28E35700 Alternative Investments

Hedge Fund Strategies

Spring 2024

Juha Joenväärä

Aalto University
School of Business

Hedge Fund Strategies

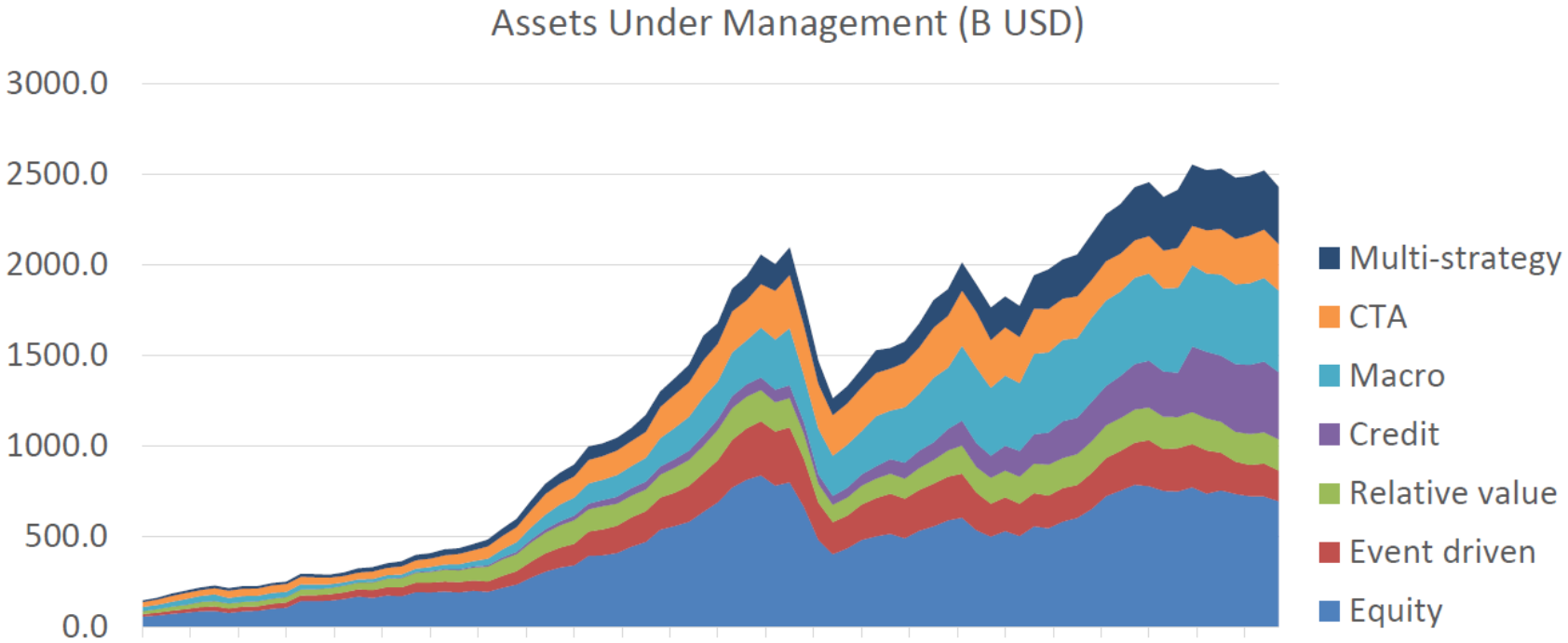
- **Two main approaches**
  - **Market timing:** range from specialists in certain sectors to **global macro** seeking to capture global market trends. This style is **directional** and is net long or short.
  - **Non-directional:** aims to be **market neutral** and usually extracts value from a diversified set of "**arbitrage**" opportunities
  - **Both approaches can deliver low correlations** with traditional asset classes

- **Two main styles**
  - **Discretionary:** relies on **a person's judgment** to determine trades, e.g., Brevan Howard
  - **Systematic:** more **rules-based** and relies on **quantitative models**. An extreme example is quant black-box high-frequency trading, e.g., Renaissance, DE Shaw

Quantitative vs Fundamental Investment Process

- **Investment process** can be seen as **“fundamental” or “quantitative”** by the way asset managers making investment decisions.
  - If the whole procedure is done by **human judgment or intuition**, an investment process will be labeled as a “**fundamental**” one;
  - and only if it is **purely** done by **computer-based models**, the process can be classified as “**quantitative**” or “**quants**”.
- There is also tradeoff between these two approaches, which they define it as a **hybrid** one if the hedge fund **combines both ways.**
- Chincarini (2014):
  - Find **quantitative** hedge funds outperform **qualitative** hedge funds by 72bps per year after correcting for risk
  - Additional performance might be due to better **market timing skills**

Form PF “US Regulator” Hedge Fund Strategy Classifications



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Suorce: Joenväärä, Kauppila, Kosowski and Tolonen (2021)

HFR Hedge Fund Strategy Classifications

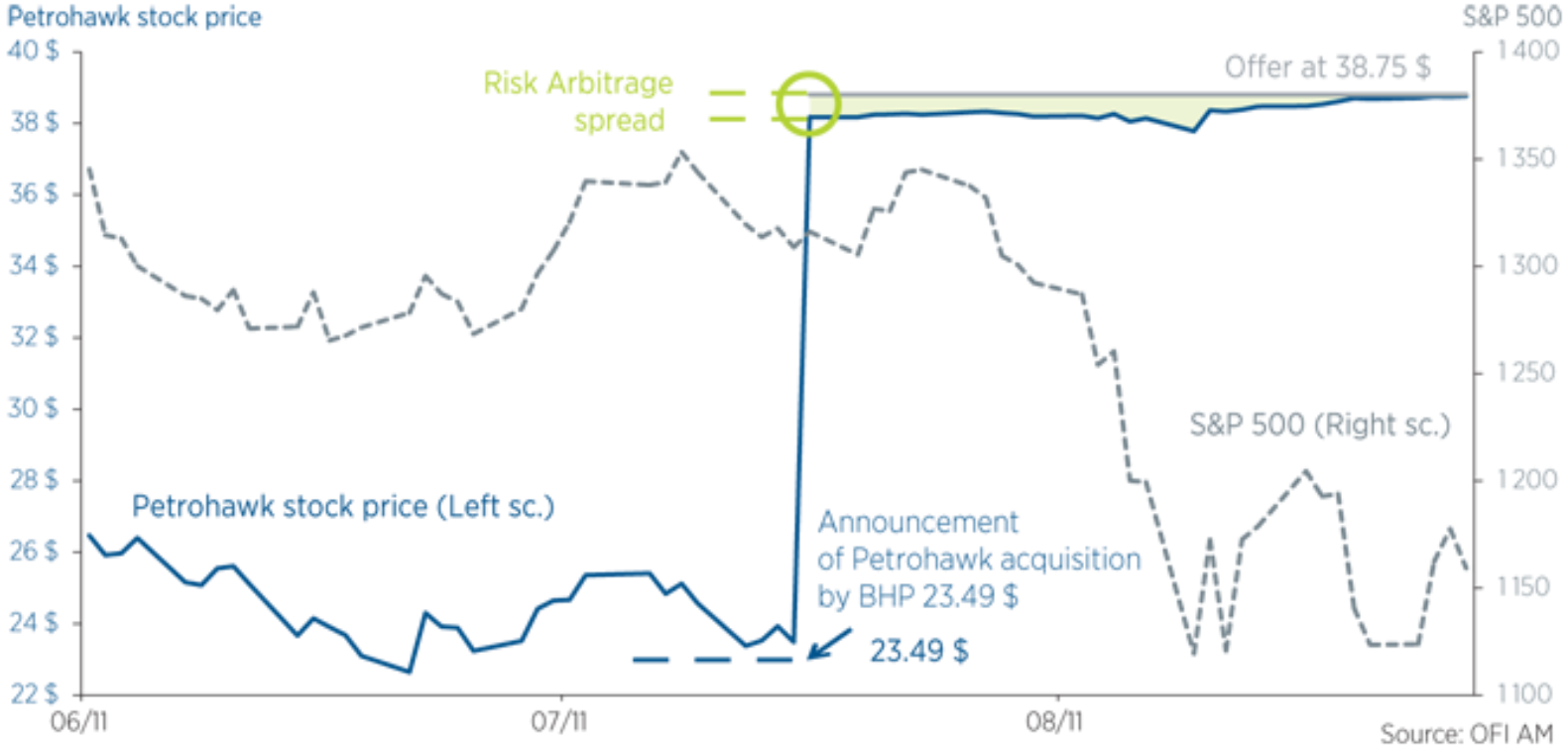
Equity Hedge	Event Driven	Macro	Relative Value
Equity Market Neutral	Activist	Active Trading	Fixed Income - Asset Backed
Fundamental Growth	Credit Arbitrage	Commodity: Agriculture	Fixed Income - Convertible Arbitrage
Fundamental Value	Distressed / Restructuring	Commodity: Energy	Fixed Income - Corporate
Quantitative Directional	Merger Arbitrage	Commodity: Metals	Fixed Income - Sovereign
Sector: Energy/Basic Materials	Private Issue / Regulation D	Commodity: Multi	Volatility
Sector: Healthcare	Special Situations	Currency: Discretionary	Yield Alternatives: Energy Infrastructure
Sector: Technology	Multi-Strategy	Currency: Systematic	Yield Alternatives: Real Estate
Short Bias		Discretionary Thematic	Multi-Strategy
Multi-Strategy		Systematic Diversified	
		Multi-Strategy	

Event-Driven

Event-Driven

- Event-Driven is also known as **“corporate life cycle”** investing.
  - This involves investing in opportunities created by significant transactional events, such as **spin-offs, mergers and acquisitions, bankruptcy reorganizations, recapitalizations** and **share buybacks**.
  - The portfolio of some Event-Driven managers may shift in majority weighting between **Risk Arbitrage** and **Distressed Securities**, while others may take a broader scope.
- Instruments include long and short common and preferred stocks, as well as debt securities and options.
- Leverage may be used by some managers.
- Fund managers may hedge against market risk by purchasing S&P put options or put option spreads.

