Explaining Returns in the Cat Bond Market: Factor Pricing Models and Fund Performance

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Cat bond return characteristics have not been extensively studied to date. Classical factor models exhibit low explanatory power.

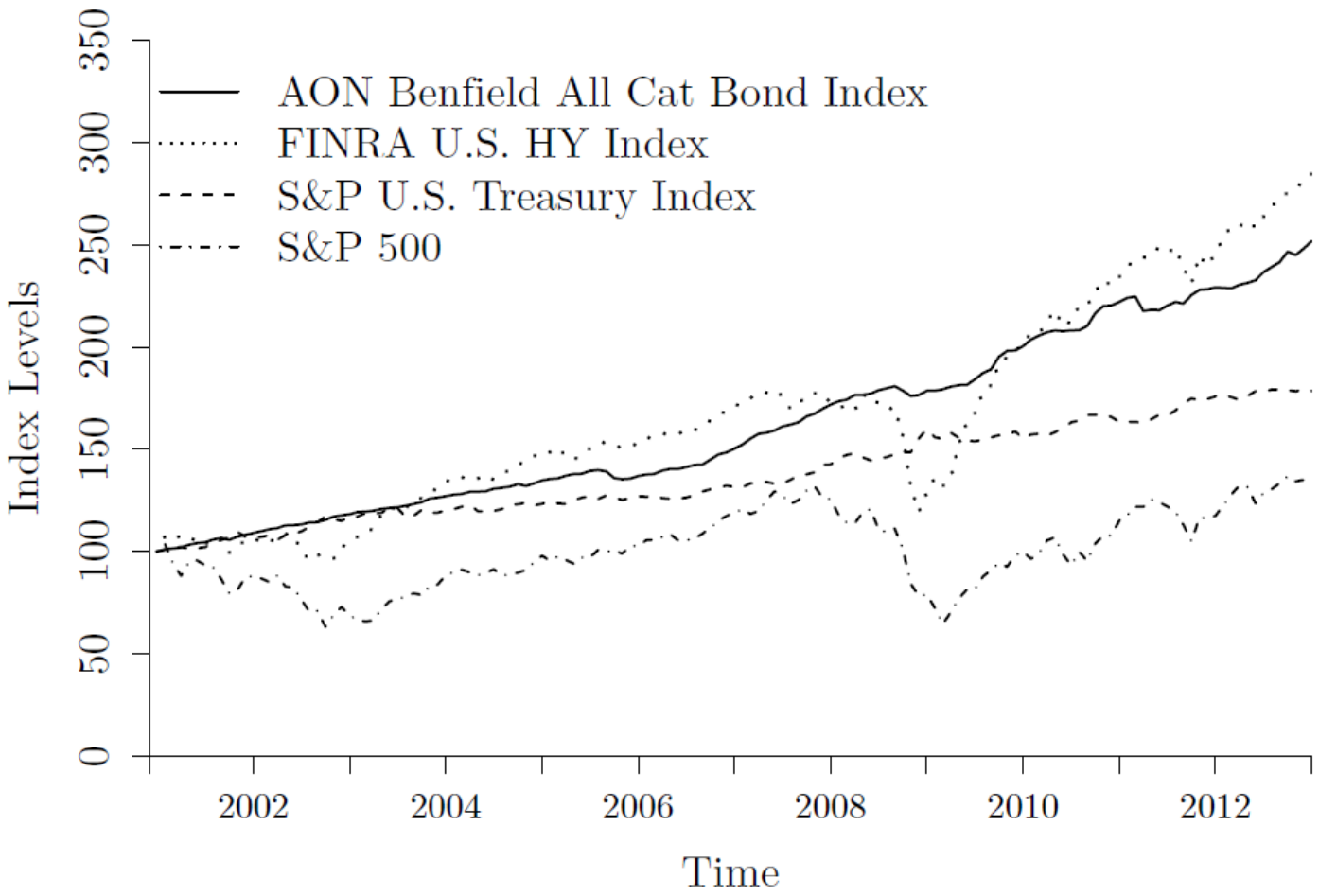
Motivation

- General lack of empirical work in the area of insurance-linked securities (ILS)
- No academic study of cat bond return characteristics available
- Traditional factor models are not suitable for the cat bond asset class
- Performance of dedicated cat funds has not been systematically analyzed yet

Contribution

- Comprehensive statistical analysis of cat bond return time series
- Introduction of a factor model for diversified cat bond portfolios
- Insights into the performance of a fast-growing investment fund industry

Throughout the last decade, cat bonds have proven themselves as an asset class with stable returns, even in times of crisis.



