Perspectives on Venture Capital by a Theorist-Practitioner

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WARBURG PINCUS

Four Canonical Facts about Venture Capital

- Venture capital returns show extreme skew: a small number of firms account for all of the excess return versus the public equity markets
- Venture capital returns show persistence: unlike other asset classes, the return on one venture fund is predictive of the return on the next fund of the same firm
- Venture capital returns are highly dependent upon the performance of the public equity markets, especially the market for Initial Public Offerings
- Venture capitalists have invested successfully in a narrow band of the spectrum of technological innovation: ICT and Biotech

Part I: Data and Analysis – Venture Capital Returns

Venture Capital Returns: Data

- The Cross-sectional Distribution of VC Returns
- VC Returns and the Public Equity Market
- VC Returns and the IPO Market
- The Evolution of the IPO Market
- Funds Flow into Venture capital
- Summary of VC Returns

Table I: Venture Fund Performance Summary

The following table summarises the performance of the 205 venture funds in the database by IRR. To highlight the skewness of the data and the influence of a select group of high performing funds, these metrics are also presented when the top decile and quintile of performing funds are excluded. Finally, the performance of the funds is summarised across different periods of time.

	Mean	Med.	St. Dev.	Skew	25th Percent	75th Percent	Max.	Min.
IRR	47%	24%	72%	2.74	9%	61%	515%	-94%
- Top decile only	215%	193%	92%	1.97	155%	254%	515%	133%
- Excluding top decile	27%	20%	35%	0.69	7%	41%	125%	-94%
- Excluding top quintile	18%	16%	24%	-0.46	6%	31%	76%	-94%
- 1980 – 1984	17%	9%	23%	2,10	4%	20%	92%	-5%
- 1985 – 1989	23%	19%	26%	2.06	11%	32%	155%	-57%
- 1990 – 1994	42%	37%	40%	-0.37	17%	64%	125%	-94%
- 1995 – 2006	86%	55%	107%	1.48	4%	136%	515%	-34%

Table II: Fund Performance Persistence

The following table summarises the output from a regression equation that measures fund performance persistence. The current fund performance is regressed against the performance of the previous GPs fund(s).

Dependent Variable	IRR_i	IRR_i		$Multiple_i$	$Multiple_i$
IRR_{i-1}	0.6313	0.4088	$Multiple_{i-1}$	0.5269	0.4771
	(6.01)	(2.17)		(6.77)	(5.61)
IRR_{i-2}		-0.1330	$Multiple_{i-2}$		-0.0923
		(0.34)			(1.04)
Adjusted R^2	0.2438	0.1065	Adjusted R^2	0.2464	0.1568
No. of Obs.	110	61	No. of Obs.	110	61

Note: absolute values of t-statistics are reported in parentheses.
: all standard errors are corrected for serial correlation and heteroscedasticity

Table III: Venture Fund Performance Relative to the NASDAQ

Fund Multiple and IRR measures of performance are estimated for a hypothetical set of funds that are created assuming that each terminated fund in the database made an equivalent investment in the NASDAQ. The Public Market Equivalent (PME) is a measure of the total disbursements to a fund expressed relative to the total distributions to the hypothetical fund. This data is also summarised excluding the top decile and quintile of funds.

	Mean	Med.	St. Dev.	Skew	25th Percent	75th Percent	Max.	Min.
Nasdaq Multiple	2.42	2.38	0.83	0.39	1.96	2.82	5.05	0.63
- Excluding top decile	2.23	2.27	0.63	-0.69	1.92	2.71	3.27	0.63
- Excluding top quintile	2.12	2.21	0.58	-0.90	1.86	2.58	2.92	0.63
Nasdaq IRR	16%	15%	10%	-0.24	11%	21%	45%	-24%
- Excluding top decile	14%	14%	8%	-1.50	11%	19%	28%	-24%
- Excluding top quintile	13%	13%	7%	-2.02	11%	17%	23%	-24%
Nasdaq PME	1.59	1.00	3.67	10.33	0.57	1.68	42.36	0.14
- Excluding top decile	1.02	0.93	0.57	0.66	0.57	1.33	2.48	0.14
- Excluding top quintile	0.88	0.83	0.43	0.44	0.54	1.19	1.85	0.14

Table IV: The Bubble and Venture Fund Performance: 1998 – 2002

The following table summarises the performance of funds that were active during the bubble and post bubble periods. To be considered active during the bubble period, a fund had to have made more than 50% of its distributions during the 1999Q2 – 2000Q3 period. To be considered active during the post-bubble period, a fund had to have made more than 50% of its distributions after 2000Q4.