Risk Arbitrage Target Premium



Steps in Merger / Risk Arb Strategy: Cash Offer

1. **Cash Offer**
   - Borrow, buy target.
   - Large chance of a small return if successful. (Leverage: a large return)
   - Small chance of a large loss if unsuccessful.
   - The strategy seems unrelated to the overall market, “beta zero”.

(2) $$R_{it} = R_{TARit}$$

where R_{it} is the risk arbitrage return for deal i on day t and R_{TARit} is the return on target firm i on day t between the deal announcement and completion (or cancellation) day.

Mitchell and Pulvino (2001, JF)

Steps in Merger / Risk Arb Strategy: For stock and hybrid deals

2. <u>For stock and hybrid deals</u>:

- A long-short portfolio provides a similar payoff structure for cash deals
- Assuming that arbs establish **the optimal short position in acquires shares**, the risk arbitrage returns for stock deals are determined as

(3)

$$R_{it} = R_{TARit} - \left(R_{ACQit} - R_f\right)\delta \frac{P_{ACQit-1}}{P_{TARit-1}}$$

where R_{it} is the risk arbitrage return for deal i on day t, R_{TARit} is the return on target firm i on day t, R_{ACQit} is the return on the acquiring firm i on day t, and R_f is the cost of borrowing for the short position and is set to be the risk-free rate. The exchange ratio of target stock for acquirer stock is represented by δ.[4] The ratio of the lagged acquirer stock price, $P_{ACQit-1}$, to the lagged target stock price, $P_{TARit-1}$, times δ yields the number of shares of acquirer stock to be shorted for the ownership of one share of target stock. Finally, the return for hybrid deals is calculated as a weighted average of the returns for cash and stock deals.

A?

Mitchell and Pulvino (2001, JF)

John Paulson: ”*Risk Arbitrage is not about making money, it’s about no losing money*”

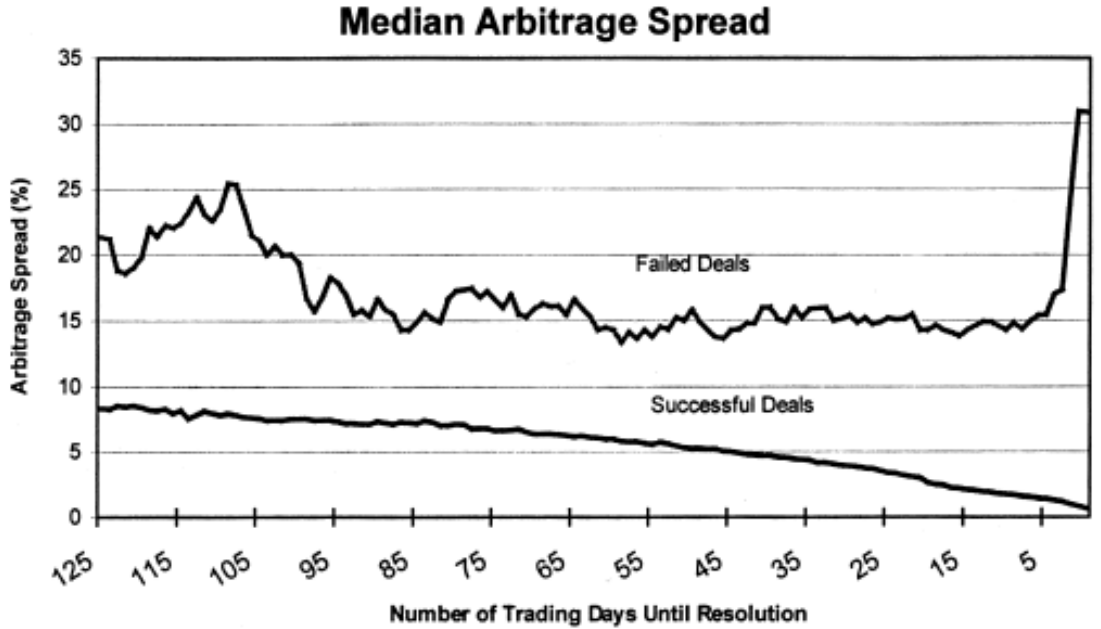


Figure 1. This figure plots the median arbitrage spread versus time until deal resolution. The arbitrage spread is defined to be the offer price minus the target price divided by the target price. For failed deals, the deal resolution date is defined as the date of the merger termination announcement. For successful deals, the resolution date is the consummation date.

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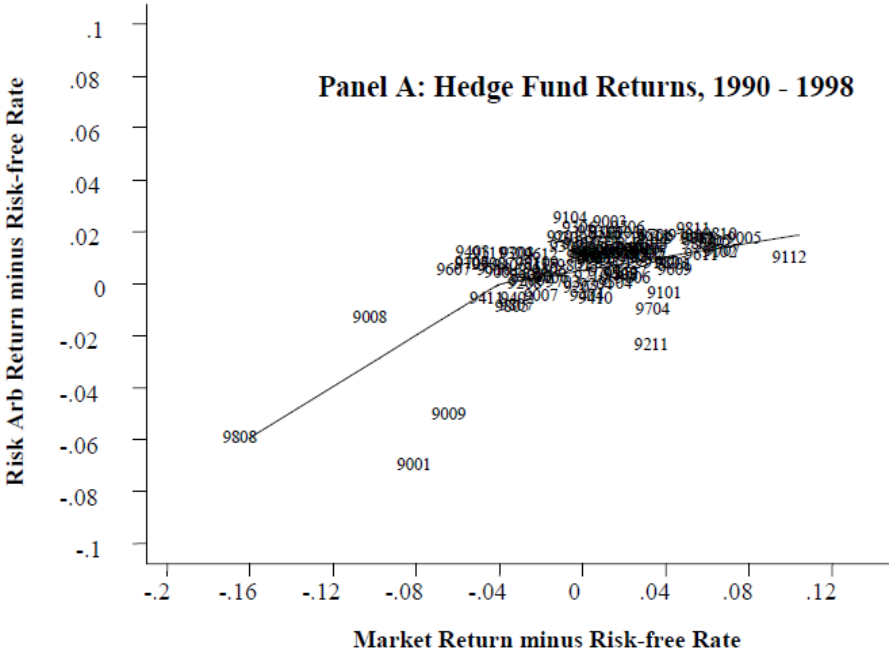
Mitchell and Pulvino (2001, JF)

Merger Arbitrage Strategy



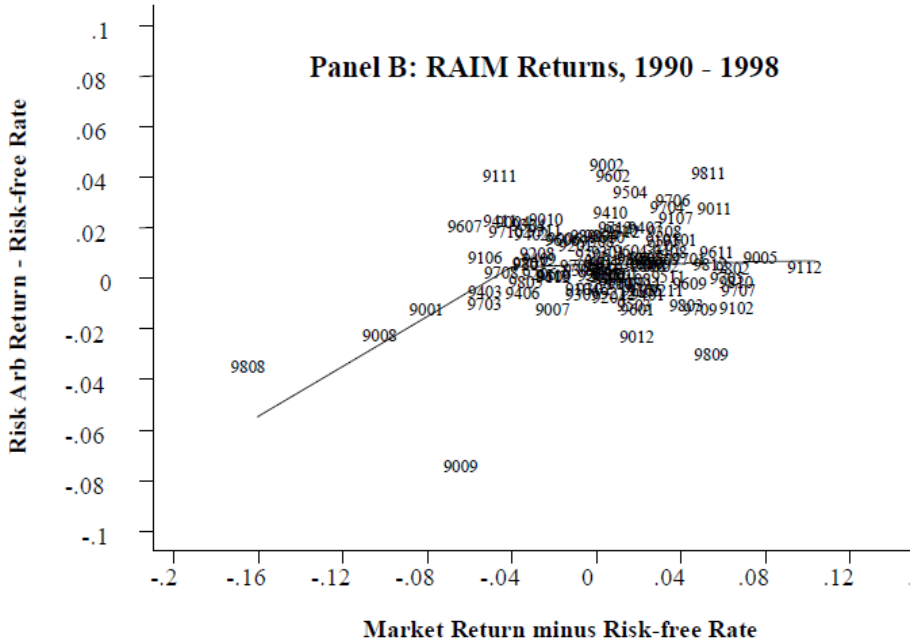


Figure 5: This figure compares RAIM returns and hedge fund returns during 1990 - 1998. Panel A presents hedge fund returns obtained from Hedge Fund Research's merger arbitrage index and Panel B presents RAIM returns. Data labels correspond to months (i.e. 9808 is August, 1998). Fitted lines from a piecewise linear regression are also shown.