Data: *monthly return time series from Bloomberg*

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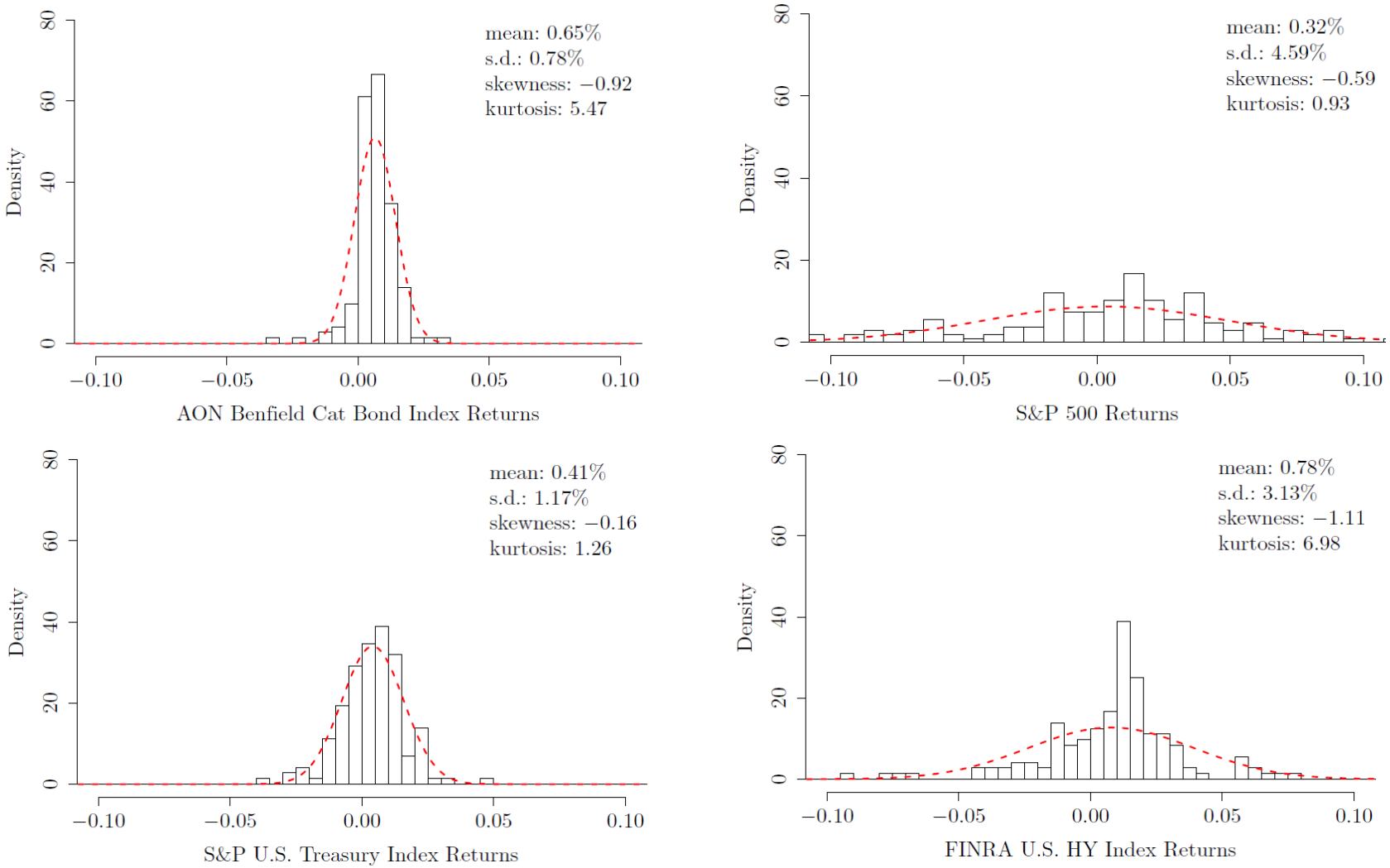
