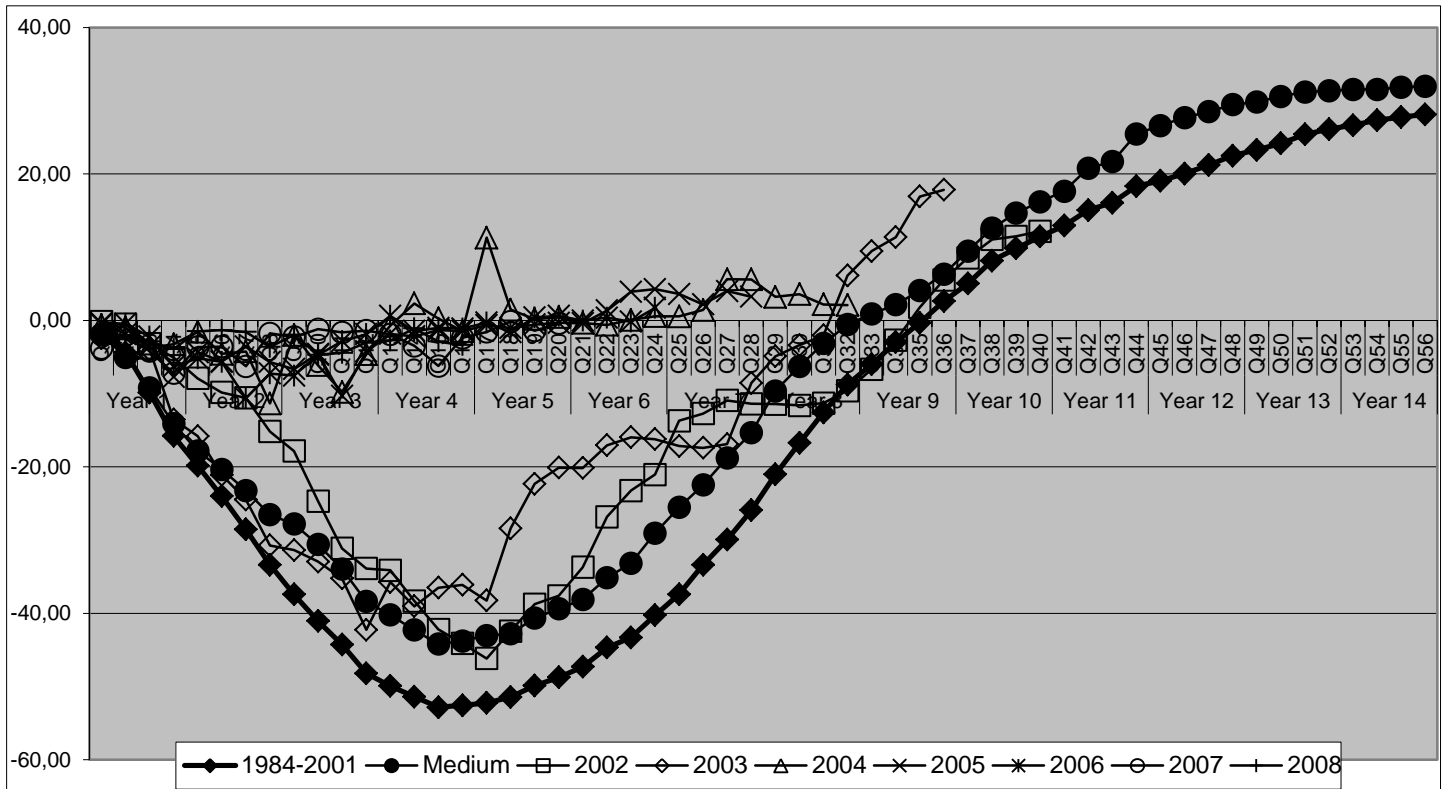

EMEA VC funds curves (Exhibit 10) are another challenge: given the high number of outliers and the limited number of available VYs, some curve shapes (such as "very high" returns) are based on only one VY (1990 in that case). Ideal-types curves might have to be broken down differently in EMEA (in three or five categories). In EMEA, the earliest that the J-Curve crosses the x-axis is in Year 9 ("Very high" returns). "High" returns cross the axis in Year 10 only, while the "Medium" returns J-Curve crosses the x-axis in Year 12. Surprisingly, "very high" and "high" returns are the curves reaching the lowest points in terms of cumulated draw downs (70%). "Medium" returns reach –65% and the "Low" returns stop at –55%. Hence EMEA VC funds exhibit specific cash-flow shapes. Exhibit 11 hints at a possibly good performance of VY 2002, as well as 2003 and 2005.

Exhibit 10. Cumulated cash-flows curves of EMEA VC funds for 1981-2001, high, medium, low and very high returns periods

The figure provides five cumulated cash-flow curves, based on data reported by Thomson ONE Banker[17] (re-scaled on a basis 100), excluding outliers. Four ideal types are identified: "high" returns (VYs 1983, 1984 and 1986), "medium" returns (VYs 1985, 1987, 1991, 1993), "low" returns (VYs 1995, 2000, 2001) and "very high" returns (VY 1990 only).

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17 As of December 31, 2011.

Exhibit 11. Cumulated cash-flows curves of EMEA VC funds for 1981-2001, the low returns period and the years 2002, 2003, 2004, 2005, 2006, 2007 and 2008

The figure provides nine cumulated cash-flow curves: the period "1981-2001" (VYs 1983, 1984, 1985, 1986, 1987, 1990, 1991, 1993, 1995, 2000 and 2001), "low" returns (VYs 1995, 2000, 2001), and active VYs 2002, 2003, 2004, 2005, 2006, 2007 and 2008, based on data from Thomson ONE Banker (re-scaled on a basis 100).
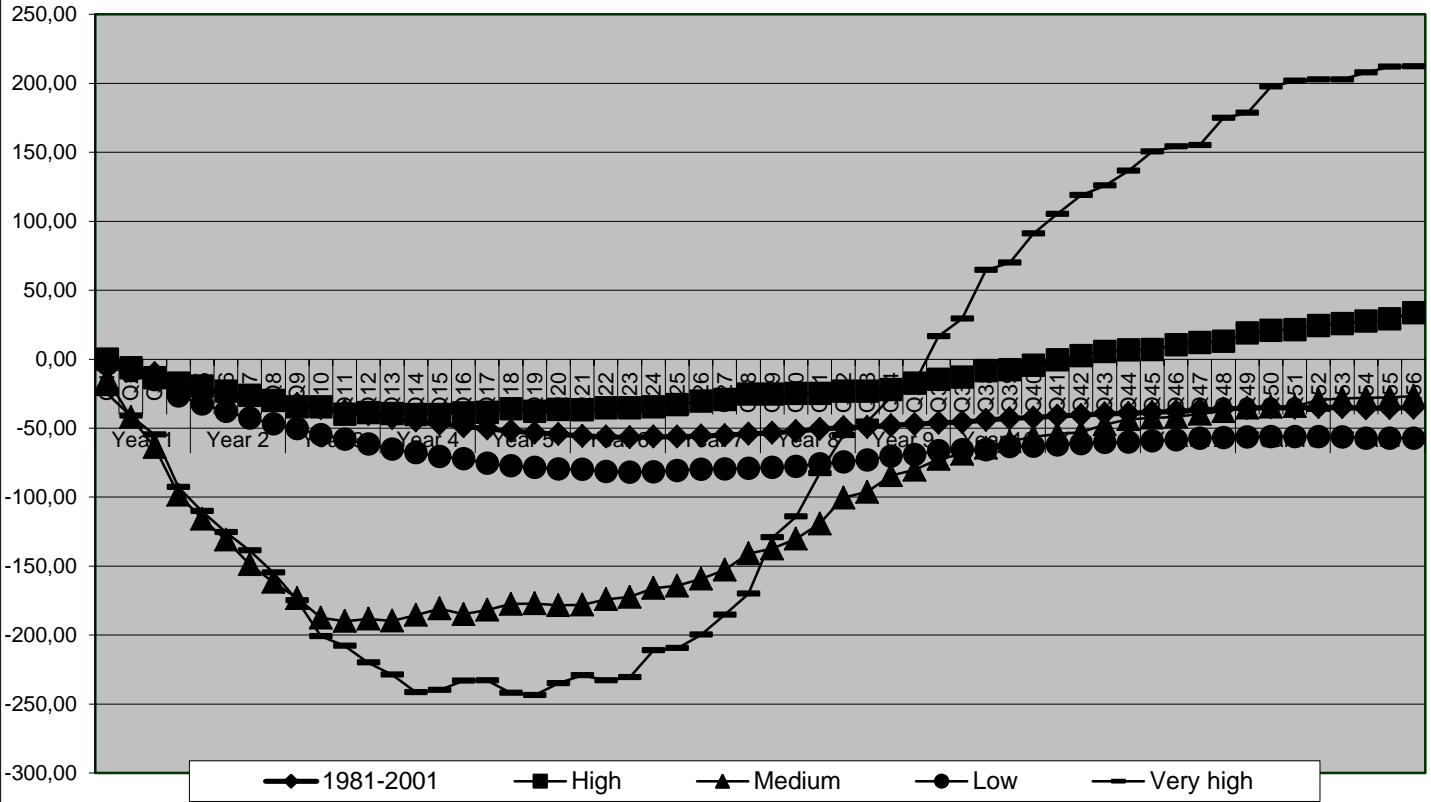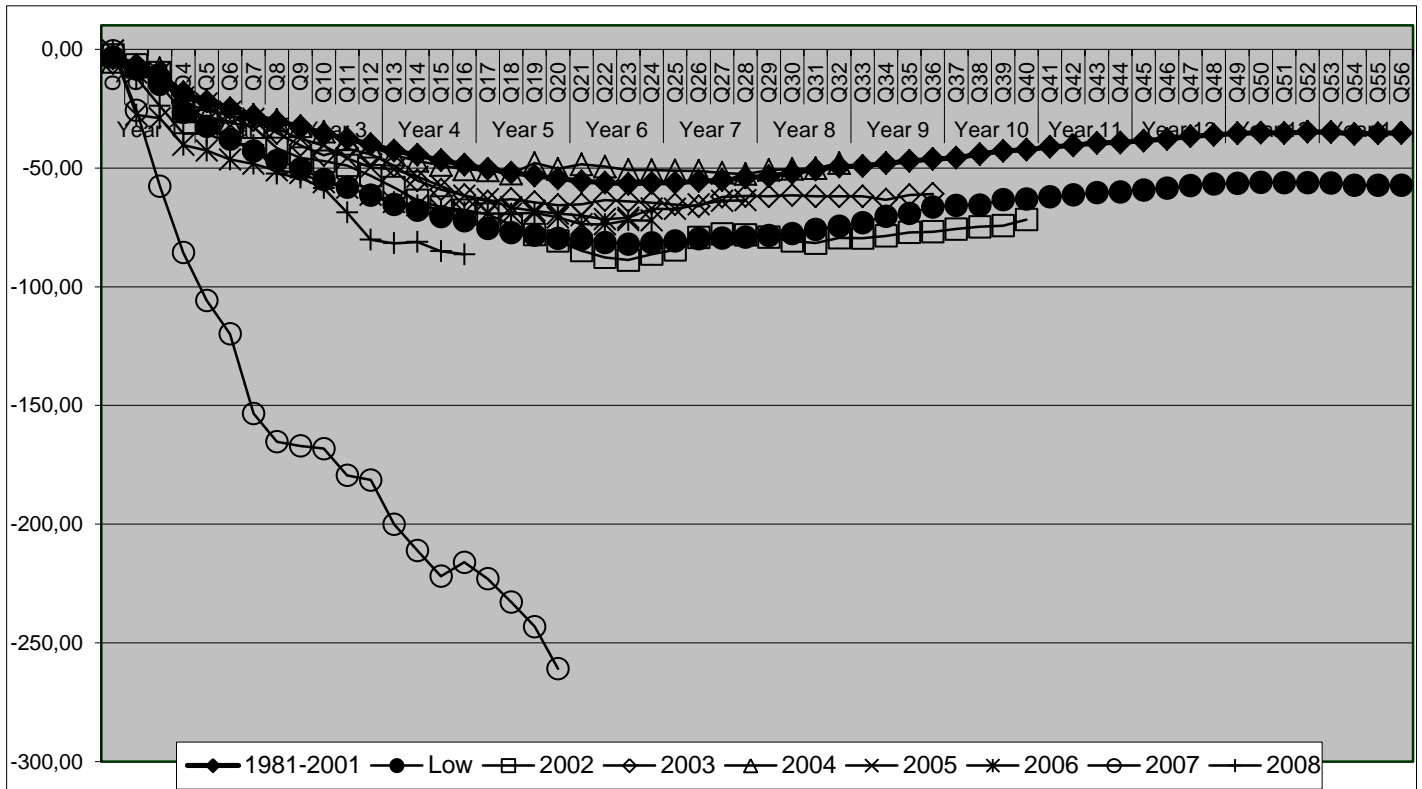

