

When There is No Place to Hide - Correlation Risk and The Cross-Section of Hedge Fund Returns

(joint work with A. Buraschi, Imperial College London, and F. Trojani,
University of Lugano; We thank INQUIRE UK for financial support)

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Presentation Outline - When There is No Place to Hide

- Motivation
- Related Literature
- Methodology
- Empirical Results (*5 Steps*) and Data
- Conclusions and Extensions

Motivation (1): Mutual and hedge funds differ in many ways

	MFs	HF's
<i>Legal</i>	Bus. Comp./Inv. Trust	LP/GP, PB contract
<i>Capital Structure</i> *	No Leverage	PB debt, Fragile
<i>Positions</i> **	Long	OTC, Short, Deriv.
<i>Investment Mandate</i>	Relative return, TE	Absolute return
<i>Liquidity</i>	Daily	Lockups, Notice per.

* (Liu and Mello (2009), Brunnermeier and Pedersen (2009))

** (Almazan, Brown, Carlson and Chapman (2004))

Motivation (2): Hedge Funds Investment Mandate 'Implies' Potential Correlation Risk

- How is the mandate implemented? Long and Short positions

	MFs	HF's
<i>Positions</i>	Long	Long/Short
$\beta_{Equity\ Market}$	Yes	$\downarrow \beta_{Equity\ Market}$
$\beta_{Correlation\ Risk}$		$\beta_{Correlation\ Risk} < 0$
Performance Implic.		$\bar{r}_{CR} < 0$
Risk		CR co-skewness.



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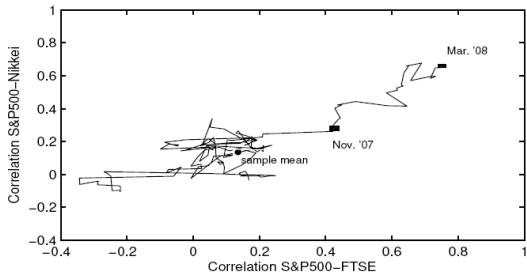
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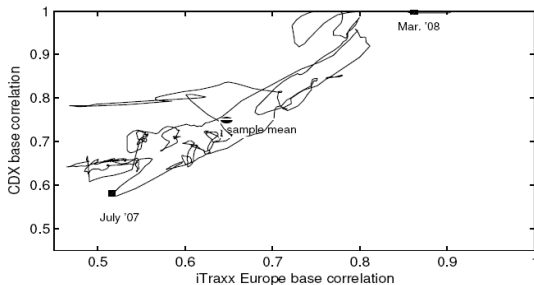


- Why is this important?
- Policy implications: UCITS III hybrid structure open to retail investors
- Is this an idiosyncratic or systematic effect?... (1) applies across asset classes, (2) time-series and (3) cross-sectional evidence

Correlation Risk Phenomenon Occurs Across Asset Classes



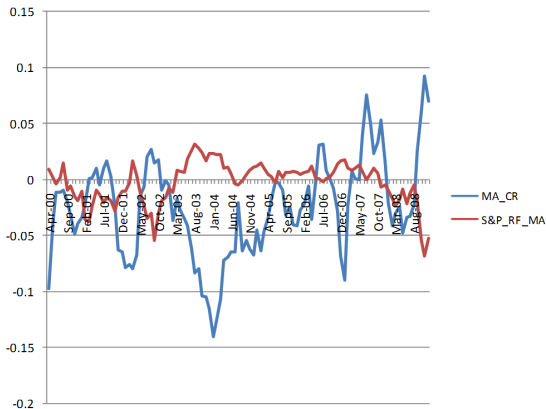
Equity market



Credit/CDO market

Realized Above Implied Correlation When Market Drops

- Correlation Risk Premium and S&P Excess Return, 12-month MA (4/2000-12/2008)



Our Analysis Consists of 5 Main Empirical Steps

- 1 Time-series exposures of hedge funds to correlation risk (CR)
- 2 Results by investment objective and net exposure
- 3 Sorting hedge funds on β_{CR} (link to α)
- 4 Pricing: 2-pass regression
- 5 Correlation risk exposure and drawdowns

- Is there a General Equilibrium explanation for the correlation risk premium?
- "When Uncertainty Blows in the Orchard: Comovement and Equilibrium Variance Risk Premia (Buraschi, Trojani and Vedolin (2009))
- Related Literature:
 - Volatility Risk and Hedge Fund Returns:
 - Fung and Hsieh (2001), Bondarenko (2003), Kong (2008)
 - Correlation Risk Priced in Options:
 - Driessen, Maenhout and Vilkov (2009)
 - Option-Implied Correlations
 - Longstaff, Santa-Clara and Schwartz (2003), Collin-Dufresne and Goldstein (2001) and others

Correlation Risk Premium Construction

- How to extract a CR premium? (1) Classic well-known Dispersion Trade (JPMorgan (2005), DMV(2006, 2009)) using **Optionmetrics** Data or (2) Correlation swap