		Bubble Funds				Post-Bubble Funds		
	Full Sample		Excluding Top Decile		Full Sample		Excluding Top Decile	
	IRR	Multiple	IRR	Multiple	IRR	Multiple	IRR	Multiple
Average	111%	7.94	85%	5.05	8%	2.37	-3%	1.21
Median	91%	4.66	78%	4.14	-3%	0.89	-7%	0.85
Stdev	100%	13.15	61%	3.73	38%	3.83	20%	1.18
Skewness	1.68	5.71	0.51	1.41	1.82	2.78	0.79	1.15
25th Percentile	39%	2.73	33%	2.12	-15%	0.64	-16%	0.58
75th Percentile	146%	7.73	131%	6.47	11%	1.70	7%	1.33
Max	515%	96.10	237%	16.69	116%	14.85	42%	6.13
Min	-2%	0.97	-2%	0.97	-34%	0.18	-34%	0.18
No. Obs.	56	56	50	50	28	28	25	25

Table V: Venture Fund Performance (IRR) Relative to the IPO Market-1

The performance of the sample of venture funds, as measured by the IRR, is summarised by market and exit conditions indicators.

	Mean	Med.	St. Dev.	Skew	25th Percent	75th Percent	Max	Min
- Market Conditions < -1	22%	4%	52%	1.28	-15%	39%	141%	-30%
- Market Conditions = -1 to 1	51%	27%	77%	2.75	9%	65%	515%	-94%
- Market Conditions > 1	41%	20%	60%	2.52	10%	32%	256%	-10%
- Exit Conditions <2	19%	9%	42%	1.60	-7%	29%	155%	-34%
- Exit Conditions = 2 to 3	33%	24%	42%	1.93	11%	40%	237%	-94%
- Exit Conditions >3	106%	76%	110%	1.56	22%	167%	515%	-6%

Table VI: Venture Fund Performance (IRR) Relative to the IPO Market - 2

The performance of the sample of venture funds, as measured by the IRR, is summarised
market and exit conditions indicators excluding the top decile of funds.

	Mean	Median	St. Dev.	Skew	25th Percent	75th Percent	Max	Min
- Market Conditions < -1	9%	-2%	37%	1.69	-16%	29%	116%	-30%
- Market Conditions = -1 to 1	31%	24%	36%	0.60	8%	44%	133%	-94%
- Market Conditions > 1	23%	18%	25%	1.62	9%	27%	94%	-10%
- Exit Conditions <2	6%	7%	23%	0.86	-9%	15%	83%	-34%
- Exit Conditions = 2 to 3	22%	20%	23%	-1.20	10%	33%	71%	-94%
- Exit Conditions >3	78%	69%	70%	0.64	18%	130%	254%	-6%

Table VII: Venture-Backed IPOs: Key Statistics by Year

Year	Number of IPOs	Average 1st Day Return (%)	Offer Amount (U.S. $ MM)	Med Age at IPO (Years)	Med Offer Amount (U.S. $)
1980	59	49.53	664	9.43	9
1981	97	16.76	1,068	6.05	8
1982	39	15.24	577	3.95	8
1983	196	23.59	3,770	4.00	12
1984	84	11.68	1,028	4.63	9
1985	76	13.20	1,293	3.80	13
1986	366	10.87	3,461	5.57	15
1987	127	9.97	2,361	5.35	15
1988	54	9.49	846	5.29	14
1989	65	13.70	1,223	6.39	15
1990	70	13.55	1,396	5.96	20
1991	157	17.95	4,923	6.66	25
1992	196	12.25	7,280v	5.88	24
1993	221	15.33	6,688	6.73	22
1994	167	13.73	4,671	7.53	23
1995	205	20.04	8,147	7.47	33
1996	272	17.01	11,482	5.66	32
1997	138	13.57	4,826	6.37	30
1998	78	27.01	3,782	5.24	41
1999	270	72.98	20,871	4.31	63
2000	264	49.59	25,499	4.93	73
2001	41	13.35	3,490	6.05	71
2002	22	8.48	2,109	7.47	71
2003	29	12.70	2,023	7.83	66
2004	93	12.72	11,015	6.75	69
2005	56	10.69	4,461	6.13	66
2006	57	9.92	5,117	8.10	76
2007	44	N/A	6,463	7.68	88

Source: Venture Expert; Thomson Financial; Jay Ritter http://bear.cba.ufl.edu/ritter/ipodata.htm
Note: $1.00 1980 = $2.50 2007