Reading graphical representations is insufficient for tentative performance predictions

Reading the potential performance from the graphical illustration remains difficult. EMEA LBO funds' J-Curves (Exhibit 11) clearly differentiate the "High" and "Very high" returns funds from "Medium" and "Low" returns. The first two categories bottom out respectively at –45% and –40%, while the next two reach respectively –55% and –50%. "High" returns cross the x-axis in Year 6 (Q23) and "Very high" returns in Year 7 (Q25); while "Medium" returns cross the axis in Year 8 (Q31) and "Low" returns in Year 9 (Q35). "High" returns show a more attractive profile than "Very high" returns until Year 11. This suggests that it is necessary to break down the return categories differently for EMEA, or that there is the presence of outliers in the cash-flows. Exhibit 12 illustrates the difficulty of predicting the performance of current vintages based on their J-Curves. The case in point is VY 2002: it drew down a maximum of 40% of its commitment and crossed the x-axis in Year 6, which would qualify it for "High" returns. However, its performance since Year 7 draws it towards the "Medium" category. VY 2003 seemed to be "Low" performance but crossed the x-axis in Year 9.

Exhibit 11. Cumulated cash-flows curves of EMEA LBO funds for the periods 1984-2001, high, medium, low and very high returns periods

This figure provides five cumulated cash-flow curves, based on data reported by Thomson ONE Banker18 (re-scaled on a basis 100), excluding outliers. Four ideal types are identified: "high" returns (VYs 1984, 1986, 1995, 2001), "medium" returns (VYs 1987, 1991, 1997, 1998, 1999), "low" returns (VY 1989 only) and "very high" returns (VYs 1991, 1994 and 2000).

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18 As of December 31, 2011.

Exhibit 12. Cumulated cash-flows curves of EMEA LBO funds for the periods 1984-2001, a "Very high" returns period, and the years 2002, 2003, 2004, 2005, 2006, 2007 and 2008

The figure provides nine cumulated cash-flow curves: the period "1984-2001" (VYs 1984, 1986, 1987, 1989, 1991, 1992, 1994, 1995, 1997, 1998, 1999, 2000 and 2001), "very high" returns (VYs 1991, 1994 and 2000), and active VYs 2002, 2003, 2004, 2005, 2006, 2007 and 2008, based on data from Thomson ONE Banker (re-scaled on a basis 100).
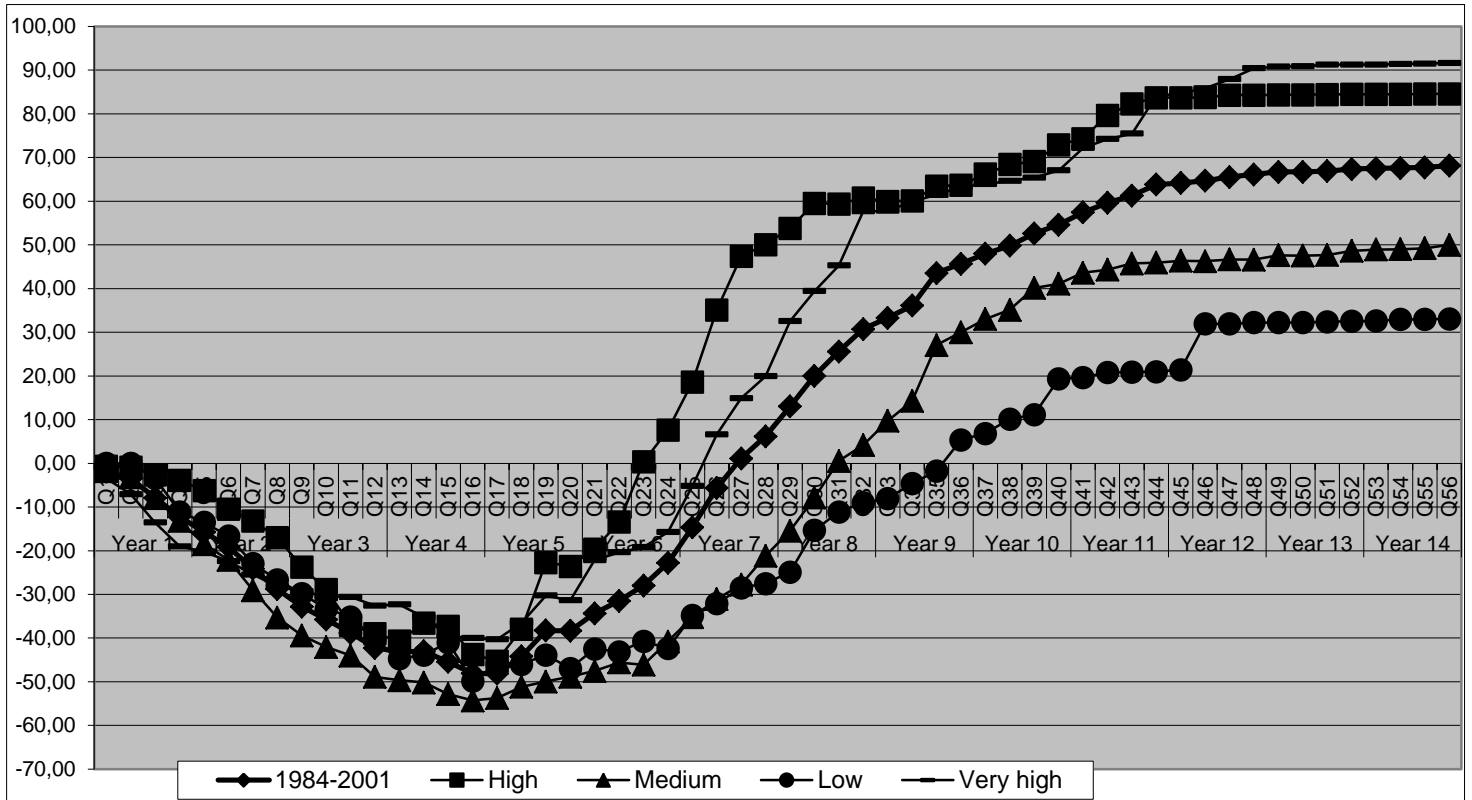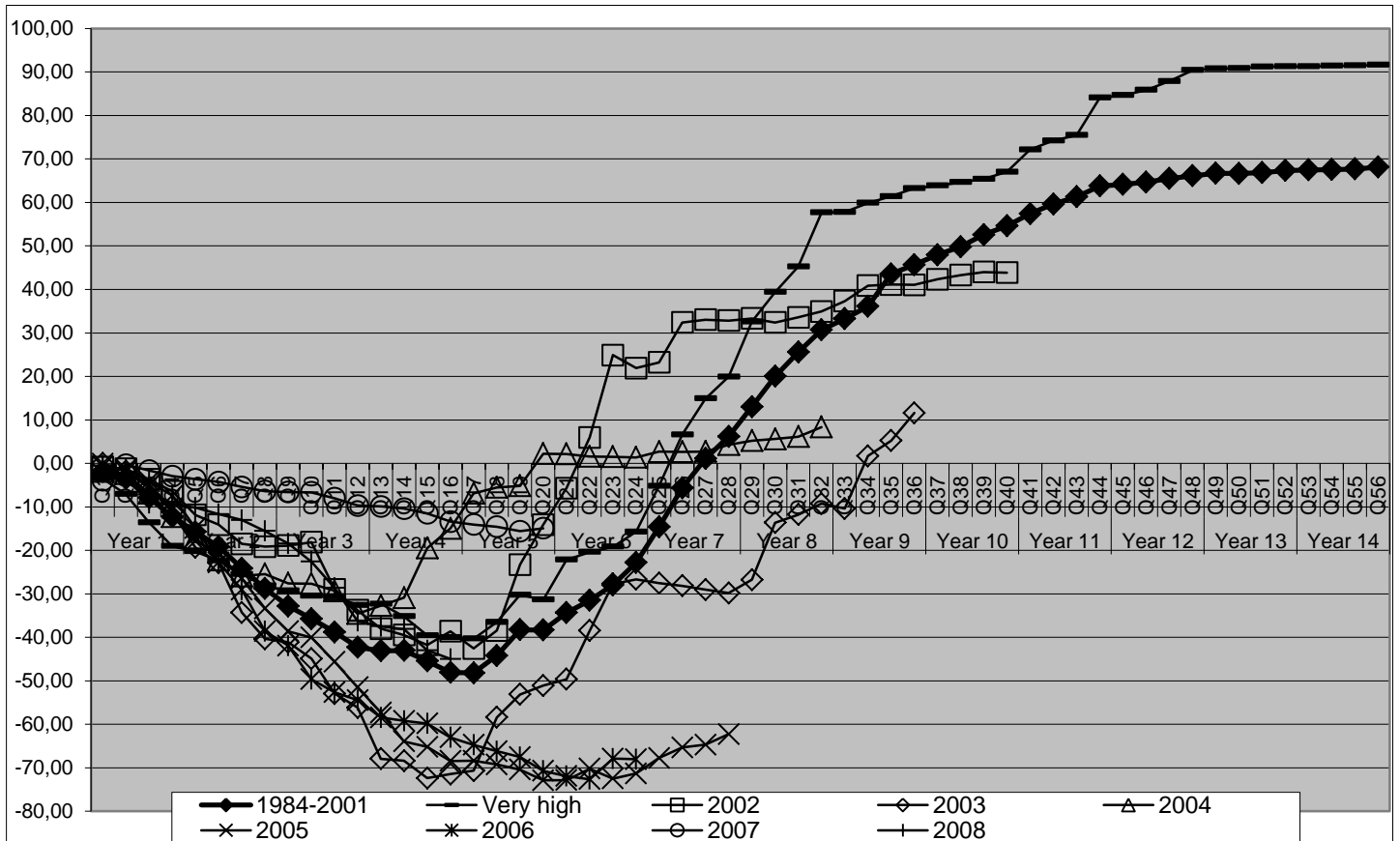

Correlation analysis of the J-Curves

Though graphical interpretation of J-Curves is difficult, the shape of these curves might be of use to identifying the potential performance of a VY. Given the flaws of data available, our method will focus on measuring the distance of a given VY from the "ideal-types" categories.

