



Armin Höll-Steier

## Venture Capital

Fund Certification,  
Performance Prediction and  
Learnings from the Past



PETER LANG

This book contains three studies. The first study investigates the relationship between private equity investors and fund managers and how intermediaries can mitigate their agency problems. The incentive structure of three intermediary types and their behavior in signaling fund qualities to investors are studied theoretically. A recommendation which intermediary to consult is given. The second study presents a new statistical method to predict the performance distribution of venture capital direct investments. The accuracy of this method is investigated and compared to existing approaches. The third study is about the European venture capital market's historic development before and after the internet bubble and reasons for the bad development especially after the bubble.

Armin Höll-Steier, born in 1980 in Munich; Master of Business Administration at Ludwig-Maximilians-University (LMU) Munich and master-level studies at the Center for Digital Technology and Management (CDTM) at LMU und Technical University Munich 2000–2004; work-related period of residence in Australia 2004–2005; employment at the strategy advisory Bain & Company since 2005; Master of Business Research in 2009 and doctorate degree (Dr.oec.publ.) at LMU Munich in 2010.

## Venture Capital

# European University Studies

Europäische Hochschulschriften  
Publications Universitaires Européennes

## **Series V** **Economics and Management**

Reihe V Série V  
Volks- und Betriebswirtschaft  
Sciences économiques, gestion d'entreprise

**Vol./Bd. 3381**



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Frankfurt am Main · Berlin · Bern · Bruxelles · New York · Oxford · Wien

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Internationaler Verlag der Wissenschaften

**Bibliographic Information published by the Deutsche  
Nationalbibliothek**

The Deutsche Nationalbibliothek lists this publication in the  
Deutsche Nationalbibliografie; detailed bibliographic data is  
available in the internet at <http://dnb.d-nb.de>.

Zugl.: München, Univ., Diss., 2010

D 19

ISSN 0531-7339

ISBN 978-3-653-00904-0

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Internationaler Verlag der Wissenschaften

Frankfurt am Main 2011

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# Acknowledgements

*"The quest for wisdom starts with the genuine desire to learn."*

The Bibel

Every thesis starts with a desire, the desire to wander an unknown and arduous path of learning towards a blurry goal in the future. This path has many crossings, some are misleading and need to be walked back, some are rocky or steep and hard to conquer, only few passages are easy to pass. On this journey other people are waiting on the roadside and support the wanderer to fulfil his quest - some are continuous supporters and encouragers and some just guide the wanderer for a while or give advice for which direction to take. Unless the final goal is clear and the wanderer has enough stamina he will reach his destination. But in the end he will realize that it was not the end of the journey that provides pleasure but what he experienced on his way and the individuals he met, the discussions he had which were most enjoyable.

I had the pleasure to go such a path and I enjoyed the company of many supporters whom I am deeply indebted to:

First, and foremost, I want to thank Prof. Dr. Bernd Rudolph from the Ludwig-Maximilians-University Munich, my doctoral advisor for accepting me as an external doctoral candidate, for his support, encouragement and guidance over the last two and a half years. He granted me a high level of freedom to dive-deep into the research topics I am most interested in and was a reliable source of advice. Despite my external position to his chair

I always felt welcome and part of the group when joining doctoral events, pleasure trips and Christmas parties. Therefore, I also want to thank all doctoral candidates whom I met during my MBR studies and at the chair for Capital Market Research of Prof. Rudolph for sharing their experience, motivating me to pursue and acting as a sounding board for my ideas.

I want thank Prof. Dietmar Harhoff, Ph.D. my thesis referee for his support.

I am grateful to Prof. Dr. Manfred Schwaiger and Prof. Dr. Anton Meyer who have been my advisors during the MBR studies.

My dissertation - especially my second and third study - critically depended on the access to proprietary and confidential data on private equity and venture capital funds, their investors and their investments. I especially wish to thank the CEO of the Center for Private Equity Research (CEPRES) Dr. Daniel Schmidt, the COO Dr. Philipp Krohmer and their colleagues Dr. Axel Buchner, Matthias Kling, Ulrich Häberle and Dr. Miroslav Adamov at CEPRES who have become friends both for their support with data, as well as fruitful discussions and advice during the last years.