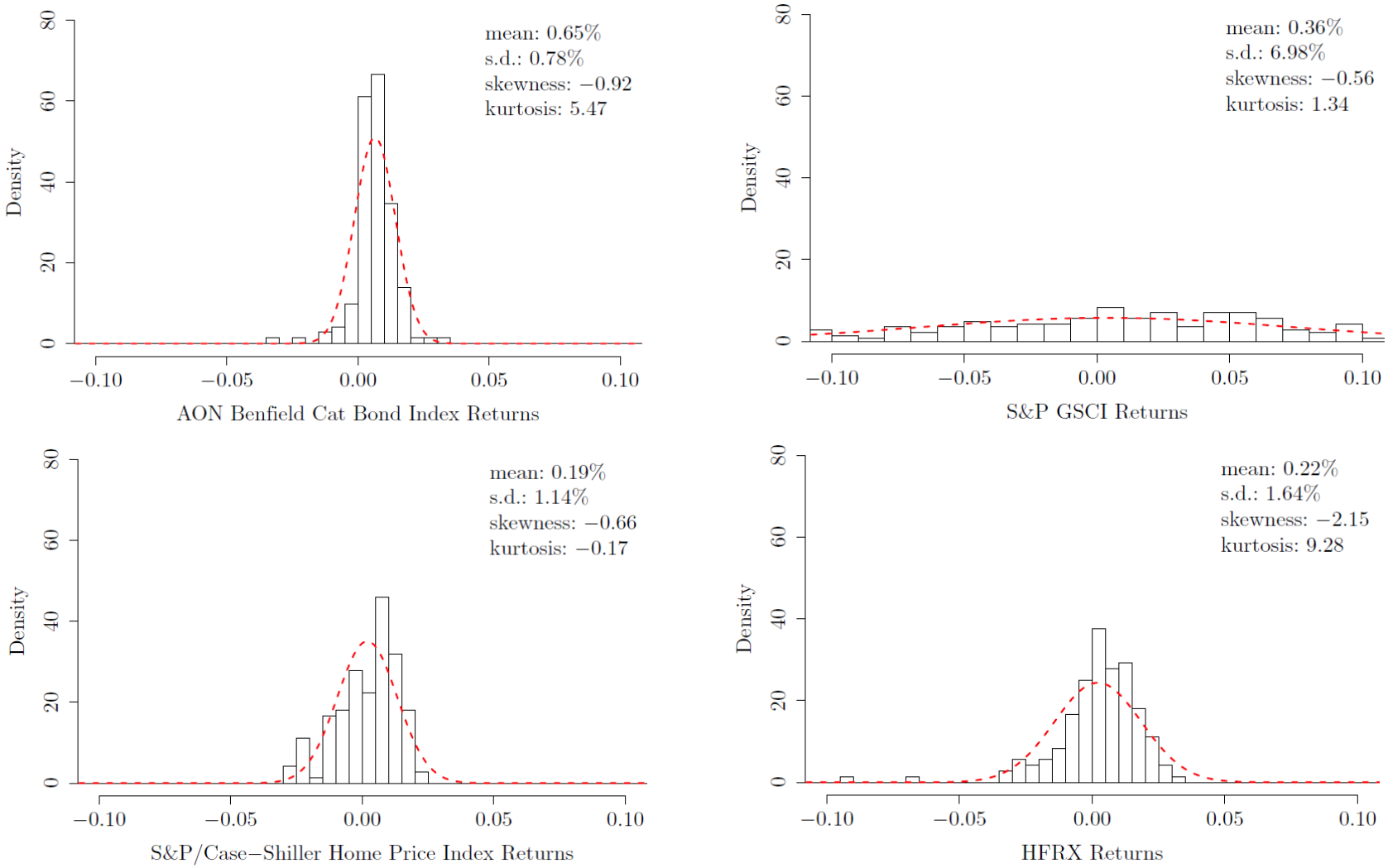
Based on monthly returns from January 2001 to December 2012, we see an extraordinarily attractive risk-return profile.