Table VIII: Venture-Backed Liquidity Events by Year/Quarter

Quarter / Year	Total M&A Deals	M&A Deals with Disclosed Values	*Total Disclosed M&A Value ($ MM)	*Average M&A Deal Size ($ MM)	**Number of IPOs	Total Offer Amount ($ MM)	Average IPO Offer Amount ($ MM)
2005	**350**	**163**	**17,324.7**	**106.3**	**57**	**4,482.4**	**78.6**
2006	**377**	**164**	**19,034.8**	**116.1**	**57**	**5,117.1**	**89.8**
2007-1	88	31	4,640.3	149.7	18	2,190.6	121.7
2007-2	90	37	3,912.1	105.7	25	4,146.8	165.9
2007-3	108	55	11,261.7	204.8	12	945.2	78.8
2007-4	93	45	9,645.8	214.4	31	3,043.8	98.2
2007	**379**	**168**	**29,460.0**	**175.4**	**86**	**10,326.3**	**120.1**
2008-1	109	42	4,983.2	118.7	5	282.7	56.6
2008-2	87	27	3,321.2	123.0	0	0.0	0.0
2008-3	89	32	3,080.2	96.3	1	187.5	187.5
2008-4	66	18	2,390..9	132.8	0	0.0	0.0
2008	**260**	**96**	**13,915.4**	**145.0**	**6**	**470.2**	**78.4**
2009-1	65	15	666.0	44.4	0	0.0	0.0
2009-2	65	13	2,570.1	197.7	5	720.7	144.1
2009-3	69	23	1,392.4	60.5	3	572.1	190.7
2009-4	74	41	8,924.3	217.7	4	349.3	87.3
2009	**273**	**92**	**13,552.7**	**147.3**	**12**	**1,642.1**	**136.8**
2010-1	121	31	5,586.6	180.2	9	936.2	104.0
2010-2	97	22	2,932.2	133.3	17	1,274.9	75.0
2010-3	104	27	3,843.0	142.3	14	1,249.1	89.2

*Only accounts for deals with disclosed values **Includes all companies with at least one U.S. VC investor that trade on U.S. exchanges,
Source: Thomson Reuters and National Venture Capital Association

Table IX: VC Fund-raising 1980-2009

	# of Funds	$B raised	$B managed
1980	52	2.0	2.1
1885	121	4.0	11.2
1990	87	3.2	22.1
1995	172	9.9	33.5
2000	653	105.0	184.4
2005	235	28.8	229.2
2009	120	15.2	176.7
2010:1-3	124	9.1	NA

Source: National Venture Capital Association

Table X: U. S. VC Index Returns

For the period ending 3/31/2010

1 year	3 years	5 years	10 years	15 years
6.5%	-0.7%	4.9%	-3.7%	38.2%

NASDAQ Composite

1 year	3 years	5 years	10 years	15 years
56.9%	0.3%	3.7%	-6.3%	7.4%

Source: Cambridge Associates LLC.

What is to be done? - 1

- There have always been VCs: *The Merchant of Venice*
- BUT the (US) Venture Capital "Industry" =
  - Transient epiphenomenon
  - Built upon the greatest bull market in the history of capitalism
  - Leveraging historic collaboration between State and Market
- Venture capitalist can play useful role
  - Funding distributed R&D for big companies
  - Launching light-weight Web start-ups
  - Still over-capitalized for these purposes

What is to be done? - 2

- Alternative 1: Find a “Black Hole” = Alternative Energy
- Alternative 2: Retreat to light-weight (web) start-ups
- Alternative 3: Presume that the default exit = trade sale
  - “When I plug it in, it lights up!”: sell now?
  - “Three customers are references!”: sell now?
  - “We have revenue!”: sell now?
  - “Do I really want to…”
    - Try to build a business and
    - Accept dilution from funding to positive cash flow?

or **SELL NOW?**

Part II: Speculation -
VC Focus Present and Future

Venture Capital Focus by Industry

- **Information and Communications Technology = Primary Focus**
- **BioTechnology/Healthcare = Secondary Focus**
- **All Other <20% of Investments**

VC Investments by Industry Group: 1980-2009

(Source: NVCA Yearbook, 2010)