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Mitchell and Pulvino (2001, JF)

Down-market αs and βs for risk arbs

$$R_{Risk\,Arb} - R_f = \alpha + \beta_{Mkt}(R_{Mkt} - R_f)$$

where $R_{Risk\,Arb}$ is the monthly return on a portfolio of risk arbitrage transactions, R_f is the monthly risk-free rate, R_{Mkt} is the monthly return on the value-weighted CRSP index

Dependent Variable	α	β_{Mkt}	β_{SMB}	β_{HML}	Adj. R^2	Sample Size
Panel A: Complete Sample						
RAIM portfolio returns	0.0029 (0.0010)**	0.1232 (0.0236)***			0.057	432
Panel C: Market Return—Rf < –5%						
RAIM portfolio returns	0.0232 (0.0134)	0.4830 (0.1479)**			0.222	35

A?

Mitchell and Pulvino (2001, JF)

Piecewise Linear Regressions: Risk Arbitrage Returns Versus Market Returns

$$R_{Risk\,Arb} - R_f = (1-\delta)[\alpha_{Mkt\,Low} + \beta_{Mkt\,Low}(R_{Mkt} - R_f)] + \delta[\alpha_{Mkt\,High} + \beta_{Mkt\,High}(R_{Mkt} - R_f)],$$

where $R_{Risk\,Arb}$ is the monthly return on a portfolio of risk arbitrage transactions, R_f is the risk-free rate, R_{Mkt} is the monthly return on the value-weighted CRSP index, and δ is a dummy variable equal to one if the market return is greater than a threshold and zero otherwise. To insure continuity, the following restriction is imposed:

$$\alpha_{Mkt\,Low} + \beta_{Mkt\,Low}(Threshold) = \alpha_{Mkt\,High} + \beta_{Mkt\,High}(Threshold).$$

Results are presented for a threshold equal to −4 percent, that being the threshold that maximizes the adjusted R^2 for the complete sample. Panel A presents results using the entire 432 month sample between 1963 and 1998. Panels B, C, and D present results for various subperiods. Standard errors are in parentheses.

Dependent Variable	$\alpha_{Mkt\,High}$	$\beta_{Mkt\,Low}$	$\beta_{Mkt\,High}$	Adj. R^2	Sample Size
Panel A: Complete Sample					
RAIM portfolio returns	0.0053 (0.0011)***	0.4920 (0.0673)***	0.0167 (0.0292)	0.124	432

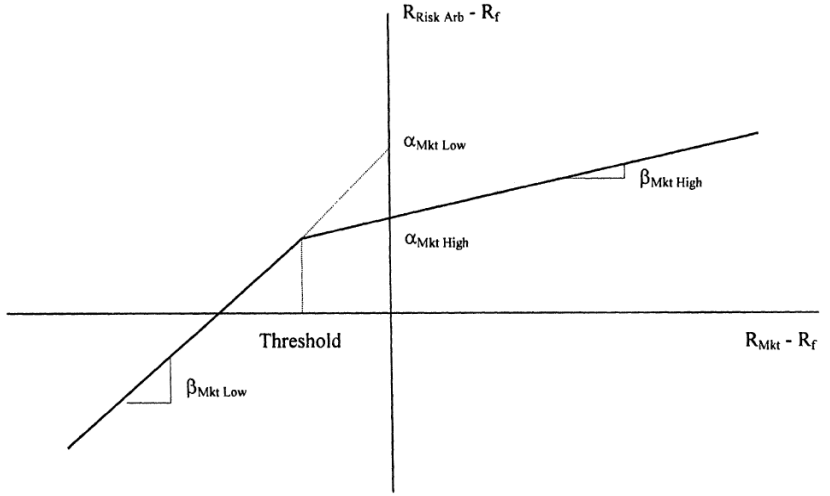


Figure 2. This figure depicts the piecewise linear model specified in equations (2) and (3). $R_{Risk\,Arb}$ is the monthly return obtained from the risk arbitrage portfolio, R_f is the monthly risk-free rate, and R_{Mkt} is the monthly return obtained from the CRSP value-weighted index. The market beta is allowed to vary depending on market returns. $\beta_{Mkt\,Low}$ is the slope coefficient when the difference between the market return and the risk-free rate is less than the threshold. $\beta_{Mkt\,High}$ is the slope coefficient when the difference between the market return and the risk-free rate is greater than the threshold.

Hedge Fund Activism

- **An activist shareholder**
  - Acquires a **minority equity position** in a public corporation
  - Pressure on management in order to increase shareholder value through changes in corporate policy
- **Common changes advocated by activist shareholders:**
  - General undervaluation
  - Capital structure
  - Business strategy
  - Sale of target company
  - Governance
  - Climate change

Daniel Loeb's Third Point Buys Stake in Nokia

Hedge Fund Investor Discloses Buying Shares After Microsoft Bought Handset Business

By John D. Stoll

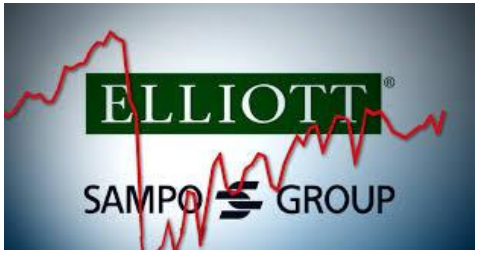
Updated Oct. 22, 2013 1:09 pm ET

Hedge-fund investor Daniel Loeb's Third Point LLC is betting Nokia Corp. is headed for brighter days after it hands off its money-losing handset business to Microsoft Corp.

MSFT **+3.20%** ▲

In a third-quarter letter sent to investors, Mr. Loeb said his New York firm purchased Nokia shares last month after Microsoft's $7.2 billion acquisition of the Finnish company's struggling handset business was announced. Citing Nokia's cash reserves, estimated by Third Point to be $11 billion after the sale, Mr. Loeb said a share buyback or special dividend "is possible."

"We expect a meaningful portion of the excess [cash] will be distributed to shareholders in coming quarters," he said. This "should draw additional investors to new Nokia when the cash return scenario develops following the deal closing."



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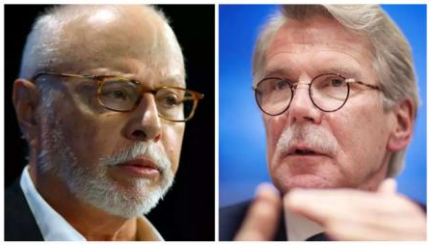


Elliott Managementin perustaja Paul Singer (vas.) ja Sammon hallituksen puheenjohtaja Björn Wahlroos. KUVA: MIKE BLAKE / REUTERS, AKSELI VALMUNEN

Elliott Releases Presentation on Sampo

Elliott calls upon Sampo to fully exit its Nordea stake by Q4 2021 and create EUR 8 billion of value for Sampo shareholders
February 24 CMD is Sampo's chance to reset its equity story and restore investor confidence
Materials available at new website www.SimplifyingSampo.com

February 02, 2021 02:00 AM Eastern Standard Time

LONDON--(BUSINESS WIRE)--Elliott Advisors (UK) Limited ("Elliott" or "we"), which advises funds that as at the date of this release collectively hold investments equivalent to more than 3% of the share capital of Sampo Oyj ("Sampo" or the "Company"), today published a new presentation outlining a clear pathway to transform Sampo into a pure-play insurer and create in excess of EUR 8 billion of value.

Whilst Sampo's announcement of 10 November 2020 was a positive first step towards making the structural simplifications necessary to re-establish the Company's reputation among investors, Sampo's shares have continued to underperform. Today, Sampo's high quality core insurance business trades at an unmerited ~5x P/E discount to its peers; this sits in stark contrast to the ~4x P/E premium the business used to trade at several years ago.

Elliott believes that Sampo's upcoming Capital Markets Day ("CMD") on 24 February 2021 is the opportune moment for the Company to reverse this historical underperformance and value destruction, highlight its strengths and restore investor confidence. As such, Elliott encourages Sampo to:

1. **Simplify the Portfolio**: Sampo should announce that it plans to become **a pure-play insurer by Q4 2021.** The Company's Nordea stake is widely acknowledged to have become a significant distraction and a sustained drag on valuation for Sampo. In a survey of investors commissioned by Elliott, the vast majority of respondents indicated they would like to see a full exit from the Nordea stake within the next twelve months. Sampo is positioned to satisfy investor demands by distributing half of Sampo's Nordea shares directly to shareholders – an act that over two-thirds of investors surveyed are supportive of – in Q2 2021 and selling the remainder to maintain a healthy balance sheet.
2. **Clarify the Strategy**: Importantly, Sampo should assert that without the overhang of the Nordea stake, **the Company will commit to being a dividend-focused P&C insurer, with no material M&A ambitions outside the Nordics until the Hastings deal proves successful.** We believe that there is widespread confusion amongst investors about the Sampo equity story, including scepticism on the rationale for the Hastings transaction and Sampo's future M&A appetite. What is clear is that investors are seeking greater focus on stable dividends, viewed as the lifeblood of a highly rated insurance company, and a commitment by Sampo to become a focused P&C insurer. The stability and growth prospects of IF P&C ideally position Sampo to become the stable dividend payer that investors seek; however, concerns about Sampo's capital allocation strategy must be resolved before the market can give Sampo the credit it deserves.
3. **Enhance the Communications**: **IF P&C is Sampo's crown jewel.** Sampo should clearly and confidently articulate IF P&C's strong fundamentals and provide the market with relevant, timely and specific targets and KPIs. Shining a spotlight on IF P&C will enable Sampo to recover its premium valuation.

Elliott believes that these measures and the transformation of Sampo into a pure-play insurer would collectively restore investor confidence and unlock in excess of EUR 8 billion in value for Sampo's shareholders.