None of the other considered asset classes has delivered a comparable mean return with such a low standard deviation.



Since cat bond returns exhibit low correlations with other asset classes, specific factor models are required for fund evaluation.

01/2001 - 12/2006	AON Cat		S&P 500		S&P USTI		FINRA HY		HFRX		S&P/CS HPI		S&P GSCI
AON Cat	1.00												
S&P 500	0.19		1.00										
S&P USTI	0.06		-0.45	***	1.00								
FINRA HY	0.24	**	0.52	***	-0.04		1.00						
HFRX	0.17		0.36	***	0.00		0.43	***	1.00				
S&P/CS HPI	-0.27	**	-0.14		-0.01		-0.22	*	-0.33	***	1.00		
S&P GSCI	-0.06		-0.06		0.01		0.00		0.12		0.20	*	1.00

01/2007 - 12/2012	AON Cat		S&P 500		S&P USTI		FINRA HY		HFRX		S&P/CS HPI		S&P GSCI
AON Cat	1.00												
S&P 500	0.29	**	1.00										
S&P USTI	0.06		-0.31	***	1.00								
FINRA HY	0.34	***	0.75	***	-0.35	***	1.00						
HFRX	0.35	***	0.72	***	-0.39	***	0.75	***	1.00				
S&P/CS HPI	0.15		0.18		-0.03		0.19		0.19		1.00		
S&P GSCI	0.19		0.60	***	-0.29	**	0.50	***	0.71	***	0.09		1.00

Time series regressions based on excess returns:

$$R_t^e = \alpha + \beta_1 \text{CATMKT}_t^e + \beta_2 \text{AONUSW}_t^e + \beta_3 \text{AONUSEQ}_t^e + \beta_4 \text{S\&P500}_t^e + \beta_5 \text{S\&PUSTI}_t^e + \beta_6 \text{FINRAHY}_t^e + \beta_7 \text{S\&PCS}_t^e + \beta_8 \text{S\&PGSCI}_t^e + \epsilon_t$$