Amount ($million)	1980	1985	1990	1995	2000	2005	2009
ICT	231.5 (44.3%)	1,851.2 (70.3%)	1,366.5 (53.3%)	4,020.2 (54.5%)	75,373.7 (75.0%)	13,642.6 (59.5%)	8,052.2 (45.5%)
Healthcare/ Biotech	87.3 (16.7%)	362.6 (13.8%)	674.1 (26.3%)	1,744.6 (23.7%)	7,574.6 (7.5%)	6,624.2 (28.9%)	6,116.3 (34.6%)
Other	204.3 (39.1%)	417.7 (15.9%)	525.5 (20.5%)	1,605.2 (21.8%)	17,576.2 (17.5%)	2,674.2 (11.7%)	3,522.1 (19.9%)
Total	*523.0*	*2,631.5*	*2,566.1*	*7,370.1*	*100.524.6*	*22,941.0*	*17,690.7*

VC and ICT: Legacy of Government Investment

- Vannevar Bush: “Science: The Endless Frontier”, 1945
- “The real visionaries in the early days were to be found in defense organizations” (Henry Kressel)
- 1953-1978: US Federal R&D > 50% of National R&D
  - Semiconductor physics, computer science, software engineering
  - Languages and protocols: Cobol to TCP/IP
  - Internet
- Role as customer: military procurement required second source
- “Weak intellectual property rights environment” (Fabrizio & Mowery): spillovers to private sector

VC and BioTech - 1

- Government (NIH) investment in science BUT:
  - Time from laboratory to clinic
  - Low hanging fruit plucked by Genentech, Amgen
  - Rate of attrition due to side effects of novel therapeutics
  - Positive cash flow not available to VC investors
- Returns entirely depend on IPO market

VC and BioTech - 2

- **As an Industry, BioTech = failure when measured by cash generation:**

  "[F]rom 1975 to 2004…[w]hile revenues have grown exponentially…, profit levels essentially hover close to zero throughout the life of the industry. Furthermore, the picture becomes even worse if we take the largest and most profitable firm, Amgen, out of the sample. Without Amgen the industry has sustained heavy losses throughout its history….[T]he analysis includes no privately held firms, almost all of which lose money. Therefore, the data presented here are just for the most profitable part of the industry…." (G. Pisano, p. 117)

VC and BioTech - 3

- Yet VC Returns from BioTech comparable with those from ICT
- Recurrent "hot" IPO markets: 1983, 1991-3, 1996-7, 2000
- 77 IPOs in 2004-7

"[W]hile the aggregate returns to biotechnology are poor, investors are focusing on the "tails" of the distribution. The phenomenal stock returns for a company like Amgen provide a beacon for investors…Never mind that the probabilities are very low and, on a risk adjusted basis, it may not be a good bet. The promise is there." (Pisano, p. 129)

VC and Materials Science

- No history of success over 50 years
- Plastics commercialized by duPont and GE
- NanoTech commercialized by nobody…yet
- Value generated by
  - Product Marketing: “who needs this stuff?”
  - Product Engineering: “can we make it reliably and economically?”
- Big Company resources required

VC and Physics

- VCs funding science = category error
- Lasers
  - 200 ventures launched in the US
  - Search for applications:
    - Check-out counters?
    - CD players?
- Superconductivity
  - MRI Scanners
  - And…?
- VCs funding scientists to make tools for other scientists

VC and Energy - Conventional

- Scale: 1 unit = $1 billion
- Exposure to Commodity Markets
- Success possible…Warburg Pincus experience
  - Focus on specific geographical domains
  - Relevantly experienced entrepreneurs
  - “Crumbs off the tables of the Majors”
  - “Line of Equity” financing
- Alien to VC model

VC and Cleantech/GreenTech

- Two fundamental risks
  - Science immature/technology nascent
  - Exposure to commodity markets
- Dependent on government policies along multiple dimensions
  - Investment in R&D
  - Procurement programs
  - Carbon price
- At deployment, 1 unit still = $1 billion
- China ahead of Europe; both way ahead of US

State Investment in Next "New Economy": CleanTech/GreenTech

- China 2009: ~$35 billion
- US 2009: ~ $17 billion
- ARPA-E: $300 million
- How not to do it:
  - National champions
  - VCs investing in science
  - Take China to the WTO for doing what we should be doing!
- Time to go back to the future

Venture Capital and the Next "New Economy"

- Transformational economic impact depends on 2 factors
  - Base of science and technology
    - Created for non-economic purposes
    - Available for commercial exploitation
  - Access to speculative, liquid markets
    - So that VCs can win even when venture fails, and
    - To provide the capital need to fund deployment at scale
- Not visible now…but "Pearl Harbor"
  - Loss of Greenland Icecap?
  - Palm Beach under water
  - Bubbles on the surface?

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