I want to thank especially Nora Fenske and Prof. Dr. Helmut Küchenhoff from the Statistical Consulting Unit, Department of Statistics, LMU Munich for their reliable support and advice concerning statistical issues for my second study.

I am grateful to Prof. Dr. Christoph Kaserer from the Center for Economic and Financial Studies (CEFS) at Technical University Munich and to Thomas Meyer from the European Venture Capital Association (EVCA) for their support with my third study and many fruitful discussions. I am indebted to anonymous data providers who supplied data on European funds



and their investors and I wish to thank Mei Niu from the British Venture Capital Association (BVCA) for challenging my results.

My thesis was supported financially by my current employer Bain & Company. I am grateful that Bain offered me the chance to exclusively focus on my thesis for two years and sponsored my living. Moreover, I thank the other doctoral candidates at Bain who went through the same ups and downs with me in parallel for sharing their experiences and challenging my ideas.

I want to express my deepest gratitude to my loving parents Ernst and Brigitte Höll and my dear uncle Prof. Dr. Rudolf Höll who shared both my times of doubt and my times of enthusiasm. They inspired me with their ideas when I was looking for a research topic and guided me during times of disorientation. They kept faith in me and encouraged me. I was allowed to draw from their experience and advice which helped me find my way through the jungle of academia.

Last but not least, I want to thank my wife Veronika Steier who supported me mentally during the last three years doing my MBR and writing my research papers.

To all of them and any other person who supported my development during the dissertation: Thank you very much!



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# Acronyms

AIC	Akaike Information Criterion
BCI	Business Climate Index
BCPE	Box-Cox Power Exponential
BO	Buyout
BVCA	British Venture Capital Association
CAPM	Capital Asset Pricing Model
CEPRES	Center for Private Equity Research
CPV	Credit Portfolio View
CREM	Credit Risk Evaluation Model
EVCA	European Venture Capital Association
GAMLSS	Generalized Additive Model of Location, Scale and Shape
GDP	Gross Domestic Product
GP	General Partner
IPO	Initial Public Offering
IRR	Internal Rate of Return

LP	Limited Partner
M&A	Mergers and Acquisitions
MCS	Monte Carlo Simulation
MIRR	Modified Internal Rate of Return
NASDAQ	National Association of Securities Dealers Automated Quotations
NAV	Net Asset Value
OLS	Ordinary Least Square
PE	Private Equity
PME	Public Market Equivalent
SBC	Schwarz Criterion
TVE	Thompson Venture Economics
TVPI	Total Value to Paid-In
USA	United States of America
USD	United States Dollar
VC	Venture Capital
VIF	Variance Inflation Factor

# Nomenclature

## Symbols of Chapter 2

$\eta$	A lead investor's share in a private equity fund
$\gamma$	Share of good funds in the market
$\gamma^*(p)$	Market clearing share of good funds for a given quality detection skill level
$\gamma_{max}$	Share of good funds in the market when placement agents or lead investors support the fund management as good as possible
$\gamma_{min}$	Share of good funds in the market when placement agents or lead investors do not support the fund management
$\hat{p}_{max}$	A monopoly certifier's skill level to correctly identify a fund management's quality
$A$	Financial return/surplus of a private equity fund
$d$	A single fund's probability to get a certificate
$d(p, \gamma)$	A single fund's probability to get a certificate at a given probability to correctly identify a fund management's quality and a given share of good funds in the market
$E_I$	Investors' return/surplus from a private equity fund investment
$e_I$	An investor's expected return from a private equity fund standardized by the extent of the fund surplus

---

$E_{PEF}$	Compensation of private equity fund management
$e_{PEF}$	A fund management's expected return from a private equity fund standardized by the extent of the fund surplus; equals a fund's probability to get a certificate
$k$	A lead investor's collusion payments standardized by the extent of the private equity fund surplus
$p$	Probability to correctly identify a fund management's quality
$p'_{max}$	Second best certifier's skill level to correctly identify a fund management's quality
$p^* = p^*(\gamma)$	Market clearing detection skill level for a given share of good private equity funds in the market
$p_{max}$	A certifier's skill level to correctly identify a fund management's quality
$p_{min}$	Investors' minimum requirement for a certifier's quality detection skill
$Q$	Ratio between reputation gain from investors and from private equity funds
$R$	Reputation of a certifier
$R^{std}$	A certifier's total reputation gain standardized by reputation gain from private equity funds
$R_{I,b}$	A certifier's reputation loss/threat from investors for identifying a badly performing fund
$R_{I,g}$	A certifier's reputation gain from investors for identifying a well performing fund
$R_I$	A certifier's total reputation gain from investors