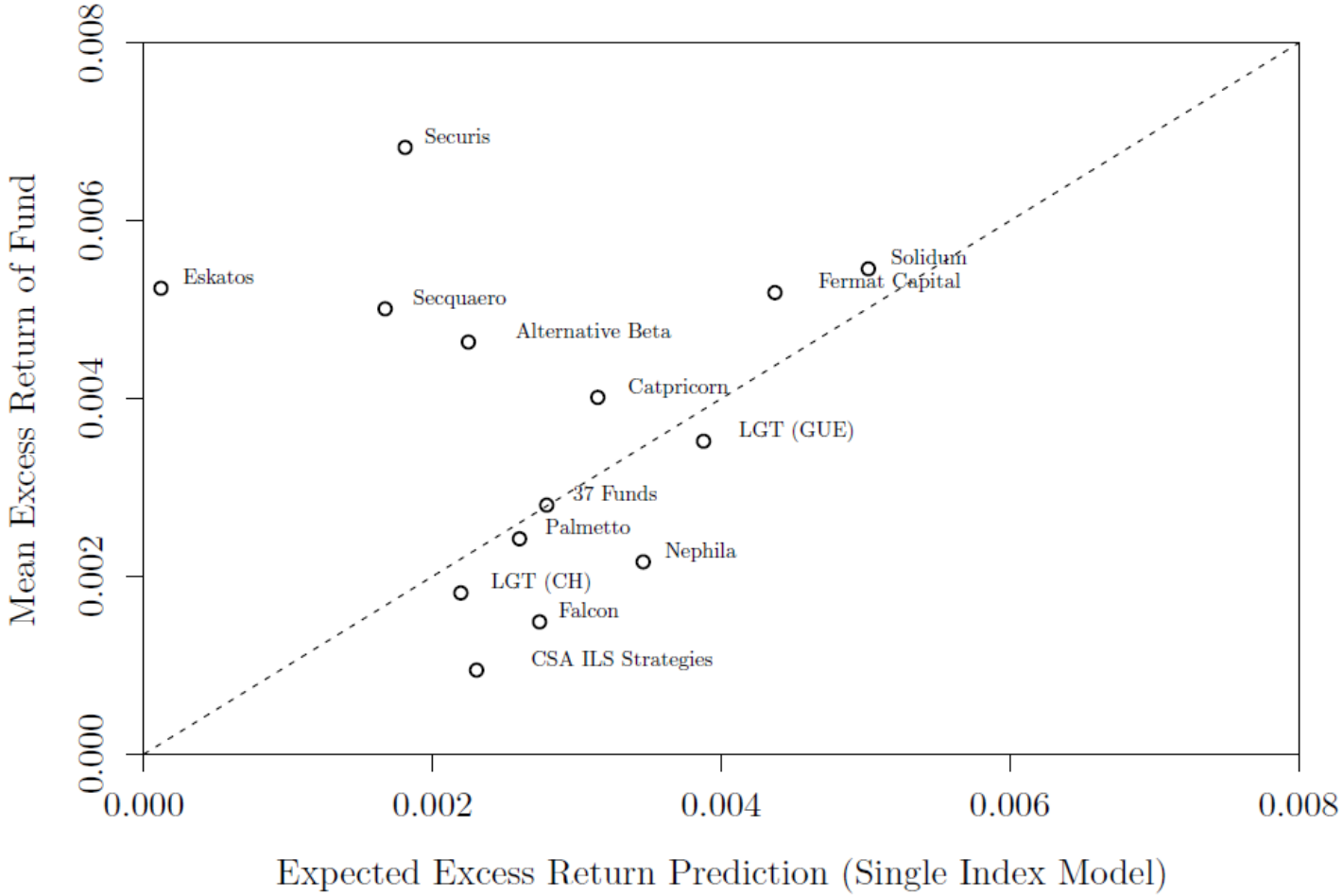
None of the four largest dedicated cat bond funds seems to have generated significant alpha returns to date.

	LGT (CH) (01/2002 - 12/2012)			Nephila (01/2002 - 12/2008)			CSA ILS Strategies (08/2003 - 12/2012)			Fermat Capital (01/2005 - 12/2012)		
	coeff.	p-val.	sig.	coeff.	p-val.	sig.	coeff.	p-val.	sig.	coeff.	p-val.	sig.
Intercept	-0.0003	0.6226		0.0009	0.4484		-0.0003	0.5014		0.0009	0.4383	
Cat Bond Market	0.5289	0.0132	**	1.4225	0.0000	***	0.7152	0.0000	***	1.0402	0.0192	**
AON U.S. Wind	0.1375	0.0072	***	0.2075	0.1063		0.0718	0.0971	*	0.4189	0.0000	***
AON U.S. EQ	0.1390	0.0093	***	-0.0495	0.7323		0.0237	0.7037		0.2731	0.0041	***
S&P 500	0.0094	0.1973		-0.0256	0.5481		-0.0038	0.8080		-0.0113	0.6842	
S&P U.S. Treasuries	0.0022	0.9450		-0.1108	0.2850		0.0038	0.9302		-0.0204	0.8185	
FINRA U.S. HY Index	0.0108	0.4025		0.0030	0.9573		0.0092	0.6674		0.0183	0.6358	
S&P/Case-Shiller	0.1255	0.0002	***	-0.0798	0.4052		0.0055	0.8785		0.0410	0.5450	
S&P GSCI	-0.0030	0.5611		-0.0310	0.0467	**	0.0067	0.3435		0.0015	0.8839	
df	123			75			104			87		
Adjusted R^2	0.4216			0.4797			0.6134			0.5700		
SEE	0.0056			0.0097			0.0046			0.0094		
F-Statistic	12.9400	0.0000	***	10.5700	0.0000	***	23.2100	0.0000	***	16.7400	0.0000	***
White's Test	11.8002	0.0027	***	3.6247	0.1633		2.4523	0.2934		37.2136	0.0000	***
BP Test	23.1624	0.0032	***	8.5961	0.3775		7.8443	0.4488		66.1495	0.0000	***
DW Test	2.0188	0.4810		2.1891	0.7423		2.1963	0.8077		2.2652	0.8617	
LB Test (lag 3)	2.1346	0.5450		1.1677	0.7608		2.3002	0.5125		2.0969	0.5525	
LB Test (lag 6)	8.5497	0.2005		5.5018	0.4812		4.5006	0.6093		2.9487	0.8153	
LB Test (lag 12)	20.4505	0.0590	*	14.6627	0.2604		7.5860	0.8166		5.1747	0.9519	