Elliott today launched a new website www.SimplifyingSampo.com, where Elliott's presentation is available to view and download in full. Interested parties are encouraged to visit the website to receive additional information and to sign up for future updates.

https://www.simplifyingsampo.com/

Short-term vs Long-term

Martin Lipton of Wachtell, Lipton, Rosen & Katz:

"I think its a terrible thing for corporate America. I think what were seeing is a replay of the attempt to drive American business to short-term results instead of long-term values"

tive replacements. Certain hedge funds, such as Third Point, run by the colorful Daniel Loeb, adopted the aggressive tactics of the 1980s corporate raiders and turned the poison pen into legendary screeds against management. He has branded a CEO a CVD, or chief value destroyer; referred to two great-grandsons of one company's founder as part of the Lucky Sperm Club; and in a letter to Irik Sevin, CEO of fuel distributor Star Gas Partners LP, wrote: "Do what you do best: Retreat to your waterfront mansion in the Hamptons where you can play tennis and hobnob with your fellow socialites."[13]

Prof. Laura Starks

Activist HFs are very active in ESG

- **TCI** launched ‘Say on Climate’ Campaign
  - **TCI** criticized heavily Asset Management industry that **their efforts are joke**

- **Engine No. 1 LLC** focuses stakeholders instead of shareholders
  → Impact investing
  - letter to Exxon Mobil Corp.'s board

- Green innovation driven by **brown companies with low ESG scores**

Hedge Fund Activism

Updated tables and figures

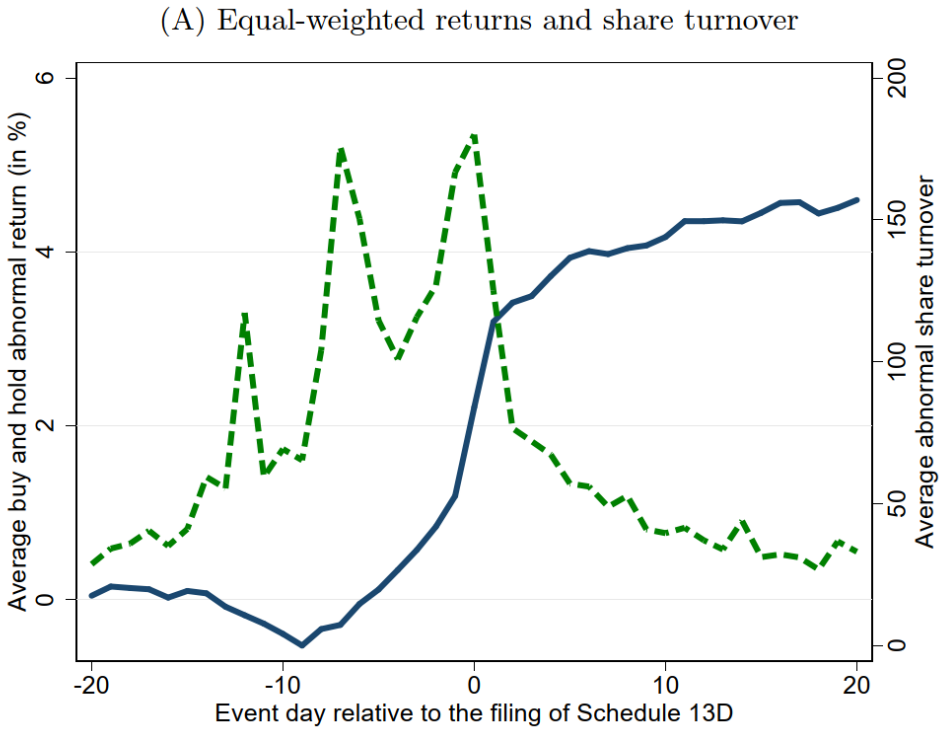
John Barry *
Fuqua School of Business
Duke Univesity
Durham, NC 27708, USA

Alon Brav †
Fuqua School of Business
Duke University
Durham, NC 27708, USA

Wei Jiang ‡
Columbia Business School
New York, NY 10027, USA

February 6, 2020

Short-term Stock Reaction

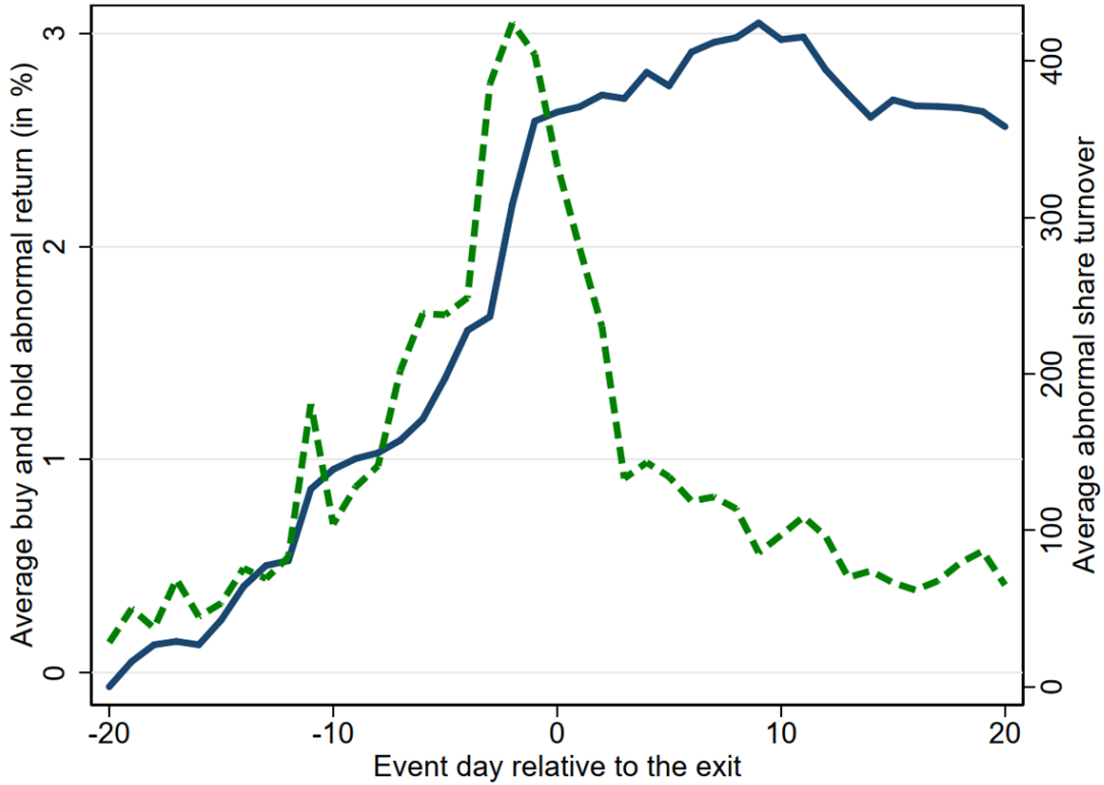


A?

– The solid blue line (left axis) plots the average buy-and-hold return around the filing of the Schedule 13D, in excess of the buy-and-hold return of the value-weight market, from 20 days prior the 13D file date to 20 days afterwards.

– The dashed green line (right axis) plots the increase in percentage points of the share trading turnover during the same time window compared to the average turnover rate during the preceding (-220, -21) event window.

Buy-and-Hold Abnormal Return Around Exits



Long-term Abnormal Returns

Panel A: Value-weighted target firm four-factor regressions						
	Holding period (in months)					
	(1)	(2)	(3)	(4)	(5)	(6)
	-36 to -25	-24 to -13	-12 to -1	+1 to +12	+13 to +24	+25 to +36
α	-0.693	-0.813	-1.327	0.251	0.153	0.251
	(-3.297)	(-3.768)	(-5.320)	(1.230)	(0.793)	(1.241)
β_{RMRF}	0.991	1.048	0.970	0.914	1.059	0.973
	(18.336)	(16.811)	(14.558)	(15.258)	(20.587)	(17.321)
β_{SMB}	0.424	0.281	0.078	0.319	0.313	0.262
	(4.534)	(3.427)	(0.727)	(4.218)	(4.704)	(3.181)
β_{HML}	0.026	-0.141	0.191	0.284	0.137	0.193
	(0.288)	(-1.478)	(1.830)	(2.774)	(2.089)	(2.428)
β_{MOM}	-0.048	-0.158	-0.086	-0.142	0.006	0.061
	(-1.020)	(-2.840)	(-0.993)	(-2.827)	(0.158)	(1.215)
N	277	277	277	273	273	262
R^2	0.656	0.693	0.556	0.666	0.729	0.657

A?