US VC

Exhibit 13 provides a correlation matrix for US VC funds by VYs (fully realized and unrealized) and by categories. "Low" returns categories clearly appear as negatively correlated with the rest of the categories. "Very high" returns also exhibit a 0.71 correlation rate with "Medium" returns and a 0.92 correlation rate with "High" returns. Digging into the categories and their VYs, we have sought to identify which vintage is the most representative of each category. 1985 exhibits a 1.0 correlation with "Medium" returns (and a higher differentiation with other categories than VY 1987, which also exhibits a 1.0 correlation with "Medium" returns). 1990 is the most representative VY of "High" (1.0), 1995 of "Very high" (0.98) and 2000 of "Low" returns (0.79). Focusing on unrealized VYs, 2002, 2003, 2004 and

2005 would belong to the "Low" returns categories. VY 2006 does not appear clearly as belonging either to a "Low" or a "Medium" returns category (yet). It is clear that it will not be a "Very high" return VY, and most likely not a "High" returns VY. VY 2007 is excluded from the "Very high" returns category, and VY 2008 drifts away from this category. Most likely, 2007 and 2008 would belong to "Medium" returns. VY 2009 is difficult to attribute, but a closer look shows that its pattern exhibits a correlation of 1.0 with VYs 2003, 2005 and 2006.

US LBO

The exercise is repeated for US LBO funds (Exhibit 14). The differentiation between the vintages is much smaller [19]. Though less important, we judge the correlations rates sufficiently distinct to draw conclusions. 1986 is the most representative VY of "Very high" returns; 1990 of "Low", 1993 of "High" and 1995 of "Medium" returns. Analyzing unrealized VYs, a first phenomenon appears: some correlation rates fall at or below 0.6. This might signal a potential new category. 2002 appears as most likely to be a "Medium" vintage (0.95 category correlation, 0.97 with VY 1995). 2003 is likely to be a "High" vintage (0.93 category correlation, 0.94 with VY 1993). 2004 is leaning towards "Medium" (0.88 category correlation, 0.92 with VY 1995), though "Low" returns remain possible. VY 2005 is likely to exhibit "Low" performances (0.98 category correlation, 0.98 with VY 1990). VY 2006 could be also "Low" (0.95 category correlation as well as with "Medium", but a 0.95 correlation rate with 1990 and a 0.94 with VY 1995). VY 2007 is likely to be a "Medium" performance (0.97 category correlation, though "Low" is close at 0.96 – and both representative VY are at 0.96). 2008 and 2009 will not be "Very high" return vintages, 2008 most likely to be "Medium" to "Low" and 2009 "Medium" to "High".

EMEA VC

Exhibit 15 provides the results for EMEA VC funds. The different categories appear as very distinctive, but not necessarily very representative. In fact "Very high" returns relies only on VY 1990. "High returns" rely on two vintages (1984 being the most representative). "Medium" returns rely on four VYs (1991 as the most representative) and "Low" returns on three vintages (2000 is the most representative). 2002 and 2003 are going to be "Low" returns VYs. 2004 is most likely to be "Low" returns VY as well (0.90 category correlation rate, 0.88 with VY 2000). 2005 is a puzzle: it shows a very strong correlation with "Low" and at the same time "Very high" returns (0.99 correlation with both categories). This can be related to the quality of the underlying cash-flows, which is insufficient; or the emergence of a new category. It can mean that VY 1990 started as a "Low" returns vintage to later recover spectacularly. 2006 is most likely a "Low" returns VY (0.93 category correlation, at par with "Medium", but the highest correlation is with VY 2000). 2007 leans closer to "Medium" than "Low" (0.98 category correlation versus 0.97) but the closest VY is 2000. 2008 leans towards "High" returns (0.98 category correlation, at par with "Medium", but the highest correlation is with 1984), while 2009 leans towards "Low" (category correlation) to Medium (VY correlation).

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[19] This might be an argument to refine the categories and aggregate the vintages differently, should this investigation be a support for further research (with higher density and quality of data)

Exhibit 13. Correlation table for US VC funds, by VY (1980-2009) and category of returns (very high, high, medium and low)

This table provides the results of correlation tests between of the cash-flow curves for US VC funds by VY and category of returns as well as the 1980-2001 average. Cash-flows are provided by Thomson ONE database (as of 31/12/2011). Categories are ours.

	'80-'01	Medium	High	V. H.	Low	High 1980	Medium 1981	1982	1983	1984	1985	1986	1987	1988	1989	High 1990	Very high 1991	1992	1993	1994	1995	1996	1997	1998	Low 1999	2000	2001
1980-'01	1	0.94	0.99	0.90	-0.55	1.00	0.97	0.95	0.92	0.90	0.93	0.84	0.96	0.97	0.93	0.98	0.98	0.97	0.96	0.95	0.86	0.73	0.79	0.98	0.38	0.10	0.16
Medium	0.94	1	0.90	0.71	-0.36	0.93	0.98	0.97	0.98	0.98	1.00	0.96	1.00	0.98	0.99	0.90	0.96	0.85	0.86	0.82	0.66	0.50	0.60	0.89	0.49	0.39	0.52
High	0.99	0.90	1	0.92	-0.62	0.99	0.94	0.91	0.87	0.85	0.88	0.78	0.93	0.96	0.91	1.00	0.97	0.99	0.98	0.98	0.89	0.75	0.79	0.97	0.28	0.02	0.11
V. high	0.90	0.71	0.92	1	-0.78	0.91	0.80	0.75	0.68	0.63	0.69	0.57	0.75	0.81	0.70	0.93	0.85	0.96	0.93	0.95	0.98	0.93	0.92	0.91	0.08	-0.30	-0.23
Low	-0.55	-0.36	-0.62	-0.78	1	-0.57	-0.42	-0.30	-0.25	-0.20	-0.30	-0.25	-0.42	-0.49	-0.38	-0.62	-0.49	-0.70	-0.67	-0.70	-0.81	-0.88	-0.86	-0.60	0.54	0.79	0.73
1980	1.00	0.93	0.99	0.91	-0.57	1	0.96	0.94	0.90	0.88	0.91	0.82	0.95	0.97	0.93	0.99	0.98	0.98	0.97	0.96	0.86	0.74	0.80	0.98	0.35	0.08	0.16
1981	0.97	0.98	0.94	0.80	-0.42	0.96	1	0.97	0.97	0.95	0.97	0.92	0.97	0.96	0.96	0.93	0.97	0.89	0.88	0.88	0.76	0.61	0.68	0.91	0.47	0.28	0.39
1982	0.95	0.97	0.91	0.75	-0.30	0.94	0.97	1	0.98	0.98	0.98	0.90	0.97	0.96	0.96	0.90	0.97	0.87	0.86	0.83	0.69	0.53	0.61	0.91	0.62	0.43	0.53
1983	0.92	0.98	0.87	0.68	-0.25	0.90	0.97	0.98	1	0.99	0.99	0.96	0.97	0.94	0.96	0.86	0.93	0.81	0.81	0.78	0.62	0.47	0.56	0.86	0.63	0.51	0.62
1984	0.90	0.98	0.85	0.63	-0.20	0.88	0.95	0.98	0.99	1	0.99	0.95	0.97	0.94	0.97	0.84	0.93	0.79	0.79	0.76	0.57	0.39	0.49	0.84	0.64	0.58	0.71
1985	0.93	1.00	0.88	0.69	-0.30	0.91	0.97	0.98	0.99	0.99	1	0.97	0.98	0.96	0.98	0.87	0.94	0.83	0.83	0.80	0.64	0.48	0.57	0.87	0.56	0.46	0.60
1986	0.84	0.96	0.78	0.57	-0.25	0.82	0.92	0.90	0.96	0.95	0.97	1.00	0.93	0.89	0.93	0.77	0.85	0.71	0.72	0.70	0.53	0.39	0.49	0.77	0.50	0.52	0.73
1987	0.96	1.00	0.93	0.75	-0.42	0.95	0.97	0.97	0.97	0.97	0.98	1	1	0.99	0.99	0.92	0.97	0.89	0.89	0.85	0.70	0.55	0.65	0.92	0.44	0.30	0.41
1988	0.97	0.98	0.96	0.81	-0.49	0.97	0.96	0.96	0.94	0.94	0.96	0.89	0.99	1	1	0.95	0.99	0.93	0.94	0.89	0.76	0.61	0.70	0.94	0.37	0.20	0.29
1989	0.93	0.99	0.91	0.70	-0.38	0.93	0.96	0.96	0.96	0.97	0.98	0.93	0.99	0.98	1.00	0.90	0.96	0.86	0.87	0.82	0.66	0.49	0.60	0.89	0.43	0.35	0.49
1990	0.98	0.90	1.00	0.93	-0.62	0.99	0.93	0.90	0.86	0.84	0.87	0.77	0.92	0.95	0.90	1	0.97	0.99	0.98	0.98	0.90	0.75	0.79	0.96	0.26	0.00	0.11
1991	0.98	0.96	0.97	0.85	-0.49	0.98	0.97	0.97	0.93	0.93	0.94	0.85	0.97	0.99	0.96	0.97	1	0.95	0.94	0.92	0.81	0.65	0.71	0.95	0.40	0.20	0.30