Although some slopes for other asset classes are statistically significant, the substantive effects are mostly negligible.

	Alternative Beta (11/2004 - 12/2012)			Catpricorn (06/2005 - 12/2012)			Falcon (12/2006 - 12/2012)			LGT (GUE) (10/2005 - 12/2012)		
	coeff.	p-val.	sig.	coeff.	p-val.	sig.	coeff.	p-val.	sig.	coeff.	p-val.	sig.
Intercept	0.0019	0.0005	***	0.0008	0.1828		-0.0005	0.4691		0.0001	0.8735	
Cat Bond Market	0.4013	0.0255	**	0.6975	0.0000	***	0.6768	0.0220	**	1.0506	0.0000	***
AON U.S. Wind	0.2812	0.0000	***	0.2621	0.0000	***	0.2521	0.0000	***	0.2907	0.0000	***
AON U.S. EQ	0.1367	0.0019	***	0.1736	0.0003	***	0.1465	0.1935		0.2433	0.0004	***
S&P 500	-0.0083	0.3418		0.0372	0.0074	***	-0.0394	0.0420	**	0.0124	0.5256	
S&P U.S. Treasuries	-0.0375	0.2909		0.0937	0.0278	**	-0.1159	0.0729	*	-0.1307	0.0527	*
FINRA U.S. HY Index	0.0311	0.0208	**	-0.0085	0.5925		0.0394	0.2952		-0.0174	0.4784	
S&P/Case-Shiller	0.0422	0.1261		-0.0134	0.7737		0.1673	0.0047	***	-0.0429	0.4506	
S&P GSCI	0.0023	0.6828		0.0208	0.0388	**	0.0034	0.6878		-0.0240	0.1690	
df	123			102			89			82		
Adjusted R^2	0.4917			0.7139			0.4657			0.6840		
SEE	0.0049			0.0048			0.0074			0.0068		
F-Statistic	16.8400	0.0000	***	35.3100	0.0000	***	11.5700	0.0000	***	25.3500	0.0000	***
White's Test	13.0211	0.0015	***	5.3110	0.0703	*	25.2374	0.0000	***	12.5201	0.0019	***
BP Test	43.8783	0.0000	***	18.9215	0.0153	**	40.1021	0.0000	***	21.4087	0.0061	***
DW Test	1.7460	0.0534	*	1.3518	0.0002	***	2.1339	0.6756		1.9379	0.3067	
LB Test (lag 3)	3.6977	0.2960		16.4804	0.0009	***	1.0711	0.7840		1.7095	0.6348	
LB Test (lag 6)	5.3609	0.4984		18.3041	0.0055	***	6.0988	0.4122		4.4925	0.6103	
LB Test (lag 12)	13.5531	0.3302		19.1681	0.0846	*	26.0607	0.0105	**	11.6531	0.4739	

Even a simple single index model seems to be well-suited to explain the returns of most diversified cat bond portfolios.