Activist Hedge Fund Performance

Greg Brown
UNC-Chapel Hill

Juha Joenväärä
Aalto University

Philip Howard
Wake Forest University

Christian Lundblad
UNC-Chapel Hill

Campaigns vs Fund Returns

- **The literature has primarily focused on the campaign's results on firm performance (Brav, Jiang, Partnoy, Thomas JF 2008)**
  - Public equity returns & 13D/G filings

- **There is very little focus on the performance of activists (Brav, Jiang, Partnoy, Thomas FAJ 2008)**
  - Hard to observe performance of activist funds
  - No publicly available dataset of performance

- **This paper addresses the later**

Activist Hedge Fund Performance

Merged:

- Bloomberg
- BarclayHedge
- Eurekahedge
- eVestment
- HFM
- HFR
- Morningstar
- Thomson Reuters
- PivotalPath

Expected Return	10.86
Standard Deviaiton	9.11
Skewness	-0.99
Kurtosis	4.94
Sharpe Ratio	1.05

alpha	5.09
Market beta	0.52
SMB beta	0.20
HML beta	-0.03

Macro

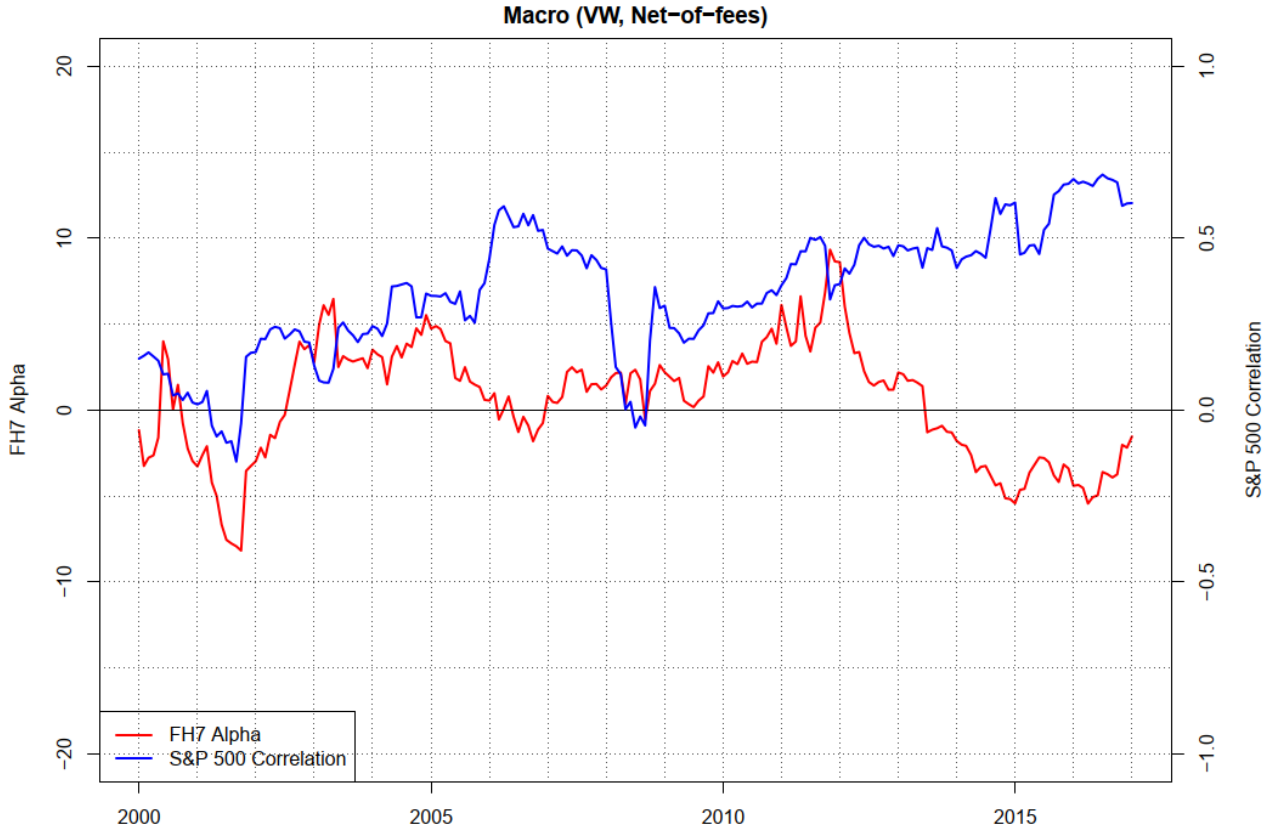
Macro

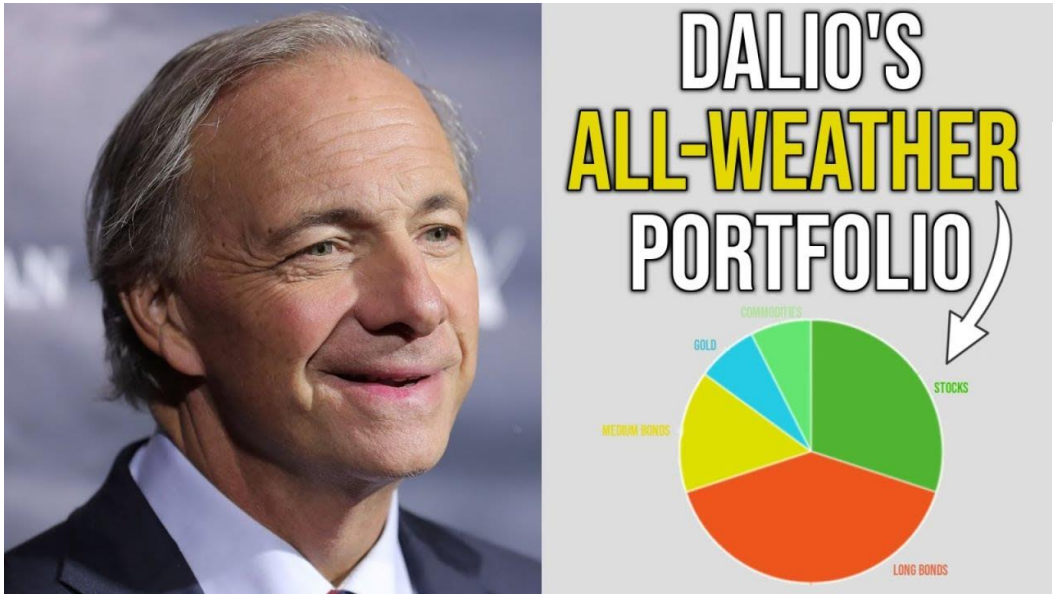
- The macro investment style refers to strategies that **speculate** on the **direction** of market prices of
  - Currencies
  - Commodities
  - Equities
  - Bonds

  on a **systematic** or **discretionary** basis.

- **Strategies include:**
  - Global Macro
  - CTA (Commodity Trading Advisors) or Managed Futures.

Time-varying Alpha of Global Macro





MARKET EXPECTATIONS	Growth	Inflation
Rising	25% OF RISK Equities Commodities Corporate Credit EM Credit	25% OF RISK IL Bonds Commodities EM Credit
Falling	25% OF RISK Nominal Bonds IL Bonds	25% OF RISK Equities Nominal Bonds

Asset Allocation

- 30% Total Stock Market
- 40% Long Term Bonds
- 15% Intermediate Bonds
- 7.5% Commodities
- 7.5% Gold

Bridgewaters All-Weather fund: 1996-2016

Basic statistics (%, pa where applicable)

Mean ER	Volatility	Sharpe	Drawdown
6.19	11.63	0.53	32.26

Fung-Hsieh 7-factor Benchmark Regression

	Alpha (%pa)	SP	SCLC	CGS10	CREDSPR	PTFSBD	PTFSCOM	PTFSFX	Adj R2
estimate	**-1.39**	0.36	0.11	**1.01**	**0.47**	-0.01	0.00	0.00	0.60
t-stat	**-0.83**	10.44	2.65	**14.74**	**6.17**	-0.58	-0.46	-0.41	

Global 7-factor Benchmark Regression

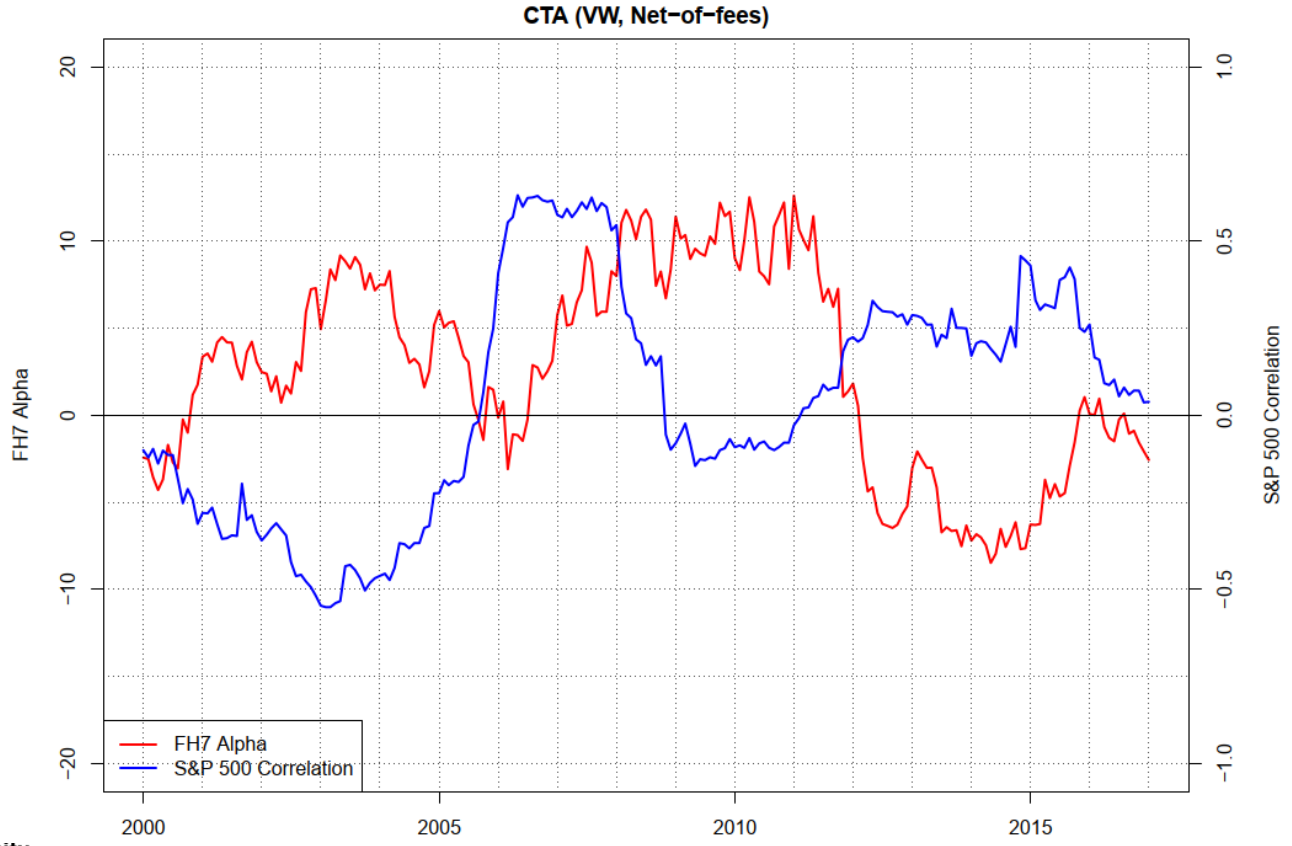
	Alpha (%pa)	Mkt_RF	SMB	HML	MOM	TSMOM	BAB	LIQ	Adj R2
estimate	**-0.05**	0.41	0.07	-0.18	-0.21	0.20	0.27	0.02	0.32
t-stat	**-0.02**	9.49	0.82	-2.01	-1.87	3.16	3.59	0.38	