Year						High	Medium				High					High	Very high				Very high				Low		
1992	0.97	0.85	0.99	0.96	-0.70	0.98	0.89	0.87	0.81	0.79	0.83	0.71	0.89	0.93	0.86	0.99	0.95	1	0.99	0.98	0.93	0.82	0.85	0.96	0.19	-0.11	-0.03
1993	0.96	0.86	0.98	0.93	-0.67	0.97	0.88	0.86	0.81	0.79	0.83	0.72	0.89	0.94	0.87	0.98	0.94	0.99	1	0.95	0.88	0.78	0.83	0.97	0.20	-0.07	0.00
1994	0.95	0.82	0.98	0.93	-0.70	0.96	0.88	0.83	0.78	0.76	0.80	0.70	0.85	0.89	0.82	0.98	0.92	0.98	0.95	1	0.94	0.81	0.83	0.94	0.14	-0.15	-0.05
1995	0.86	0.66	0.89	0.98	-0.81	0.86	0.76	0.69	0.62	0.57	0.64	0.53	0.70	0.76	0.66	0.90	0.81	0.93	0.88	0.94	1	0.92	0.88	0.86	-0.01	-0.37	-0.29
1996	0.73	0.50	0.75	0.93	-0.88	0.74	0.61	0.53	0.47	0.39	0.48	0.39	0.55	0.61	0.49	0.75	0.65	0.82	0.78	0.81	0.92	1.00	0.95	0.75	-0.16	-0.57	-0.54
1997	0.79	0.60	0.79	0.92	-0.86	0.80	0.68	0.61	0.56	0.49	0.57	0.49	0.65	0.70	0.60	0.79	0.71	0.85	0.83	0.83	0.88	1	1	0.84	-0.09	-0.50	-0.52
1998	0.98	0.89	0.97	0.91	-0.60	0.98	0.91	0.91	0.86	0.84	0.87	0.77	0.92	0.94	0.89	0.96	0.95	0.96	0.97	0.94	0.86	0.75	0.84	1	0.32	0.01	0.04
1999	0.38	0.49	0.28	0.08	0.54	0.35	0.47	0.62	0.63	0.64	0.56	0.50	0.44	0.37	0.43	0.26	0.40	0.19	0.20	0.14	-0.01	-0.16	-0.09	0.32	1	0.87	0.80
2000	0.10	0.39	0.02	-0.30	0.79	0.08	0.28	0.43	0.51	0.58	0.46	0.52	0.30	0.20	0.35	0.00	0.20	-0.11	-0.07	-0.15	-0.37	-0.57	-0.50	0.01	0.87	1	0.95
2001	0.16	0.52	0.11	-0.23	0.73	0.16	0.39	0.53	0.62	0.71	0.60	0.73	0.41	0.29	0.49	0.11	0.30	-0.03	0.00	-0.05	-0.29	-0.54	-0.52	0.04	0.80	0.95	1
2002	-0.08	0.39	-0.16	-0.47	0.91	-0.10	0.19	0.40	0.53	0.64	0.49	0.75	0.24	0.08	0.34	-0.17	0.09	-0.29	-0.25	-0.33	-0.52	-0.72	-0.72	-0.19	0.82	0.99	0.97
2003	-0.14	0.46	-0.25	-0.55	0.97	-0.17	0.18	0.45	0.62	0.70	0.56	0.81	0.30	0.05	0.39	-0.27	0.07	-0.41	-0.36	-0.43	-0.60	-0.75	-0.78	-0.29	0.82	0.97	0.95
2004	0.13	0.81	-0.03	-0.42	0.95	0.09	0.45	0.72	0.82	0.92	0.83	0.95	0.72	0.46	0.75	-0.06	0.37	-0.26	-0.21	-0.26	-0.50	-0.68	-0.68	-0.06	0.90	0.99	0.97
2005	0.22	0.91	0.11	-0.49	0.97	0.23	0.54	0.74	0.83	0.94	0.87	0.95	0.88	0.76	0.95	0.08	0.55	-0.25	-0.17	-0.25	-0.54	-0.74	-0.79	-0.05	0.83	0.98	0.99
2006	0.61	0.98	0.73	-0.28	0.99	0.64	0.86	0.87	0.92	0.99	0.97	0.98	0.98	0.96	0.98	0.74	0.82	0.11	0.17	0.47	-0.40	-0.66	-0.67	0.24	0.88	0.99	0.98
2007	0.83	1.00	0.98	0.19	0.99	0.86	0.95	0.95	0.96	0.99	0.99	0.99	0.99	0.99	0.97	0.99	0.99	0.81	0.62	0.95	0.30	-0.49	-0.55	0.40	0.91	0.99	0.98
2008	0.86	0.98	0.96	0.79	0.96	0.88	0.95	0.93	0.96	0.97	0.96	0.99	0.96	0.99	0.99	0.98	0.99	0.97	0.91	0.97	0.87	0.30	-0.36	0.43	0.86	0.96	1.00
2009	0.93	0.98	0.99	0.99	0.95	0.96	0.98	0.95	0.98	0.98	0.98	0.97	0.97	0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.92	0.95	0.94	0.75	0.90	0.95	0.99

Categorisation based on ThomsonOne's communicated returns

Exhibit 14. Correlation table for US LBO funds, by VY (1984-2009) and category of returns (very high, high, medium and low)

This table provides the results of correlation tests between of the cash-flow curves for US LBO funds by VY and by category of returns as well as the 1984-2001 average. Cash-flows are provided by Thomson ONE database (as of 31/12/2011). Categories are ours.

	1984-'01	V. H.	Medium	High	Low	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1984-'01	1	0.87	1.00	0.96	0.98	0.87	0.88	0.81	0.94	0.99	0.96	0.98	0.95	0.90	0.96	0.95	0.99	0.96	0.99	0.93	0.97	0.98	0.97
V. High	0.87	1	0.89	0.90	0.84	0.98	0.97	0.97	0.86	0.89	0.89	0.84	0.88	0.87	0.90	0.91	0.87	0.77	0.82	0.66	0.73	0.88	0.83
Medium	1.00	0.89	1	0.98	0.98	0.89	0.90	0.83	0.94	0.99	0.98	0.98	0.96	0.93	0.98	0.95	0.99	0.94	0.98	0.89	0.94	0.99	0.99
High	0.96	0.90	0.98	1	0.96	0.93	0.92	0.81	0.87	0.95	0.99	0.96	0.98	0.97	1.00	0.90	0.96	0.87	0.93	0.81	0.86	0.98	0.96
Low	0.98	0.84	0.98	0.96	1	0.85	0.88	0.78	0.93	0.98	0.98	1.00	0.97	0.88	0.95	0.90	0.97	0.92	0.98	0.87	0.92	0.96	0.94
1984	0.87	0.98	0.89	0.93	0.85	1	0.98	0.91	0.81	0.87	0.91	0.85	0.90	0.93	0.93	0.89	0.87	0.76	0.81	0.64	0.71	0.86	0.80
1985	0.88	0.97	0.90	0.92	0.88	0.98	1	0.90	0.87	0.90	0.92	0.88	0.93	0.89	0.92	0.91	0.89	0.79	0.85	0.68	0.74	0.86	0.79
1986	0.81	0.97	0.83	0.81	0.78	0.91	0.90	1	0.85	0.85	0.80	0.78	0.80	0.76	0.82	0.87	0.81	0.73	0.77	0.62	0.71	0.87	0.87
1987	0.94	0.86	0.94	0.87	0.93	0.81	0.87	0.85	1	0.96	0.89	0.93	0.89	0.76	0.86	0.95	0.95	0.94	0.96	0.88	0.92	0.87	0.87
1988	0.99	0.89	0.99	0.95	0.98	0.87	0.90	0.85	0.96	1	0.97	0.98	0.96	0.87	0.95	0.94	0.99	0.94	0.98	0.89	0.94	0.97	0.96
1989	0.96	0.89	0.98	0.99	0.98	0.91	0.92	0.80	0.89	0.97	1	0.98	0.99	0.94	0.98	0.89	0.96	0.87	0.94	0.81	0.87	0.97	0.96
1990	0.98	0.84	0.98	0.96	1.00	0.85	0.88	0.78	0.93	0.98	0.98	1	0.97	0.88	0.95	0.90	0.97	0.92	0.98	0.87	0.92	0.96	0.94
1991	0.95	0.88	0.96	0.98	0.97	0.90	0.93	0.80	0.89	0.96	0.99	0.97	1	0.92	0.96	0.89	0.95	0.87	0.94	0.80	0.86	0.94	0.92
1992	0.90	0.87	0.93	0.97	0.88	0.93	0.89	0.76	0.76	0.87	0.94	0.88	0.92	1	0.97	0.84	0.90	0.79	0.84	0.73	0.78	0.93	0.91
1993	0.96	0.90	0.98	1.00	0.95	0.93	0.92	0.82	0.86	0.95	0.98	0.95	0.96	0.97	1	0.90	0.95	0.87	0.93	0.82	0.87	0.98	0.95
1994	0.95	0.91	0.95	0.90	0.90	0.89	0.91	0.87	0.95	0.94	0.89	0.90	0.89	0.84	0.90	1	0.95	0.93	0.93	0.86	0.92	0.90	0.87
1995	0.99	0.87	0.99	0.96	0.97	0.87	0.89	0.81	0.95	0.99	0.96	0.97	0.95	0.90	0.95	0.95	1	0.96	0.98	0.91	0.95	0.97	0.97

THE PREDICTIVE POWER OF THE J-CURVE

Year						Very high				Med.	Hi	Low	High				Med.	Low				Med.	
1996	0.96	0.77	0.94	0.87	0.92	0.76	0.79	0.73	0.94	0.94	0.87	0.92	0.87	0.79	0.87	0.93	0.96	1	0.96	0.96	0.97	0.88	0.86
1997	0.99	0.82	0.98	0.93	0.98	0.81	0.85	0.77	0.96	0.98	0.94	0.98	0.94	0.84	0.93	0.93	0.98	0.96	1	0.93	0.97	0.95	0.92
1998	0.93	0.66	0.89	0.81	0.87	0.64	0.68	0.62	0.88	0.89	0.81	0.87	0.80	0.73	0.82	0.86	0.91	0.96	0.93	1	0.98	0.84	0.82
1999	0.97	0.73	0.94	0.86	0.92	0.71	0.74	0.71	0.92	0.94	0.87	0.92	0.86	0.78	0.87	0.92	0.95	0.97	0.97	0.98	1	0.91	0.87
2000	0.98	0.88	0.99	0.98	0.96	0.86	0.86	0.87	0.87	0.97	0.97	0.96	0.94	0.93	0.98	0.90	0.97	0.88	0.95	0.84	0.91	1	0.98
2001	0.97	0.83	0.99	0.96	0.94	0.80	0.79	0.87	0.87	0.96	0.96	0.94	0.92	0.91	0.95	0.87	0.97	0.86	0.92	0.82	0.87	0.98	1
2002	0.95	0.63	0.95	0.86	0.88	0.61	0.60	0.65	0.84	0.93	0.86	0.88	0.82	0.81	0.86	0.83	0.97	0.92	0.90	0.87	0.91	0.91	0.94
2003	0.89	0.84	0.91	0.93	0.85	0.82	0.80	0.81	0.60	0.83	0.89	0.85	0.89	0.90	0.94	0.83	0.86	0.70	0.78	0.67	0.75	0.93	0.87
2004	0.94	0.22	0.88	0.66	0.87	0.21	0.18	0.23	0.89	0.90	0.65	0.87	0.71	0.52	0.70	0.80	0.92	0.92	0.92	0.95	0.93	0.84	0.81
2005	0.95	-0.20	0.90	0.59	0.98	0.21	0.25	-0.09	0.97	0.98	0.69	0.98	0.71	0.28	0.64	0.71	0.91	0.94	0.98	0.98	0.97	0.87	0.85
2006	0.98	-0.11	0.95	0.86	0.95	-0.13	-0.12	-0.02	0.99	0.96	0.94	0.95	0.92	0.56	0.85	0.79	0.94	0.94	0.99	0.99	0.99	0.95	0.94
2007	0.96	0.05	0.97	0.93	0.96	0.05	0.10	-0.16	0.95	0.98	0.98	0.96	0.94	0.77	0.91	0.80	0.96	0.94	0.98	0.95	0.97	0.96	0.96
2008	0.98	0.45	0.99	0.98	0.98	0.58	0.33	0.20	0.97	0.99	0.99	0.98	0.92	0.94	0.97	0.79	0.99	0.99	0.97	0.96	0.95	0.98	0.99
2009	0.98	0.82	0.97	0.98	0.94	0.90	0.92	0.39	0.98	0.96	0.97	0.94	0.92	0.97	0.97	0.89	0.97	0.98	0.98	0.99	0.98	0.97	0.96