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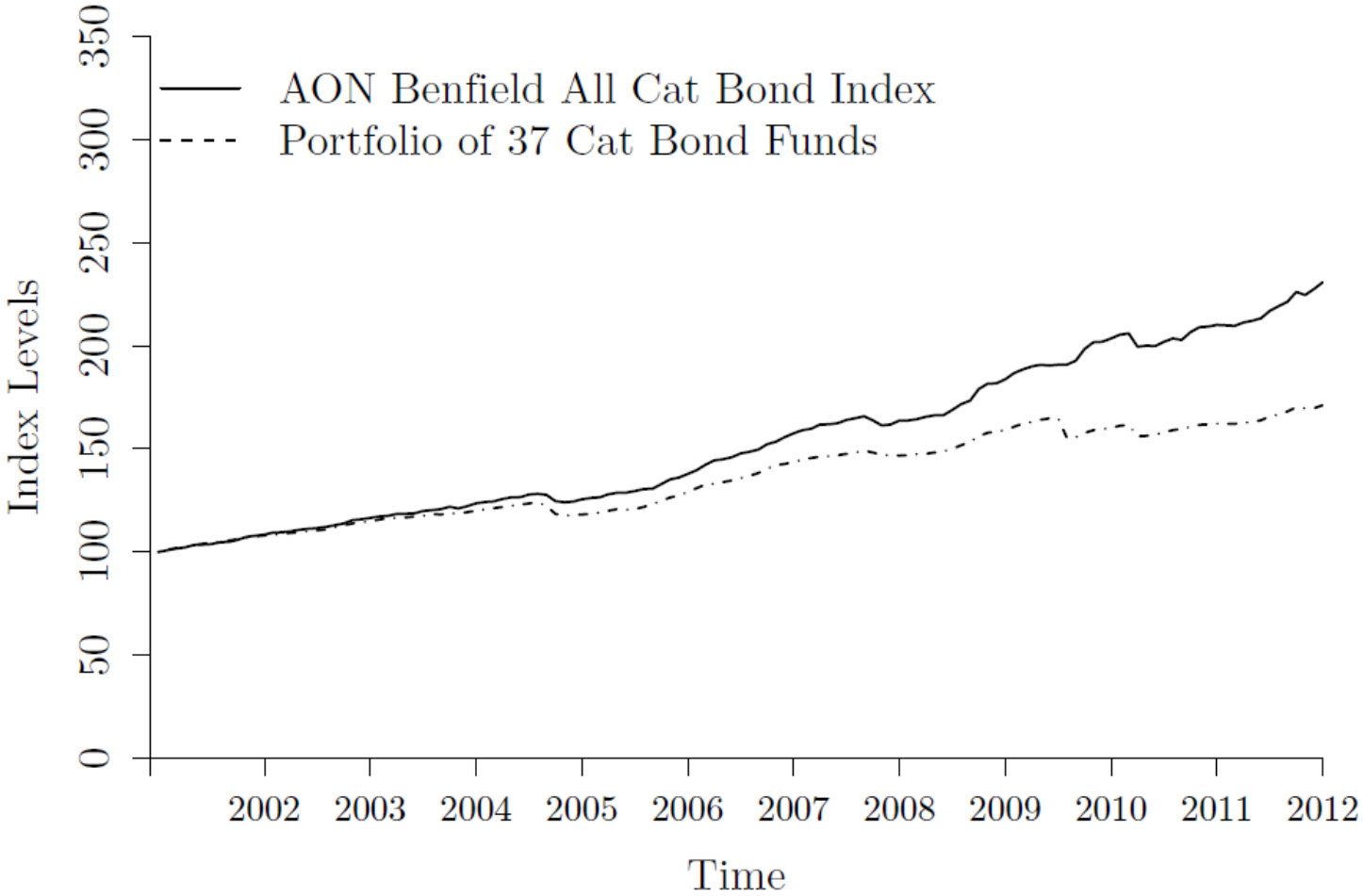
Investors with market access and ILS know-how could simply form their own portfolios and save the funds' cost structure.



All of the presented results are preliminary in nature: the analysis will be extended in several directions.

Summary and Conclusion

- Outstanding historical risk-return profile of the cat bond asset class
- The “cat market factor” is the main driver of cat bond returns (single index model)
- Three-factor model can be employed for cat bond fund style analysis
- Buy and hold if possible: funds seem to be largely unable to outperform the index

Outlook

- Try to improve data basis (missing Nephila/Palmetto returns, life bond market)
- Run robustness checks (split sample regressions)
- Include the “TERM” and “DEF” factors for fixed income (Fama/French, 1993)
- Evaluate out-of-sample performance of the model