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	Correlation Swap Pros/Cons
Pros	Maturity, no cont. hedging, pure CR exposure, no model risk
Cons	illiquidity, bid/ask spreads, true premium probably lower

Survivorship Bias Free BarclayHedge Data (1996-2008)

- More than 9000 hedge funds and funds of funds in cleaned data set
- Summary Statistics for individual hedge fund returns (% p.m.):

	#	μ	σ
All Funds (ALL_{HF})	6722	0.48	1.65
Long Short Equity (LSE)	770	0.64	2.25
Low Net Exposure LSE (LN_{LSE})	41	0.58	2.25
Low Net Exposure ALL (LN_{ALL})	271	0.87	1.92
Equity Long (EL)	532	0.4	3.40
Option Trader (OPT)	186	0.66	3.3
Merger Arbitrage (MA)	56	0.36	1.11
Fixed Income Relative Value (FI_{RV})	245	0.25	1.46
...
Equity Market Neutral	187	0.22	1.18

Adjusting Hedge Fund Performance for Correlation and Variance Risk

- BKT (Buraschi-Kosowski-Trojani) 8-Factor Model (FH(2001) + CR_t):

$$\begin{aligned} r_{i,t} = & \alpha_i + \\ & \beta_i^1 SNPMRF_t \\ & + \beta_i^2 SCMLC_t + \beta_i^3 BD10RET_t + \beta_i^4 BAAMTSY_t + \\ & \beta_i^5 PTFSBD_t + \beta_i^6 PTFSFX_t + \beta_i^7 PTFSKOM_t + \\ & \beta_i^8 CR_t + \varepsilon_t^i, \end{aligned}$$

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- Is CR significant after accounting for Variance Risk Premium?add adjustment
- How does CR differ from OTM Put or straddle?

Fung-Hsieh Model Alphas and Betas for HF Indices

- This table *excludes* CR
- LSE and LNX funds have significant alpha
- Equity Long funds have higher equity beta than options traders

	ALL	LSE	LNX LSE	LNX ALL	EL	OPT	MA	FI RV
\bar{r}_i (%p.a.)	5.8	7.7	7.0	10.4	4.8	7.9	4.4	3.0
α (%p.a.)	4.7	6.8	6.4	10.1	2.9	6.4	4.0	2.0
t_α	3.9	4.9	3.6	6.4	1.8	2.0	4.8	1.8
β_{SNP}	0.2	0.4	0.2	0.2	0.6	0.1	0.1	0.1
t_β	8.2	12.5	5.8	6.4	16.6	1.1	7.0	4.0
...
adj. \bar{R}^2	46.4	60.6	35.0	30.5	75.4	3.5	40.5	39.9

BKT Model Alphas and Betas for HF Indices

- This table *includes* CR
- Low net exposure funds have significant exposure to correlation risk

	<i>ALL</i>	<i>LSE</i>	<i>LNX</i> <i>LSE</i>	<i>LNX</i> <i>ALL</i>	<i>EL</i>	<i>OPT</i>	<i>MA</i>	<i>FI</i> <i>RV</i>
\bar{r}_i	5.8	7.7	7.0	10.4	4.8	7.91	4.4	3.0
α	3.7	5.2	2.9	6.1	2.7	0.7	2.8	0.3
t_α	2.3	3.1	1.34	3.3	1.3	0.18	2.7	0.2
β_{SNP}	0.2	0.4	0.2	0.2	0.6	0.01	0.1	0.1
$t_{\beta_{SNP}}$	7.1	11.1	4.5	4.8	15.4	0.17	5.9	3.0
β_{CR}	-0.01 ^c	-0.01 ^c	-0.03^a	-0.03^a	0.0	-0.04 ^a	-0.01 ^b	-0.01 ^b
$t_{\beta_{CR}}$	-1.7	-1.7	-2.9	-3.8	-0.3	-2.6	-2.1	3.0
\bar{R}^2	47.1	61.1	38.2	36.3	75.3	6.9	41.8	41.6

(significance at ^a(1%), ^b(5%), ^c(10%) level)