Categorisation based on ThomsonOne's communicated returns

Exhibit 15. Correlation table for EMEA VC funds, by VY (1981-2009) and category of returns (very high, high, medium and low)

This table provides the results of correlation tests between of the cash-flow curves for EMEA VC funds by VY and by category of returns as well as the 1981-2001 average. Cash-flows are provided by Thomson ONE database (as of 31/12/2011). Categories are ours.

	1981-'01	High	Medium	Low	V. H	1981	1983	1984 High	1985 Med.	1986 High	1987 Med.	1988	1989	1990 V. H.	1991 Med.	1992	1993 Med.	1994	1995 Low	1996	1997	1998	1999	2000 Low	2001
1981-'01	1	0.32	0.45	0.89	0.35	0.41	0.46	0.36	0.25	0.25	0.54	0.38	0.37	0.35	0.42	0.02	0.73	0.40	0.37	0.47	0.29	0.65	0.97	0.92	0.99
High	0.32	1	0.97	-0.13	0.96	0.96	0.98	0.98	0.98	0.99	0.94	0.97	0.98	0.96	0.85	0.94	0.76	0.95	-0.73	0.70	0.91	0.79	0.31	-0.12	0.18
Medium	0.45	0.97	1	0.01	0.95	0.97	0.96	0.96	0.97	0.96	0.96	0.98	0.97	0.95	0.92	0.88	0.84	0.98	-0.61	0.75	0.92	0.87	0.46	0.05	0.40
Low	0.89	-0.13	0.01	1	-0.10	-0.02	0.02	-0.07	-0.20	-0.21	0.13	-0.07	-0.09	-0.10	0.01	-0.42	0.39	-0.04	0.73	0.18	-0.12	0.31	0.88	1.00	0.97
V. High	0.35	0.96	0.95	-0.10	1	0.91	0.96	0.91	0.94	0.97	0.87	0.97	0.99	1.00	0.90	0.91	0.82	0.94	-0.65	0.58	0.86	0.75	0.29	-0.09	0.21
1981	0.41	0.96	0.97	-0.02	0.91	1	0.94	0.97	0.97	0.94	0.96	0.93	0.94	0.91	0.84	0.86	0.77	0.96	-0.66	0.72	0.87	0.81	0.45	0.04	0.37
1983	0.46	0.98	0.96	0.02	0.96	0.94	1	0.95	0.94	0.96	0.95	0.95	0.97	0.96	0.84	0.87	0.82	0.92	-0.62	1	1	0.81	0.44	0.08	0.40
1984	0.36	0.98	0.96	-0.07	0.91	0.97	0.95	1	0.97	0.95	0.97	0.92	0.95	0.91	0.79	0.88	0.71	0.93	-0.70	0.71	0.87	0.78	0.37	-0.02	0.31
1985	0.25	0.98	0.97	-0.20	0.94	0.97	0.94	0.97	1	0.98	0.92	0.96	0.96	0.94	0.86	0.95	0.72	0.96	-0.77	0.69	0.91	0.77	0.24	-0.23	0.08
1986	0.25	0.99	0.96	-0.21	0.97	0.94	0.96	0.95	0.98	1	0.91	0.97	0.98	0.97	0.86	0.96	0.74	0.94	-0.76	0.68	0.92	0.77	0.23	-0.22	0.06
1987	0.54	0.94	0.96	0.13	0.87	0.96	0.95	0.97	0.92	0.91	1	0.90	0.92	0.87	0.78	0.79	0.79	0.91	-0.55	0.78	0.86	0.85	0.58	0.27	0.61
1988	0.38	0.97	0.98	-0.07	0.97	0.93	0.95	0.92	0.96	0.97	0.90	1	0.96	0.97	0.94	0.92	0.83	0.97	-0.63	0.73	0.93	0.85	0.38	-0.07	0.27
1989	0.37	0.98	0.97	-0.09	0.99	0.94	0.97	0.95	0.96	0.98	0.92	0.96	1	0.99	0.87	0.91	0.81	0.95	-0.67	0.62	0.87	0.77	0.31	-0.06	0.26
1990	0.35	0.96	0.95	-0.10	1.00	0.91	0.96	0.91	0.94	0.97	0.87	0.97	0.99	1	0.90	0.91	0.82	0.94	-0.65	0.58	0.86	0.75	0.29	-0.09	0.21
1991	0.42	0.85	0.92	0.01	0.90	0.84	0.84	0.79	0.86	0.86	0.78	0.94	0.87	0.90	1	0.81	0.84	0.93	-0.47	0.64	0.85	0.82	0.40	-0.01	0.33
1992	0.02	0.94	0.88	-0.42	0.91	0.86	0.87	0.88	0.95	0.96	0.79	0.92	0.91	0.91	0.81	1	0.60	0.88	-0.85	0.61	0.89	0.65	-0.01	-0.49	-0.25
1993	0.73	0.76	0.84	0.39	0.82	0.77	0.82	0.71	0.72	0.74	0.79	0.83	0.81	0.82	0.84	0.60	1	0.82	-0.18	0.64	0.75	0.87	0.70	0.42	0.67

Year								High	Med.	High	Med.			V. H.	Med.		Med.		Low					Low	
1994	0.40	0.95	0.98	-0.04	0.94	0.96	0.92	0.93	0.96	0.94	0.91	0.97	0.95	0.94	0.93	0.88	0.82	1	-0.62	0.72	0.90	0.83	0.40	-0.03	0.32
1995	0.37	-0.73	-0.61	0.73	-0.65	-0.66	-0.62	-0.70	-0.77	-0.76	-0.55	-0.63	-0.67	-0.65	-0.47	-0.85	-0.18	-0.62	1	-0.33	-0.63	-0.27	0.50	0.87	0.79
1996	0.47	0.70	0.75	0.18	0.58	0.72	0.69	0.71	0.69	0.68	0.78	0.73	0.62	0.58	0.64	0.61	0.64	0.72	-0.33	1	0.86	0.90	0.60	0.18	0.41
1997	0.29	0.91	0.92	-0.12	0.86	0.87	0.88	0.87	0.91	0.92	0.86	0.93	0.87	0.86	0.85	0.89	0.75	0.90	-0.63	0.86	1	0.88	0.35	-0.13	0.16
1998	0.65	0.79	0.87	0.31	0.75	0.81	0.81	0.78	0.77	0.77	0.85	0.85	0.77	0.75	0.82	0.65	0.87	0.83	-0.27	0.90	0.88	1	0.72	0.33	0.59
1999	0.97	0.31	0.46	0.88	0.29	0.45	0.44	0.37	0.24	0.23	0.58	0.38	0.31	0.29	0.40	-0.01	0.70	0.40	0.50	0.60	0.35	0.72	1	1	0.97
2000	0.92	-0.12	0.05	1.00	-0.09	0.04	0.08	-0.02	-0.23	-0.22	0.27	-0.07	-0.06	-0.09	-0.01	-0.49	0.42	-0.03	0.87	0.18	-0.13	0.33	0.87	1	0.94
2001	0.99	0.18	0.40	0.97	0.21	0.37	0.40	0.31	0.08	0.06	0.61	0.27	0.26	0.21	0.33	-0.25	0.67	0.32	0.79	0.41	0.16	0.59	0.97	0.94	1
2002	0.98	0.14	0.34	0.99	0.20	0.33	0.49	0.28	-0.02	-0.03	0.59	0.22	0.23	0.20	0.24	-0.41	0.65	0.22	0.92	0.34	0.07	0.54	0.94	0.98	0.98
2003	0.99	0.37	0.53	0.98	0.47	0.54	0.72	0.46	0.15	0.16	0.72	0.43	0.45	0.47	0.39	-0.38	0.78	0.40	0.90	0.43	0.20	0.65	0.96	0.97	0.99
2004	0.93	0.77	0.84	0.90	0.78	0.79	0.92	0.74	0.56	0.64	0.90	0.78	0.84	0.78	0.67	-0.08	0.89	0.72	0.74	0.69	0.60	0.86	0.97	0.88	0.94
2005	0.99	0.72	0.89	0.99	0.99	0.81	0.90	0.69	0.57	0.59	0.83	0.84	0.98	0.99	0.87	-0.23	0.97	0.89	0.91	0.53	0.48	0.81	0.97	0.98	1.00
2006	0.94	0.85	0.93	0.93	0.90	0.87	0.91	0.87	0.81	0.76	0.86	0.92	0.94	0.90	0.89	0.09	0.92	0.89	0.82	0.69	0.67	0.90	0.94	0.93	0.92
2007	0.97	0.92	0.98	0.97	0.93	0.93	0.95	0.93	0.95	0.87	0.94	0.98	0.97	0.93	0.94	0.51	0.94	0.94	0.89	0.86	0.83	0.93	0.98	0.97	0.96
2008	0.97	0.98	0.98	0.97	0.93	0.92	0.97	0.98	0.98	0.98	0.95	0.97	0.97	0.93	0.96	0.84	0.93	0.93	0.93	0.94	0.95	0.96	0.97	0.97	0.96
2009	0.96	0.95	0.96	0.97	0.93	0.86	0.94	0.94	0.96	0.96	0.91	0.95	0.95	0.93	0.98	0.90	0.90	0.90	0.96	0.95	0.97	0.96	0.95	0.96	0.97

Categorisation based on ThomsonOne's communicated returns

Exhibit 16. Correlation table for EMEA LBO funds, by VY (1984-2009) and category of returns (very high, high, medium and low)

This table provides the results of correlation tests between of the cash-flow curves for EMEA LBO funds by VY and by category of returns as well as the 1984-2001 average. Cash-flows are provided by Thomson ONE database (as of 31/12/2011). Categories are ours.