CTAs or Managed Futures Strategy

- Trade listed commodity and financial **futures contracts** on behalf of their clients.
- Two groups:

1. **Systematic traders**
    - Believe that **future price movements** in all markets may be more **accurately anticipated** by analyzing **historical price movements** within **a quantitative framework**
    - Rely on **computer-generated trading signals** to gain better risk/return trade off.
2. **Discretionary trades**
    - Base their trading decisions on **fundamental and technical market analysis**, as well as on their **experience** and **trading skills** developed over the year

Time-varying Alpha of CTA



Billionaire Cliff Asness' Big Trend Following Fund Is Down 19% Since Its 2015 Peak

Nathan Vardi Forbes Staff

Following the money trail

Billionaire Cliff Asness's AQR Capital Management has over the last few years successfully sold investors on a hedge fund lite strategy featuring data-driven approaches. But amid all the investor interest in such computer trading, one of AQR's largest funds has been posting some poor returns over the last two years.

Asness' big trend following fund, AQR Managed Futures Fund, is experiencing a 19.5% daily drawdown since its peak in April 2015, according to Morningstar data. Trend following strategies have not performed well in general over the last two years and AQR's trend following losses have nearly matched the Societe Generale Trend Index, which is down 18.3% over the same period.

AQR Manages Futures fund

AQR has developed a thorough understanding of trend-following and momentum strategies from managing numerous hedge fund strategies which **utilize time-series trend following signals** for over 15 years (and studying and analyzing trend-following strategies for two decades). In the design of the Managed Futures Fund, we have developed multiple signals that target each stage of a trend's lifecycle. We believe the application of a robust and systematic approach to trend-following, diversified across multiple asset classes and markets, implemented with a focus on transaction costs and incorporating disciplined risk management will lead to attractive long-term results.

Investment Process:

Our investment approach is to take economically intuitive and rigorously tested factors and implement them in a systematic and highly risk-controlled manner. For the Managed Futures Fund, we use proprietary quantitative models to identify different measures of trend over various horizons as well as over-extended trends.

Our position sizing methodology is a function of:

1) the strength of the trend determined by econometric evaluation of combining the above-mentioned groups of signals (more agreement across signals leads to larger positions and vice-versa),

2) our volatility estimates of each market as a function of its historical and implied volatilities; and

3) a collection of risk management methods which aim to reduce portfolio concentration and excessive risk taking.

From these criteria, we will enter into a long or short position based upon the aggregate view of the combination of signals. We then size the view depending on the model's view of probability of persistence of the identified trend as well as our forecast of volatility of the instrument.

The primary driver of most managed futures strategies is trend-following or momentum investing; that is, buying assets that are rising and selling assets that are declining. Trends are pervasive across all markets, and we believe the phenomena can be explained economically by looking at 3 stages of the lifecycle of a trend: an initial under-reaction to a shift in fundamental value, potentially allowing a managed futures strategy to invest before the information is fully reflected in prices. The trend then overextends due to herding effects, and this finally results in a reversal.

AQR Manages Futures Fund: 2009 - 2016

Basic statistics (%, pa where applicable)

Mean ER	Volatility	Sharpe	Drawdown
2.77	9.89	0.28	14.20

Fung-Hsieh 7-factor Benchmark Regression

	Alpha (% pa)	SP	SCLC	CGS10	CREDSPR	PTFSBD	PTFSCOM	PTFSFX	Adj R2
estimate	**0.06**	0.25	-0.15	0.41	0.01	0.01	0.01	0.05	**0.18**
t-stat	**0.02**	2.54	-1.21	2.48	0.07	0.22	0.74	2.88	

Global 7-factor Benchmark Regression

	Alpha (% pa)	Mkt_RF	SMB	HML	MOM	TSMOM	BAB	LIQ	Adj R2
estimate	**-3.98**	0.02	0.09	0.18	-0.17	**0.67**	0.13	-0.06	**0.65**
t-stat	**-1.38**	0.44	0.69	1.44	-0.98	**9.82**	0.89	-0.89	

Multi-Strategy

Multi-Strategy

- **Multistrategy funds operate teams across multiple investment strategies with the goal of generating alpha in all markets.**
  - Capital is allocated from a central pot across different teams (fondly known as pods), and portfolio managers typically keep around 20% of their PNL, which can be very lucrative.
  - On the other hand, though, if their pod makes a loss, they typically get "stopped out," and their pod is disbanded
- **Citadel, Millennium, ExodusPoint, Point72 and Balyasny**
- **"*Multi-strategy hedge funds are the new, superior fund-of-funds*", FT**

Overview of Millennium Partners, L.P.

Fund summary

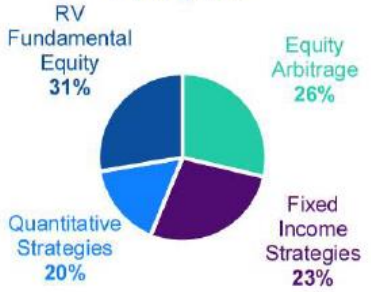
Main feeder funds	Millennium USA LP Millennium International, Ltd.
Management company	Millennium Management LLC
Core strategies	RV Fundamental Equity, Quantitative Strategies, Equity Arbitrage, Fixed Income Strategies
Employees	4,800+
Trading teams	300+
Master Partnership AUM[1]	$58.45 billion
Annualized net return	13.93% (Jan 90 – Feb 23)
Worst 12M rolling net return	-3.50%[2](Jan 08 – Dec 08)
Trailing 12M net return	10.81% (Mar 22 – Feb 23)
Percentage of up months	86.68% (Jan 90 – Feb 23)
Sharpe ratio[3]	2.61 (Jan 90 – Feb 23)
Beta to S&P	0.07 (Jan 90 – Feb 23)

NAV of $1mm invested v. selected benchmarks

Core Strategy Allocation

February 2023[4]

Trailing 12M[5]