September 2008 Correlation Risk Effects Differed

HFRI INDICES	Total Return				1 Year		3 Year Annualized		
	SEP	YTD	1 YR	3 YR	STD*	ShR**	ROR	STD*	ShR***
HFRI Fund Weighted Composite Index	-5.42%	-10.11%	-9.10%	13.89%	8.43%	-1.33	4.43%	6.62%	0.11
HFRI Equity Hedge (Total) Index	-7.70%	-15.45%	-14.91%	7.00%	11.30%	-1.55	2.28%	8.59%	-0.14
HFRI EH: Energy/Basic Materials Index	-13.36%	-20.81%	-18.74%	6.93%	19.64%	-1.06	2.26%	13.75%	-0.05
HFRI EH: Equity Market Neutral Index	-3.07%	-3.00%	-1.98%	10.50%	4.64%	-0.85	3.39%	3.25%	-0.13
HFRI EH: Quantitative Directional Index	-4.47%	-8.96%	-9.20%	21.06%	10.87%	-1.02	6.58%	9.74%	0.31
HFRI EH: Short Bias Index	4.42%	14.23%	21.40%	15.10%	10.91%	1.65	4.80%	8.64%	0.14
HFRI EH: Technology/Healthcare Index	-4.89%	-8.78%	-7.57%	22.10%	11.64%	-0.80	6.88%	9.44%	0.35
HFRI Event-Driven (Total) Index	-6.06%	-10.29%	-10.82%	11.43%	7.72%	-1.71	3.67%	6.49%	0.00
HFRI ED: Distressed/Restructuring Index	-4.83%	-9.92%	-10.44%	11.24%	6.20%	-2.07	3.61%	5.31%	-0.02
HFRI ED: Merger Arbitrage Index	-3.13%	-3.65%	-3.52%	19.62%	5.17%	-1.07	6.15%	4.51%	0.50
HFRI ED: Private Issue/Regulation D Index	-0.68%	-0.93%	1.57%	12.23%	2.92%	-0.16	3.92%	4.95%	0.03
HFRI Macro (Total) Index	-0.41%	2.06%	5.48%	25.23%	6.76%	0.52	7.79%	5.37%	0.72
HFRI Macro: Systematic Diversified Index	1.37%	8.56%	11.84%	44.43%	11.74%	0.84	13.04%	9.60%	0.93
HFRI Relative Value (Total) Index	-4.99%	-7.25%	-5.20%	15.76%	6.46%	-1.11	5.00%	4.64%	0.25
HFRI RV: Fixed Income-Asset Backed Index	-0.79%	2.36%	1.49%	14.07%	3.00%	-0.18	4.49%	2.30%	0.26
HFRI RV: Fixed Income-Convertible Arbitrage Index	-12.29%	-20.25%	-19.77%	-4.96%	12.83%	-1.80	-1.68%	8.51%	-0.60
HFRI RV: Fixed Income-Corporate Index	-4.44%	-8.00%	-8.63%	1.97%	6.68%	-1.62	0.65%	5.37%	-0.56
HFRI RV: Multi-Strategy Index	-6.49%	-10.94%	-11.13%	-0.08%	7.35%	-1.84	-0.03%	5.08%	-0.73
HFRI RV: Yield Alternatives Index	-9.35%	-14.21%	-15.42%	-0.44%	10.24%	-1.78	-0.15%	7.29%	-0.51

Note: CB losses, Macro gains; fragile capital structure; unwinding either forced or voluntary

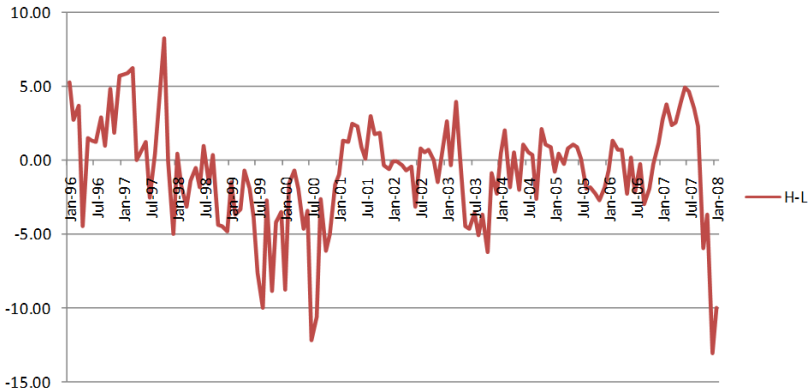
ALL Funds Sorted By Correlation Risk Beta t-stat

In this table we control for β_{CR}

		<i>Low</i>	2	...	9	<i>High</i>	<i>Mean</i>
	β_{CR}	-0.15	-0.09	...	0.04	0.1	-0.031
	Total Ret.	9.0	7.8	...	4.1	7.5	6.0
FH	α_{FH}	8.5	6.5	...	4.1	7.5	6.0
BKT	α_{BKT}	0.4	-0.3	...	6.9	16.4	4.25
	$t_{\alpha_{BKT}}$	0.4	0.7	...	0.97	1.5	0.84
	$t_{\beta_{CR}}$	-2.8	-1.8	...	0.7	1.6	-0.6
...
	cont. α	0.4	-0.3	...	6.9	16.4	4.3
	cont. β_{CR}	7.9	7.2	...	-2.9	-9.7	1.8
	cont. β_{SNP}	0.5	0.6	...	0.24	0.7	0.2

High/Low Correlation Risk Exposure Related to Drawdowns

Difference in Maximum Drawdowns



- Robustness tests: equal-weighting, liquidity factor, Tass data, equity market neutral funds

Conclusions and Implications

- Asset management industry has evolved in two directions: (a) Low cost β portfolios (ETF); (b) Hedge funds in search for absolute returns ($|\alpha| > 0$) and no β) via more flexible L/S strategies.

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 - These funds have higher maximum drawdown
- Ignoring correlation risk exposure biases α performance measure
- $\beta_{Correlation-Risk}$ important for HF risk management. Risk resurfaces in bad times