	1984-'01	High	Medium	Low	Very high	1984 (High)	1986	1987 (Me.)	1988	1989 (Low)	1990	1991 (Me.)	1992 (V.H.)	1993	1994 (V.H)	1995 (H.)	1996	1997 (Medium)	1998	1999	2000 (V.H.)	2001 (High)
1984-'01	1	0.98	0.99	0.95	0.99	0.92	0.97	0.94	0.94	0.95	0.90	1.00	0.99	0.96	0.99	0.79	0.96	0.94	0.99	0.98	0.99	0.97
High	0.98	1	0.93	0.87	0.98	0.87	0.96	0.88	0.85	0.87	0.82	0.97	0.98	0.99	0.98	0.87	0.97	0.85	0.96	0.92	0.97	1.00
Medium	0.99	0.93	1	0.98	0.96	0.92	0.94	0.96	0.97	0.98	0.95	0.98	0.97	0.91	0.95	0.70	0.92	0.98	0.99	0.99	0.95	0.90
Low	0.95	0.87	0.98	1	0.92	0.93	0.92	0.98	0.98	1.00	0.97	0.94	0.92	0.85	0.90	0.62	0.86	0.98	0.96	0.96	0.89	0.83
Very High	0.99	0.98	0.96	0.92	1	0.92	0.98	0.92	0.92	0.92	0.85	0.98	0.99	0.97	0.99	0.82	0.96	0.91	0.98	0.96	1.00	0.98
1984	0.92	0.87	0.92	0.93	0.92	1	0.95	0.96	0.93	0.93	0.85	0.90	0.91	0.87	0.91	0.72	0.90	0.92	0.91	0.90	0.92	0.87
1986	0.97	0.96	0.94	0.92	0.98	0.95	1	0.94	0.92	0.92	0.83	0.95	0.97	0.95	0.97	0.80	0.94	0.90	0.95	0.92	0.97	0.97
1987	0.94	0.88	0.96	0.98	0.92	0.96	0.94	1	0.96	0.98	0.93	0.93	0.92	0.87	0.90	0.66	0.89	0.96	0.95	0.94	0.89	0.84
1988	0.94	0.85	0.97	0.98	0.92	0.93	0.92	0.96	1	0.98	0.95	0.92	0.91	0.83	0.90	0.56	0.83	0.98	0.94	0.97	0.89	0.80
1989	0.95	0.87	0.98	1.00	0.92	0.93	0.92	0.98	0.98	1	0.97	0.94	0.92	0.85	0.90	0.62	0.86	0.98	0.96	0.96	0.89	0.83
1990	0.90	0.82	0.95	0.97	0.85	0.85	0.83	0.93	0.95	0.97	1	0.91	0.87	0.79	0.82	0.54	0.80	0.96	0.93	0.93	0.81	0.74
1991	1.00	0.97	0.98	0.94	0.98	0.90	0.95	0.93	0.92	0.94	0.91	1	0.99	0.96	0.98	0.80	0.96	0.93	1.00	0.98	0.98	0.97
1992	0.99	0.98	0.97	0.92	0.99	0.91	0.97	0.92	0.91	0.92	0.87	0.99	1	0.98	0.99	0.82	0.97	0.90	0.98	0.96	0.99	0.98
1993	0.96	0.99	0.91	0.85	0.97	0.87	0.95	0.87	0.83	0.85	0.79	0.96	0.98	1	0.97	0.90	0.98	0.82	0.95	0.89	0.96	0.98
1994	0.99	0.98	0.95	0.90	0.99	0.91	0.97	0.90	0.90	0.90	0.82	0.98	0.99	0.97	1	0.84	0.97	0.89	0.97	0.94	0.99	0.97
1995	0.79	0.87	0.70	0.62	0.82	0.72	0.80	0.66	0.56	0.62	0.54	0.80	0.82	0.90	0.84	1	0.91	0.60	0.78	0.65	0.78	0.82
1996	0.96	0.97	0.92	0.86	0.96	0.90	0.94	0.89	0.83	0.86	0.80	0.96	0.97	0.98	0.97	0.91	1	0.85	0.96	0.89	0.94	0.94

Year						High		Me.		Low		Me.	V. H.		V. H	H.			Medium		V. H.	High
1997	0.94	0.85	0.98	0.98	0.91	0.92	0.90	0.96	0.98	0.98	0.96	0.93	0.90	0.82	0.89	0.60	0.85	1	0.95	0.96	0.87	0.77
1998	0.99	0.96	0.99	0.96	0.98	0.91	0.95	0.95	0.94	0.96	0.93	1.00	0.98	0.95	0.97	0.78	0.96	0.95	1	0.98	0.97	0.95
1999	0.98	0.92	0.99	0.96	0.96	0.90	0.92	0.94	0.97	0.96	0.93	0.98	0.96	0.89	0.94	0.65	0.89	0.96	0.98	1	0.95	0.90
2000	0.99	0.97	0.95	0.89	1.00	0.92	0.97	0.89	0.89	0.89	0.81	0.98	0.99	0.96	0.99	0.78	0.94	0.87	0.97	0.95	1	0.98
2001	0.97	1.00	0.90	0.83	0.98	0.87	0.97	0.84	0.80	0.83	0.74	0.97	0.98	0.98	0.97	0.82	0.94	0.77	0.95	0.90	0.98	1
2002	0.89	0.96	0.78	0.66	0.90	0.81	0.91	0.72	0.57	0.66	0.59	0.90	0.92	0.97	0.90	0.90	0.94	0.59	0.88	0.75	0.90	0.95
2003	0.87	0.79	0.92	0.91	0.77	0.82	0.73	0.93	0.75	0.91	0.87	0.91	0.83	0.77	0.71	0.55	0.77	0.84	0.93	0.86	0.78	0.79
2004	0.62	0.71	0.41	0.20	0.66	0.84	0.73	0.45	-0.08	0.20	0.02	0.62	0.69	0.79	0.73	0.89	0.93	0.08	0.62	0.29	0.63	0.66
2005	0.48	0.08	0.83	0.93	0.15	0.23	0.07	0.79	0.90	0.93	0.93	0.51	0.24	-0.04	-0.12	-0.43	-0.08	0.96	0.58	0.87	0.21	0.16
2006	0.85	0.54	0.95	0.98	0.65	0.45	0.57	0.87	0.95	0.98	0.96	0.80	0.65	0.32	0.24	-0.32	0.16	0.97	0.84	0.98	0.71	0.67
2007	0.96	0.87	0.97	0.98	0.95	0.58	0.74	0.94	0.95	0.98	0.98	0.96	0.93	0.79	0.69	0.00	0.57	0.96	0.94	0.99	0.96	0.92
2008	0.95	0.96	0.94	0.95	0.91	0.60	0.73	0.87	0.89	0.95	0.97	0.95	0.90	0.85	0.79	0.94	0.74	0.96	0.93	0.92	0.92	0.97
2009	0.99	0.97	0.98	0.98	0.94	0.95	0.97	0.97	0.96	0.98	0.98	0.99	0.94	0.92	0.94	0.97	0.96	0.97	0.98	0.96	0.93	0.96

Categorisation based on ThomsonOne's communicated returns

EMEA LBO

Exhibit 16 provides the results for EMEA LBO funds. The same initial limitation appears: the categories are not substantially differentiated. Just like for US LBO funds, some correlation rates appear at or below 0.6 for the unrealized vintages. This might signal a new category (possibly related to the use of "dividend recaps"). VY 1989 appears as the most representative of "Low" returns, 1999 of "Medium" returns, 2000 of "Very high" and 2001 for "High returns". 2002 is most likely to be a "High" returns VY (0.96 category correlation, 0.95 with VY 2001). 2003 leans towards "Medium" (0.92 category correlation) to "Low" (0.91 category correlation, and 0.91 with VY 1989). 2004 is a case of "High" returns (0.71 category correlation, 0.66 with VY 2001) and 2005 an example of "Low" returns (0.93 category correlation and with VY 1989), as well as 2006 (0.98 for both). 2007 appears as leaning towards "Low" (0.98 category correlation and 0.98 correlation with 1989, though the correlation is higher with 1999). 2008 is likely to be a "High" returns VY (0.96 category correlation and 0.97 with VY 2001). 2009 is leaning towards "Low" (0.98 for both).

We then tried to assess whether geographies and/or strategies are correlated (unreported). For EMEA and US VC, "Low" returns are uniquely correlated (0.97) indicating that there is a specific J-Curve profile for Low returns. As for other returns, "Medium" US VC returns correlates the most highly with "High", "Medium" and "Very High" EMEA VC. This confirms that EMEA data have to be further assessed; and that the rather disappointing average results of local funds prevent the potential development a single model for all VC funds. For EMEA and US LBO, the picture is split between "High"/"Very high" and "Medium"/"Low". This limits the generalization of the findings. Refining categories with better data would improve the results.

The analysis is deepened with same geographies but different strategies as they are partially correlated. Though "Low" returns do not match, "High" US VC and US LBO exhibit a perfect correlation. "Medium" US VC returns correlate with "Medium" and "Low" US LBO returns, hence confirming that there might be too many categories for LBO. "Very high" returns are also highly and distinctively correlated (0.94). The same conclusion for US funds applies to "Low" returns in EMEA VC and EMEA LBO. Other results are not conclusive. "Very high" EMEA VC returns match with "Low" EMEA LBO returns while "Medium" EMEA VC returns match with "Low" EMEA LBO returns and "High" EMEA VC returns match with "Low" EMEA LBO returns.

Correlations first eliminate categories and then indicate the closest comparable

From the correlations, we conclude that:
i) below two years of activity, correlations do not give any clear information about the performance categories which are relevant to analyze a given VY: correlations are high with all the "ideal-type" categories;
ii) for Years 3 to 5 of funds activity, some categories drop in terms of correlation. The most likely performance appears with three and then two categories;
iii) from Year 6 and on, the performance category to which the VY will most likely belong clearly appears.