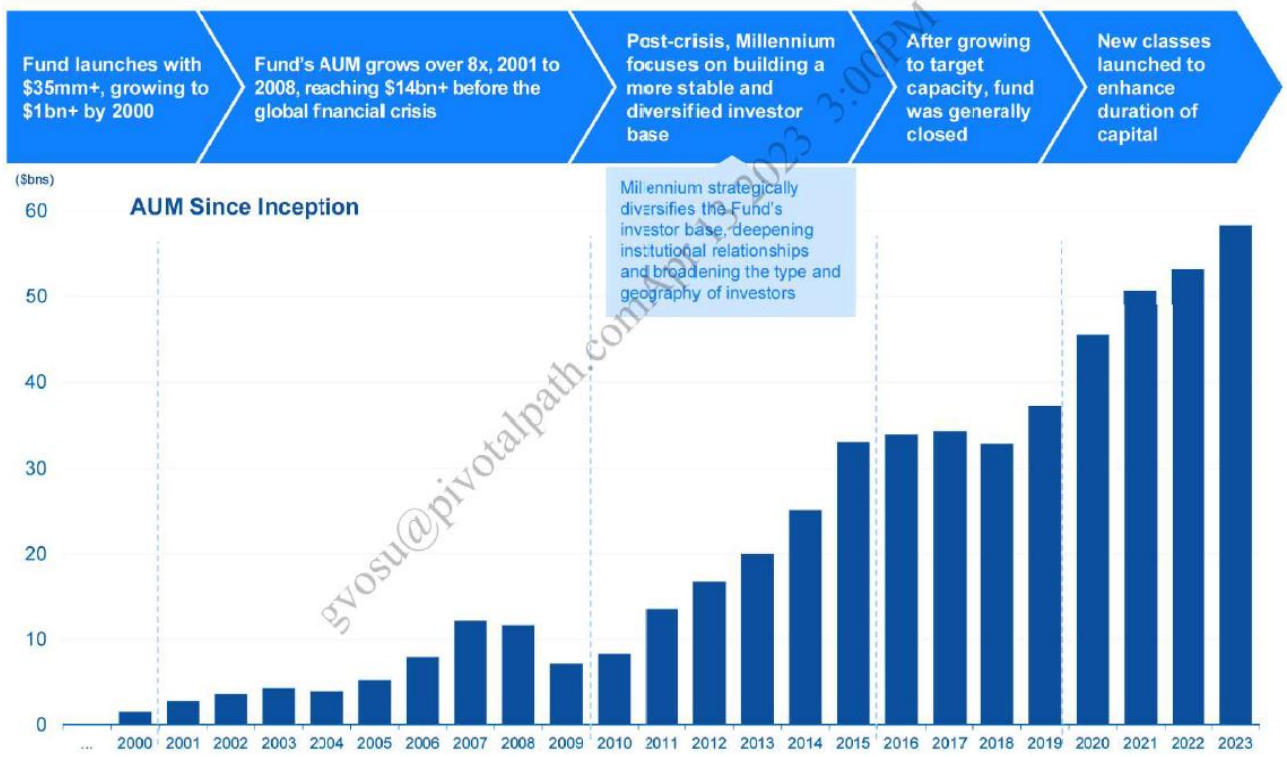


Data as of February 28, 2023 The full performance for both Millennium USA LP and Millennium International, Ltd. is provided on slides 18 and 20 of this presentation.

We believe our scale creates competitive advantages for our PMs

FINANCING	RESEARCH	DATA	EXECUTION	MARKET ACCESS
Stable financing, centrally managed across our diversified businesses	Trusted relationships with sell-side partners and access to an ever-increasing array of research providers	Thousands of data sources and a professional team dedicated to discovering and securing new data sources	Strong execution capabilities across strategies	Access to global trading venues, allowing PMs to apply their strategies across markets
10+ Equity Financing Counterparties	**900+** Research Providers	**~5307** Data Sources	**800+** Executing Brokers	**100+** Exchanges Traded On
35+ ISDA Counterparties	**13** Global-Team Focused on Sell-side Access	**460k+** Daily Data Files Ingested	**6mm+** Average Daily Trade Volume	**40+** Currencies Traded In
40+ Repo/Financing Counterparties	**3** Global-Team Focused on MLP Access	**9+** Trillion records of usable data	**100+** Global trading exchanges	**50k+** Distinct Positions Held

Millennium has adapted its capital base to meet an ever-changing financial landscape



Our approach to managing our capacity and investor demand

We remain focused on working to deliver high quality returns to our investors, while strengthening our capital base for the long-term. We believe that managing available capacity to invest in the Fund, and pairing that capacity with structured demand, will give us additional flexibility as we strive to achieve our objective of producing high quality returns for our investors.

In order to deliver on these objectives, we launched a commitment class structure, where investors commit to invest a specified amount over a specified period of time, and we call down portions of those commitments when we determine that it is the appropriate time to do so.

With this approach we hope to:

1. **Manage Capital utilization even more efficiently**
2. **Capitalize on market opportunities**
3. **Act even faster when significant opportunities present themselves**

Return Quality Comparison v. Select Indices

MILLENNIUM HAS DELIVERED NET RETURNS WITH A HIGHER SHARPE RATIO RELATIVE TO SELECTED INDICES SINCE 1990 AND ON A 3-YEAR, 5-YEAR, AND 10-YEAR BASIS

	ANNUALIZED NET RETURN (%)			STANDARD DEVIATION (%)[1]			SHARPE RATIO[1]		
PERIOD	Mill USA	HFRI	S&P 500	Mill USA	HFRI	S&P 500	Mill USA	HFRI	S&P 500
3Y	17.06	7.44	12.15	4.24	9.16	20.79	3.66	0.69	0.53
5Y	12.71	4.79	9.82	4.10	7.85	18.67	2.64	0.42	0.44
10Y	11.54	4.64	12.25	3.79	6.11	14.85	2.76	0.61	0.76
SINCE JAN. 1, 1990	13.93	9.08	9.82	4.31	6.78	14.95	2.61	0.94	0.47

Other Alternatives and New Methods

Scale, Scope, and Speed in Private Capital Funds

An Institute for Private Capital White Paper *

Draft version: March 20, 2024

Working Draft – Comments Welcome

*Corresponding author: Gregory Brown, Weatherspoon Distinguished Professor of Finance, UNC Chapel Hill Kenan-Flagler Business School and Research Director, Institute for Private Capital (gregwbrown@unc.edu). Contributing authors: Elyas Fermand (Santa Clara Univ.), Wendy Hu (MSCI), Richard Maxwell (UNC Kenan-Flagler Business School), Christian Lundblad (UNC Institute for Private Capital) and William Volckmann (UNC Institute for Private Capital). This work was guided by conversations with IPC's Research Council and benefited significantly from participant comments at the 2023 IPC Current Issues Research Symposium and 2023 PERC Research Symposium. The authors thank MSCI and the Private Equity Research Consortium for providing data used in the analysis.

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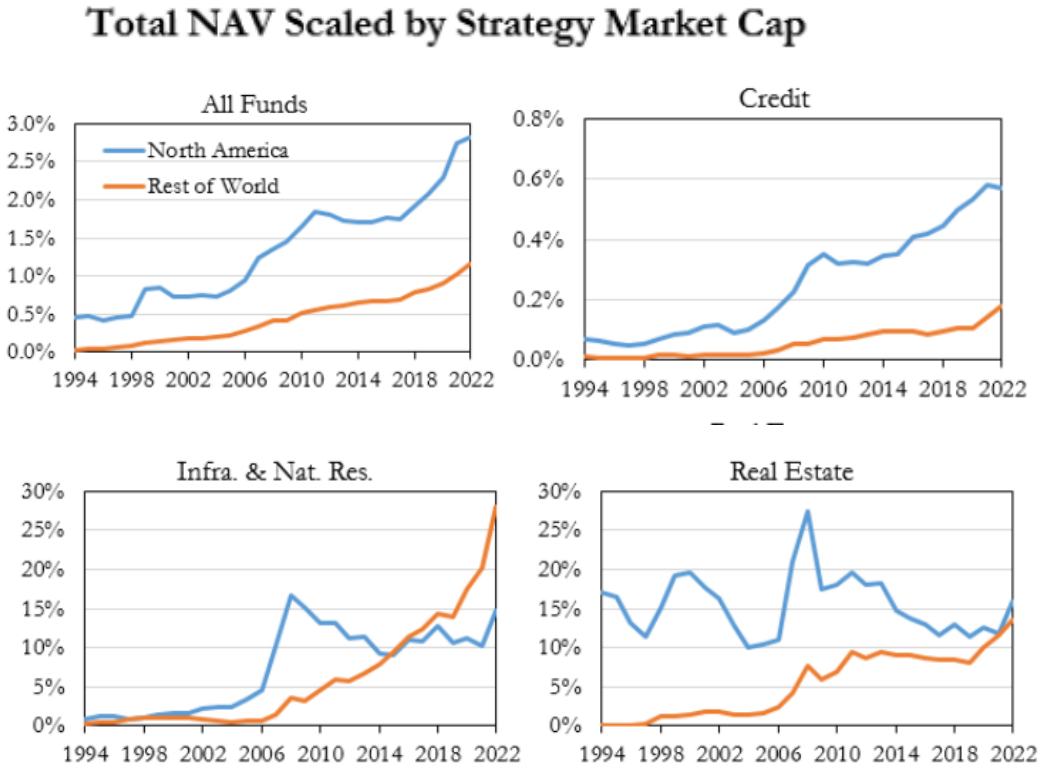

Figure 1. This figure presents the time series of scaled NAV, described in more detail in Section III. The sample includes private capital funds that were active between 1994 and 2022. The total NAVs scaled by strategy market capitalization are shown for all funds (top left chart) and for each strategy classification, as described in Section II. The two lines in each chart represent funds belonging to each geography classification, as described in Section II. The blue line portrays "North America" funds and the orange line portrays "Rest of World" funds. Data from MSCI-Burgiss Manager Universe.