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$R_I^d$	A certifier's total reputation gain from investors in a capital over-demand situation
$R_I^s$	A certifier's total reputation gain from investors in a capital over-supply situation
$R_{PA}$	A placement agent's total reputation gain
$R_{PEF,b}$	A certifier's reputation loss/threat from fund managers for not certifying a fund
$R_{PEF,g}$	A certifier's reputation gain from fund managers for certifying a fund
$R_{PEF}$	A certifier's total reputation gain from private equity funds
$R_{PEF}^d$	A certifier's total reputation gain from private equity fund managers in a capital over-demand situation
$R_{PEF}^s$	A certifier's total reputation gain from private equity fund managers in a capital over-supply situation
$R_{RA}$	A rating agency's total reputation gain
$s$	Share of funded private equity funds that leads to market clearing
$W$	Compensation of a certifier for his service
$W_C$	Carried interest payments which a placement agent gets for his support in the fundraising of recommended private equity funds that get capital from investors
$W_F$	Fixed amount which a placement agent gets for his support in the fundraising of recommended private equity funds that get capital from investors
$W_{LI}^C$	A lead investor's compensation with collusion payments

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$w_{LI}^C$	A lead investor's compensation with collusion payments standardized by the extent of the private equity fund surplus
$W_{LI}^{NC}$	A lead investor's compensation without collusion payments
$w_{LI}^{NC}$	A lead investor's compensation without collusion payments standardized by the extent of the private equity fund surplus
$W_{PA}$	A placement agent's compensation for his service
$W_{RA}$	(Fixed) compensation of a rating agency for its service
$x$	Share of well performing funds of recommended funds
$y$	Share of badly performing funds of recommended funds
$z$	Total number of (blindly) certified private equity funds

### **Symbols of Chapter 3**

$\beta$	vector indicating the influence of covariates on a dependent variable
$\delta$	probability of default within a group of investments
$\epsilon$	normal distributed regression residual with mean 0 and constant variance
$\lambda$	Box-Cox transformation parameter
$\mu$	centrality parameter in GAMLSS regression resp. median of BCPE distribution
$\nu$	skewness parameter in GAMLSS regression
BCPE()	Box-Cox power exponential distribution function
E()	expected value of a variable
F()	distribution function of a return measure (IRR or MIRR)

---

$P()$	function that returns a probability
$\pi$	probability of default of an investment
$\sigma$	scale parameter in GAMLSS regression
$\tau$	kurtosis parameter in GAMLSS regression
$c$	(positive and negative) cashflows
$CFI$	cashflows from a fund to a portfolio company
$CFO$	cashflows from a portfolio company to a fund
$d$	function of an investment's duration
$G$	MIRR distribution of a fund
$g$	MIRR distribution
$h$	share of committed capital of a fund invested in a year
$I$	duration of the investment period of a fund
$i$	index of an individual investment
$IRR$	internal rate of return of an investment
$j$	index of a group of investments
$k$	number of covariates describing an investment
$l$	index of an investment which did not default
$m$	number of covariates describing a group of investments
$MIRR$	modified internal rate of return
$n$	total number of investments
$o$	number of independent observations in GAMLSS

$p$	return measure (IRR or MIRR)
$q$	index of a group of investments a new investment belongs to
$r$	market return resp. return that an investor gets when investing capital in his investment alternative to a Venture Capital fund
$s$	index of a new investment
$T$	maturity of an investment or a fund
$t$	time index
$U$	total multiple of all investments over the whole lifetime of a fund
$u$	multiple of an investment over the whole lifetime of a fund
$w$	dummy variable indicating if an investment defaulted (value=1) or not (value=0)
$x$	vector of covariates
$y$	vector of a dependent variable with investment returns
$z$	vector of the covariates for a group of investments

### **Symbols of Chapter 4**

$c$	(positive and negative) cashflows
$IRR$	internal rate of return of an investment
$NAV$	net asset values of unrealized and/or partially realized investments
$T$	maturity of an investment or a fund
$t$	time index