Exhibit 17. Synthesis: compared categorization of average US VC and LBO funds; and EMEA VC and LBO funds by VY based on initial reading and ideal-type analysis (model), predictions for unrealized funds

These tables provide the results of the categorization of average US VC and LBO funds; EMEA VC and LBO funds by VY, based on initial reading and ideal-type predictions (mixing categories and J-curves) for fully realized funds based on previous results; predictions and categorization of partially realized vintages, based on the identification by ideal-type (« model result ») and identification of the closest comparable. Data reliability is put in perspective, notably for vintages identified as problematic (signaled by a minus sign). Outliers are signaled by an "O".*

US VC					
Vintage year	Initial category	Model result	Confirmed initial?	Closest comparable	Data reliable?
1981	Medium	Medium	Yes		++
1982	Medium	Medium	Yes		++
1983	Medium	Medium	Yes		++
1984	Medium	Medium	Yes		++
1985	Medium	Medium	Yes		++
1986	Medium	Medium	Yes		+
1987	Medium	Medium	Yes		++
1988	Medium	Medium	Yes		++
1989	Medium	Medium	Yes		++
1990	High (O?)	High	Yes		++
1991	**Medium (O*)**	**High**	**No**		**+**
1992	**Very High**	**High**	**No**		**++**
1993	**Very High**	**High**	**No**		**++**
1994	**Very High**	**High**	**No**		**+**
1995	Very High	Very High	Yes		++
1996	Very High	Very High	Yes		++
1997	Very High	Very High	Yes		++
1998	**Medium (O*)**	**High**	**No**		**++**
1999	Low	Low	Yes		++
2000	Low	Low	Yes		++
2001	Low (O?)	Low	Yes		++
2002	-	Low		2000	+
2003	-	Low		2000	++
2004	-	Low		2000	++

US VC					
Vintage year	Initial category	Model result	Confirmed initial?	Closest comparable	Data reliable?
2005	-	Low		2001	++
2006	-	Low/Medium		1984 & 2000	++
2007	-	Medium/Low/High		1984-88, 1990-91, 2000	+
2008	-	Medium/Low/High		2001	+
2009	-	High/Very High/Medium		1988, 1990-1994, 2001	+

Exhibit 17 (continued)

US LBO					
Vintage year	Initial category	Model result	Confirmed initial?	Closest comparable	Data reliable?
1981	-				
1982	-				
1983	-				
1984	Very high	Very high	Yes		+
1985	Very high	Very high	Yes		++
1986	Very high	Very high	Yes		++
1987	**Medium (O*)**	**Medium (Low)**	**Yes**		**-**
1988	Medium	Medium (Low)	Yes		++
1989	High (O*)	High	Yes		**++**
1990	Low	Low	Yes		++
1991	High	High	Yes		++
1992	High	High	Yes		++
1993	**High**	**High**	**Yes**		**-**
1994	Medium	Medium	Yes		++
1995	**Medium**	**Medium**	**Yes**		**-**
1996	**Low**	**Medium**	**No**		**++**
1997	**Low**	**Medium/Low**	**No**		++
1998	**Low**	**Medium**	**No**		++
1999	**Low**	**Medium**	**No**		++

US LBO					
Vintage year	Initial category	Model result	Confirmed initial?	Closest comparable	Data reliable?
2000	Medium	Medium	Yes		+
2001	Medium (O*)	Medium	Yes		+
2002	-	Medium		1995	++
2003	-	High		1993	++
2004	-	Medium		1998	++
2005	-	Low		1988, 1990, 1997-98	++
2006	-	Medium/Low		1987, 1997-99	++
2007	-	Medium		1988-89, 1997	++
2008	-	Medium		1988-89, 1995-96, 2001	+
2009	-	High		1998	+

Exhibit 17 (continued)

EMEA VC					
Vintage year	Initial category	Model result	Confirmed initial?	Closest comparable	Data reliable?
1981	**High**	**Medium**	**No**		**+**
1982	-				
1983	High (O*)	High	Yes		++
1984	High	High	Yes		+
1985	**Medium (O*)**	**High**	**No**		**++**
1986	High (O*)	High	Yes		++
1987	Medium	Medium	Yes		++
1988	**Low**	**Medium**	**No**		**++**
1989	**High (O*)**	**Very High**	**No**		**++**
1990	Very High (O*)	Very High	Yes		++
1991	Medium	Medium	Yes		++
1992	**Very High**	**High**	**No**		**-**
1993	Medium	Medium	Yes		++
1994	**Very High**	**Medium**	**No**		**+**
1995	Low	Low	Yes		++

EMEA VC					
Vintage year	Initial category	Model result	Confirmed initial?	Closest comparable	Data reliable?
1996	**Very High**	**Medium**	**No**		**++**
1997	**High (O*)**	**Medium**	**No**		**+**
1998	Medium (O*)	Medium	Yes		++
1999	Low	Low	Yes		+
2000	Low	Low	Yes		++
2001	Low	Low	Yes		+
2002	-	Low		2000, 2001	++
2003	-	Low		2001	++
2004	-	Low		1999	++
2005	-	Low/Very High		2001	++
2006	-	Medium/Low		1999	+
2007	-	Medium		1999	++
2008	-	Medium		1984-1986	+
2009	-	Low		1991	+

Exhibit 17 (continued)

EMEA LBO					
Vintage year	Initial category	Model result	Confirmed initial?	Closest comparable	Data reliable?
1981	-				
1982	-				
1983	-				
1984	High (O*)	Medium/V. High	No		+
1985	-				
1986	**High (O*)**	**Very high**	**No**		**-**
1987	Medium	Low	No		++
1988	**Medium**	**Low**	**No**		**-**
1989	Low	Low	Yes		++
1990	**Low**	**Low**	**Yes**		**-**

EMEA LBO					
Vintage year	Initial category	Model result	Confirmed initial?	Closest comparable	Data reliable?
1991	Medium	Medium/V. High	Yes		++
1992	Very high	Very high	Yes		++
1993	High (O*)	High	Yes		++
1994	Very high (O*)	Very high	Yes		++
1995	High (O*)	High	Yes		+
1996	**Medium**	**High**	**No**		**-**
1997	Medium (O*)	Medium/Low	Yes		++
1998	Medium (O*)	Medium	Yes		+
1999	Medium (O*)	Medium	Yes		++
2000	Very high	Very high	Yes		++
2001	**High**	**High**	**Yes**		**-**
2002	-	High		1993	++
2003	-	Medium		1987	++
2004	-	High		1996	+
2005	**-**	**Low**		**1997**	**-**
2006	-	Low		1989, 1999	++
2007	-	Low		1999	++
2008	-	High		1990, 2001	+
2009	-	Medium/Low		1991	+

Exhibit 18. Probability that performance analysis reflects the final performance of the fund, on the basis of the interim performance assessment of the final quarter of each year, based on the ideal-types identified

These tables provide the percentage of quarterly performance analyses (at year end) reflecting the final performance of the fund (realized funds only), for average US and EMEA VC and LBO funds, based on the ideal-type categories. If year end (YE) performance equals final performance (FP), the average spread with the other categories is provided, as well as the spread with the closest comparable. If YE differs with FP, the spread with the closest comparable is provided, as well as the highest spread witnessed, the lowest, and highest among the lowest.

VC CF USA (realized funds 1980-2001)

Fund Age (Years)	2	3	4	5	6	7	8	9	10	11	12	All (max 14 Y)
Year end performance = final performance	**45.45%**	**59.09%**	**68.18%**	**63.64%**	**72.73%**	**81.82%**	**86.36%**	**100%**	**95.45%**	**100%**	**100%**	**79.65%**
If YE = FP: average spread with three other categories	-0.6%	-0.7%	-6.0%	-29.1%	-41.0%	-48.6%	-49.2%	-46.3%	-46.2%	-44.8%	-44.5%	30.7%
If YE = FP: spread with closest comparable	0.4%	0.5%	4.2%	13.9%	20.2%	17.4%	19.2%	17.3%	17.1%	13.4%	11.1%	11.4%
If YE <> FP: spread with closest comparable	0.5%	0.7%	2.0%	3.8%	**6.2%**	4.8%	0.3%	-	1.1%	-	-	0.7%
If YE <> FP: higest spread with closest comparable	0.162											
If YE <> FP: lowest spread with closest comparable	0.000											
If YE <> FP: highest minimum spread with closest comp.	0.015											
If YE <> FP, does the comparable stays the same?	Yes:	8	(50%)	No:	8	(50%)						
Outlier	1	(1981)				Performance:	Medium					

LBO CF USA (realized funds 1984-2001)

Fund Age (Years)	2	3	4	5	6	7	8	9	10	11	12	All (max 14 Y)
Year end performance = final performance	**44.44%**	**61.11%**	**61.11%**	**55.56%**	**66.67%**	**72.22%**	**77.78%**	**88.89%**	**88.89%**	**88.89%**	**88.24%**	**72.22%**
If YE = FP: average spread with three other categories	-3.1%	-7.0%	-16.7%	-32.2%	-36.2%	-33.4%	-23.5%	-15.9%	-11.1%	-8.1%	-6.5%	12.8%
If YE = FP: spread with closest comparable	1.3%	3.7%	11.0%	21.1%	19.9%	15.4%	10.0%	6.7%	4.8%	3.5%	3.1%	6.7%
If YE <> FP: spread with closest comparable	0.3%	1.2%	0.6%	0.7%	1.2%	**4.9%**	4.1%	2.1%	1.9%	1.5%	0.5%	0.6%
If YE <> FP: higest spread with closest comparable	0.110											
If YE <> FP: lowest spread with closest comparable	0.000											
If YE <> FP: highest minimum spread with closest comp.	0.010											
If YE <> FP, does the comparable stays the same?	Yes:	3	(33%)	No:	6	(67%)						
Outliers		2	(1987,1988)				Performances:	Medium (x2)				

Exhibit 18 (continued)

VC CF EMEA (realized funds 1981-2001)

Fund Age (Years)	2	3	4	5	6	7	8	9	10	11	12	All (max 14 Y)
Year end performance = final performance	**50.00%**	**50.00%**	**75.00%**	**55.00%**	**50.00%**	**70.00%**	**70.00%**	**75.00%**	**90.00%**	**95.00%**	**94.74%**	**70.45%**
If YE = FP: average spread with three other categories	-1.4%	-0.8%	-2.4%	-6.6%	-12.0%	-15.6%	-21.3%	-27.4%	-30.6%	-33.0%	-33.2%	14.3%
If YE = FP: spread with closest comparable	0.9%	0.6%	0.9%	3.2%	6.7%	5.6%	11.5%	17.1%	18.0%	18.1%	15.7%	7.6%
If YE <> FP: spread with closest comparable	0.4%	0.6%	0.5%	2.1%	3.3%	**5.5%**	5.2%	4.9%	3.1%	1.8%	0.3%	1.1%
If YE <> FP: higest spread with closest comparable	0.134											
If YE <> FP: lowest spread with closest comparable	0.000											
If YE <> FP: highest minimum spread with closest comp.	0.016											
If YE <> FP, does the comparable stays the same?	Yes:	3	(27%)	No:	8	(73%)						
Outliers		6	(1989, 1991, 1993, 1996-98)			Performances:		V High, Medium (x5)				

LBO CF EMEA (realized funds 1984-2001)

Fund Age (Years)	2	3	4	5	6	7	8	9	10	11	12	All (max 14 Y)
Year end performance = final performance	**52.94%**	**64.71%**	**47.06%**	**58.82%**	**70.59%**	**88.24%**	**76.47%**	**82.35%**	**82.35%**	**82.35%**	**87.50%**	**72.19%**
If YE = FP: average spread with three other categories	-3.1%	-3.1%	-2.4%	-4.9%	-15.5%	-24.3%	-21.1%	-14.0%	-10.1%	-7.8%	-6.3%	8.6%
If YE = FP: spread with closest comparable	1.9%	1.5%	1.4%	3.1%	4.7%	3.1%	5.4%	4.1%	3.0%	2.4%	2.1%	2.4%
If YE <> FP: spread with closest comparable	0.7%	0.5%	1.2%	0.9%	2.6%	**2.7%**	0.8%	1.0%	1.2%	0.9%	0.8%	0.5%
If YE <> FP: higest spread with closest comparable	0.047											
If YE <> FP: lowest spread with closest comparable	0.000											
If YE <> FP: highest minimum spread with closest comp.	0.006											
If YE <> FP, does the comparable stays the same?	Yes:	4	(36%)	No:	7	(64%)						
Outliers		4	(1984, 1986, 1987, 1991)			Performances:	Low, V high, Low, Medium					

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The predictive power of the J-Curve

Exhibit 17 provides a summary of our initial categorization, and the results from the model. The model is then used to predict the performance of active funds, and to identify the closest comparison in terms of VY. Outliers and problematic vintages are indicated.