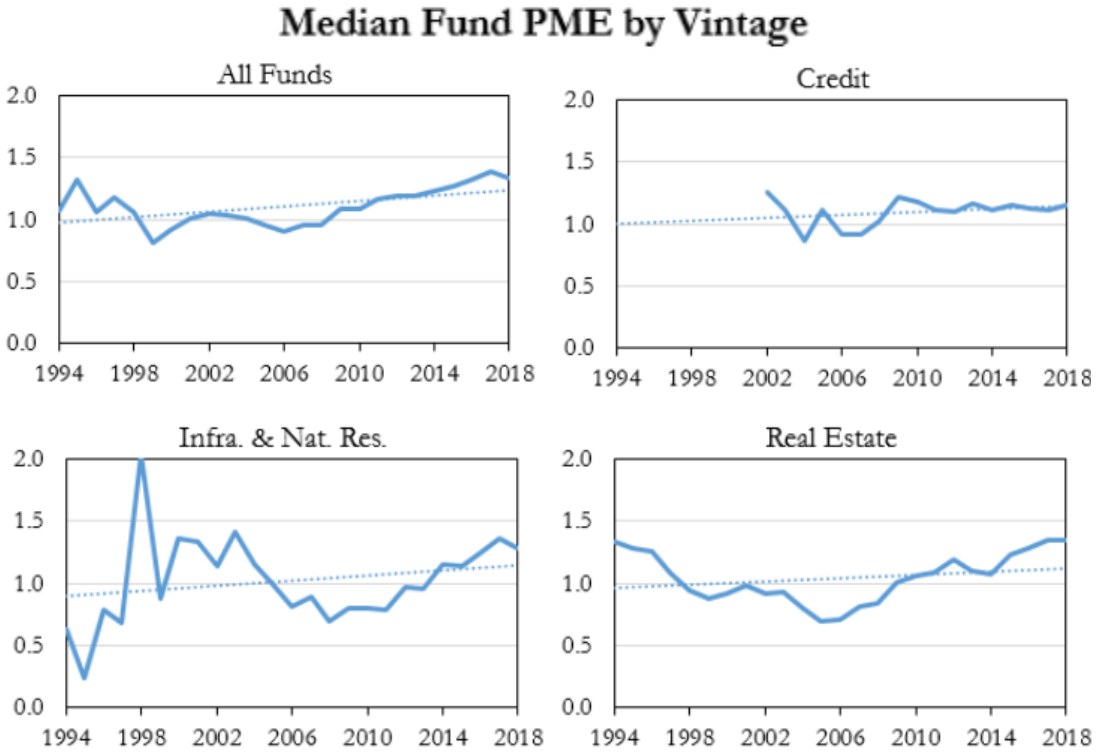

Figure 4. This figure presents a time series of fund performance by vintage. The measure of performance is the median PME, calculated as the Kaplan-Schoar PME, determined using strategy x geography public market benchmarks where available, as described in Section II. The median PMEs for each vintage is portrayed as the blue solid line in each chart and is show for all funds (top left chart) and for each strategy classification, as described in Section II. The linear time trend is demonstrated by the dotted blue line. Data from MSCI-Burgiss Manager Universe.

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Risk-Adjusting the Returns to Venture Capital

ARTHUR KORTEWEG and STEFAN NAGEL*

ABSTRACT

We adapt stochastic discount factor (SDF) valuation methods for venture capital (VC) performance evaluation. Our approach generalizes the popular Public Market Equivalent (PME) method and allows statistical inference in the presence of cross-sectionally dependent, skewed VC payoffs. We relax SDF restrictions implicit in the PME so that the SDF can accurately reflect risk-free rates and returns of public equity markets during the sample period. This generalized PME yields substantially different abnormal performance estimates for VC funds and start-up investments, especially in times of strongly rising public equity markets and for investments with betas far from one.

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Valuing Private Equity Investments Strip by Strip

ARPIT GUPTA and STIJN VAN NIEUWERBURGH

ABSTRACT

We propose a new valuation method for private equity (PE) investments. It constructs a replicating portfolio using cash flows on listed equity and fixed-income instruments (strips). It then values the strips using an asset pricing model that captures the risk in the cross-section of bonds and equity factors. The method delivers a risk-adjusted profit on each PE investment and a time series for the expected return on each fund category. We find negative risk-adjusted profits for the average PE fund, with substantial heterogeneity and some persistence in the performance. Expected returns and risk-adjusted profit decline in the later part of the sample.

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Benchmarking private equity: The direct alpha method☆

Oleg R. Gredil [a,*], Barry Griffiths [b], Rüdiger Stucke [c]

[a] Tulane University Freeman School of Business, United States of America
[b] Ares Management Corporation, United States of America
[c] Warburg Pincus LLC, United States of America

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G11
G12
G23
G24

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Private equity
Performance evaluation
Modern portfolio theory

ABSTRACT

We propose a simple and intuitive measure of the annualized excess return of investments in private equity (PE) funds, as well as in similar vehicles that hold hard-to-value assets. Our 'Direct Alpha' method is well-founded in theory and dominates the existing approaches to convert fund lifetime returns into inputs amenable for portfolio-wide optimization. Existing Public Market Equivalent (PME) approaches are either heuristic or involve significant approximation errors. Using real-world PE fund cash flow data, we juxtapose Direct Alpha against nearly all PME methods that have been in broad use.

Risk-Adjusting the Returns to Private Debt Funds *

Isil Erel, Thomas Flanagan, Michael Weisbach

April 2024

Abstract

Private debt funds are the fastest growing segment of the private capital market. We evaluate their risk-adjusted returns, applying a cash-flow based method to form a replicating portfolio that mimics their risk profiles. Using both equity and debt benchmarks to measure risk, a typical private debt fund produces an insignificant abnormal return to its investors. However, gross-of-fee abnormal returns are positive, and using only debt benchmarks also leads to positive abnormal returns as funds contain equity risks. The rates at which private debt funds lend appear to be high enough to offset the funds' fees and risks, but not high enough to exceed both their fees and investors' risk-adjusted rates of return.

Keywords: Private Credit, Private Capital, Loans, Nonbank, Shadow Bank, Alpha
JEL Classification: G12, G21, G23

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Figure 1: Investment into Private Credit over Time

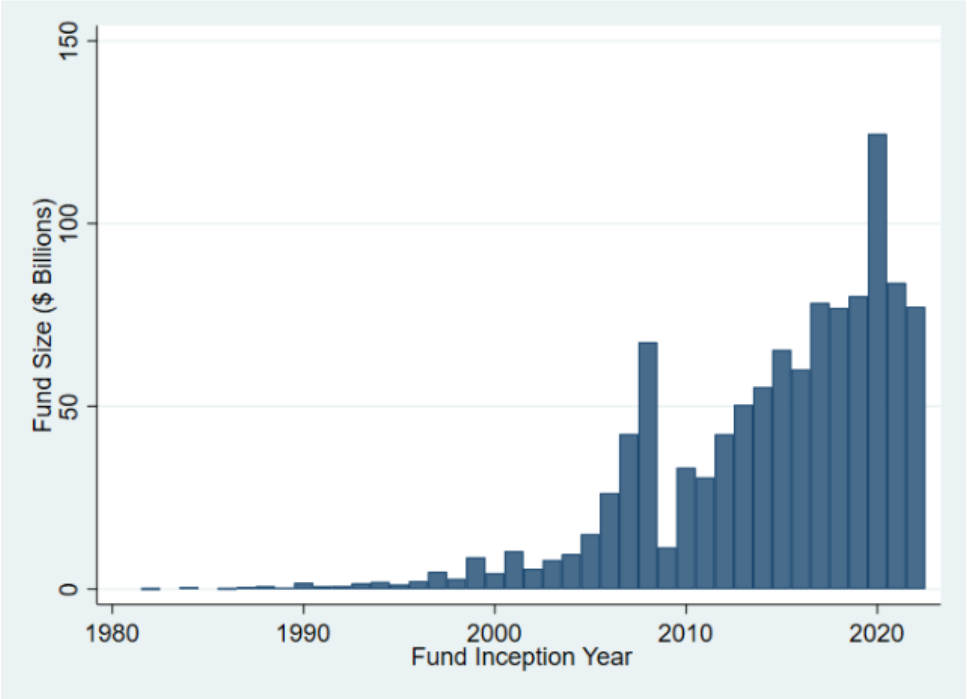

Figure 1 plots the total fund size of the entire sample of credit funds in the Burgiss-MSCI sample by vintage year in which the fund was created. Source: Burgiss-MSCI

Table 1: Fund and Investment Examples

Loan Level Example A		
Firm Name	Investment Type	Amount
CHMB	12% Loan	$1.4M
Merrick Systems	13% Loan	$3M
CAI Software	12% Loan	$6.75M
Cody Pools	Preferred Equity + 10.5% Loan	$16M

Fund Level Example A		
Fund/Lender Name	IRR	Fund Size
Main Street Capital II	7%	$159M

Loan Level Example B		
Firm Name	Investment Type	Amount
Immersive Media	13% Loan	$1.3M
B&W Growers	14% Loan	$10M
SOAR Transportation	Preferred Equity + Warrants	$16M
Abutec	Preferred Equity	$5.4M

Fund Level Example B		
Fund/Lender Name	IRR	Fund Size
CapitalSouth Partners Fund III	12%	$280M

Notes: Table 1 provides some examples of typical private credit funds and their underlying investments
Source: Pitchbook

Table 4: Baseline Fund Risk-Adjusted Returns

Panel B: Risk-Adjusted Profit

	NPV			Alpha	
	(1) Bonds	(2) Stocks	(3) Both	(4) Bonds	(5) Both
Estimate	0.105**	0.051	-0.001	0.018**	-0.000
	(2.18)	(1.02)	(-0.01)	(2.26)	(-0.01)
Observations	532	532	532	532	532
R2	0.73	0.72	0.73	0.73	0.73

Panel C: GPME

	NPV	
	(1) Bonds	(2) Stocks
Estimate	0.120**	0.041
	(2.47)	(1.48)
$b1$	0.13	0.02
$b2$	12.98	1.89
Observations	532	532

t statistics in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Notes: Table 4 presents estimates of the risk adjusted returns received by LPs. Panel A starts by reporting returns without adjusting for risk, including the mean IRR and mean NPV discounted at the risk-free rate. Panel B reports risk adjusted returns using the risk adjust profit measure using only corporate bond factors (Column 1), only stock factors (Column 2), and both corporate bond and stock factors (Column 3). In columns (4) & (5), we report the annualized "alpha" version of this risk-adjusted profit measure using corporate bonds only and both, respectively. In Panel C, we report the risk adjusted NPV measures estimated by using GPME using a corporate bond factor (Column 1) and stock factor (Column 2).
Source: Burgiss-MSCI