Exhibit 18 provides probabilities that the performance categories identified at the end of each year are the same as the final performance of the VY. For the four strategies/geographies considered, it appears that below two years the prediction is below or around 50%. At the end of the third year of activity, for the four strategies/geographies considered, the category of performance can predict the final performance at 50% (VC EMEA) to 65% (LBO EMEA rate). Year 4 exhibits an increase of this probability (except for EMEA LBO, which actually falls below 50%). From Year 5 and on, the percentage increases systematically (if the impact of outliers and defective vintages is excluded).

When the year-end performance category is the same than the final performance category, the spread of correlations with the three other categories and with the closest category increases significantly in Year 4 (US strategies) and 5 (EMEA strategies).

When the year-end performance category differs from the final performance category, the spread of correlation with the closest comparable (the category of final performance) peaks in Year 6 for US VC and Year 7 all other strategies/geographies. It is on average 6.2% for US VC (the highest correlation spread is 0.16), 2.7% for US LBO (0.11), 3.3% for EMEA VC (0.13) and 2.6% for EMEA LBO (0.05).

Overall, the spread with the closest comparison if the year-end performance category differs from the final performance is on average from 0.5% (EMEA LBO) to 1.1% (EMEA VC). If the year-end performance category is the same as the final performance, the average spread is then from 2.4% (EMEA LBO) to 11.4% (US VC). In practical terms, this means that if the spread of the year-end performance of a given active US VC fund with its closest comparison is beyond 6.2% (or 0.162) then the final performance has an above-average likelihood to be the final performance category. If the performance spread is at or above 11.4%, then in effect, the performance category has above a 60% chances to be the final one.

Conclusion, Discussion and Limits

Summary of findings and discussion

The approach taken has been to use only cash-flows and build a model which defines historical return patterns and categories which are in turn used to identify the return potential of active funds. The purpose of the model is not to immediately attribute a fund to a precise category but to reduce the time needed to attribute it to a given category – and hence to reduce the solvency costs associated with investing in PE. In this respect, the model is helpful. During the first 2 to 5 years of activity, correlations with return categories will progressively exclude certain return patterns and then a given vintage will lean towards the most likely category of return it belongs to. It is only after 6 to 8 years of activity that a final attribution can be done.

Testing it with individual vintages, and then with top and bottom quartile returns for each vintage, correlation tests hold true. Unreported tests of the most representative VYs of return categories for US VC and of the top and bottom quartile funds of these most representative VYs have been undertaken to mimic the situation of individual funds (and their correlation to

the four categories). VY 1985, representing the "Medium" returns category, was excluded from the overall samples (all categories are recalculated). Snapshots of its cash-flows were taken for each year after the first two years. In Year 4, the hypothesis of "Very high" returns is excluded. After 6 years of activity, the most likely possibility is "Medium" returns. VY 1990 representing "High" returns category is tested with the same procedure. The correlation tests hint at a "Medium" return until Year 6, when the "High" returns appear as the category to which it belongs. Given the fact that 1990 is the only item in the "High" returns category, we could infer that this VY is the one during which the cycle turned from "Medium" to "Very High" returns. VY 1995 representing "Very high" returns was also tested. The most likely return category after 2 years is "Low". It is only in Year 5 that the "Very high" returns category appears as the one to which it belongs. We test VY 2000, representing "Low" returns. After 4 years, the "Very high" returns category was excluded; after 6 years, "High" returns were excluded and "Low" seem to be the most probable.

The same reasoning is applied to top quartile funds of the same VYs (unreported). For top quartile VY 1985, the vintage correlates the closest with the average VY 1985. In Year 4, the "Medium" returns scenario appears as the highest correlation. It is in Year 6 that this is definitely confirmed. For 1990, though top quartile, the same conclusions apply for the average of the vintage. As the correlation switches from "Medium" to "High"/"Very High" after five years, we can only confirm that 1990 might have been a transition vintage. For 1995, the correlations fall below 0.6 during two years of activity, hence confirming that a specific phenomenon has affected this vintage in 1998 and 1999 (which were the peak of the technology bubble). In Year 5, the category appears as "Very high" returns. For 2000, "Very high" returns are excluded from Year 4; then "High" returns from Year 5. At this point, "Low" appears and remains the most probable scenario until Year 8, when it switches to "Medium".

The same reasoning is applied to bottom quartile funds of the same VYs. For 1985, in Year 4, the "Very high" returns scenario is excluded. In Year 5, the highest correlation is with "High" (this is not confirmed with the most representative VY, as 1985 remains the highest one). In Year 7, "High" is excluded and in Year 8, "Low" becomes prevalent. Overall, the closest VY is the "Low" returns year 1999 (0.97), which appears clearly in Year 7. For 1990, unlike for top quartile and the average, the bottom quartile vintage excludes very high returns after 3 years, high returns after 4 years and medium returns after 7 years. Though being among the bottom quartile of "High" returns, it hence appears as a "Low" returns group of funds. For 1995, the bottom quartile of "Very high" returns have been excluded from the "Very high" returns after three years, then from "High" returns after 5 years; and they then belong to the "Medium" category before drifting to "Low" in year 9. For 2000, "Very high" returns have been excluded after 3 years, then "High" returns after 34 years. At this stage, the correlation with "Low" returns increases and remains prevalent.

Assessing the reliability of performance predictions also confirms that prior to two years of activity, the predictive power is not high enough (below 50% chances of accurate prediction of the final performance). Year 3 and 4 deliver a good idea of what the vintage will *not* be and progressively what it will be. After Year 5, the performance attribution appears as rather solid and only improves with time.

This paper has several practical and theoretical implications. It also raises several limitations, and certain conclusions would support further developments.

Use for academic purposes

There is little prospect in the short to mid term of the emergence of a comprehensive database recording cash-flows measured in a consistent and coherent way of all the PEFs worldwide. Our approach deals with data uncertainty by measuring the distance of a given stream of cash-

flows from a series of ideal-type cash-flows (the return categories). The model deals with partial data, lack of precision and can function with incomplete cash-flows.

Cash-flows are reliable and verifiable, much more difficult to manipulate than NAVs20. By using cash-flows, we identified that the time to break-even for a fund is a first predictor of performance: the earlier a VY breaks even, the better the overall performance. This finding would need further research beyond US VC and LBO.

Use for practitioners and regulators

For practitioners (LPs) and regulators, the outcomes of the model are different. What matters to LPs is assessing the performance by GPs, and the ability of the latter to replicate performances in the future. This is during the fund selection phase.

Once committed, LPs need to determine the progress of the GPs as compared to expectations and their peer group. A dynamic model using cash-flows is more suitable than reference to absolute past performances. Regulations with dynamic solvency ratio calculations for institutional LPs require these models. We have offered a benchmarking methodology which can be used independently of returns assumptions.

This model can be used to sort vintages early (after two to three years) and exclude certain return scenarios. This should in turn reduce the adverse effects of solvency ratios, notably because the maximum and average losses can be predicted statistically based on our categories (and for example Weidig and Mathonet, 2004). The illiquidity of the asset class becomes less problematic if return scenarios can be sorted after two years of activity.

The model might support a more active management of existing portfolios of PE funds. The secondary market of PEFs stakes will probably initially make the most of this performance attribution model. LPs will be able to better negotiate the discounts/premia on their existing stakes, and securitize mature portfolios. Should the model be validated and adopted, the dynamics of pricing on PE's secondary market could change significantly.

Regulators have the opportunity to reduce the cost of capital associated with investing in PE. Illiquidity in PE is not necessarily associated with uncertainties and lack of transparency: cash-flows tell us a story since the early age of funds. This should be reflected in solvency ratios. "Value at risk" frameworks can integrate the output of our model.

Limitations

A certain stability at the helm of GPs was assumed. Terms and conditions determining funds cash-flows and the behavior of GPs towards these cash-flows21 were assumed as remaining materially the same. Changes of LPA terms may change the outcome of the model. This model might also be sensitive to cash-flows strategies tentatively signaling a strong performance by reaching the break-even point faster22.

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20 Either voluntarily, or under valuation methods requirements (such as the "fair market value" and the mark-to-market, which are ill adapted to private equity).

21 A clear example is a switch in the calculation of management fees in the investment period from a percentage of the fund size to a percentage of the capital paid in. The incentive would therefore be to deploy the capital faster and change the cash-flow patterns.

22 See VYs 2004, 2005 and 2006 for US LBO (Exhibit 8) and 2002, 2003, 2004 and 2007 for EMEA LBO (Exhibit 12) as an illustration.

PE being still largely an American activity, a significant share of the results is drawn from data collected on this market, limiting the generalization of the conclusions. Even though EMEA data is patchy23, comparisons exhibit differences in the shape of J-Curves, time to break-even and the overall signification of the different return categories identified. Cash-flows labeled in USD for EMEA funds could explain some erratic data. As performances exhibit wave patterns, a possible bias in favor of EMEA LBO funds might be cycle-related.

Ideal-type categories rely on past cash-flows: some might become irrelevant ("Very high" returns for EMEA VC) and others can emerge (that the model, with its explicit construction on the measure of distance of VY to categories, could help identify).

Is the model applicable to single funds? This question remains partially unsolved due to a lack of access to cash-flows of individual funds. The issue was tackled by testing individual vintages and quartiles. So far, the model confirms its predictive power, but a thorough testing with individual cash-flows would be necessary to confirm the conclusions.

At the current stage, the model does not differentiate between intrinsic and idiosyncratic behaviors of cash-flows. This is not a major limitation: funds are affected by the overall macro-economic conditions, as well as by the skills of the fund managers.

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