Lecture 9:
Managed Funds

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FINM 36700: Portfolio Management

"Hedge funds are investment pools that are relatively unconstrained in what they do. They are relatively unregulated (for now), charge very high fees, will not necessarily give you your money back when you want it, and will generally not tell you what they do. They are supposed to make money all the time, and when they fail at this, their investors redeem and go to someone else who has recently been making money. Every three or four years they deliver a one-in-a-hundred year flood. They are generally run for rich people in Geneva, Switzerland, by rich people in Greenwich, Connecticut."

-Cliff Asness, Journal of Portfolio Management 2004.

(Cliff runs the hedge fund, AQR, and is a UChicago alumnus.)

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Outline

Performance

Measuring Risk

Hedge Funds

Fees and Flow

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Active under-performance?

For mutual funds,

- Studies beginning with Jensen (1968) find negative excess returns.
- Net of fees even worse.
- Average under-performance of about 1%.

Yet, huge industry for active management. Why?

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Momentum in mutual funds

Carhart (1997) finds

- Fund with good return faces close to 50/50 chance of excess returns in next period.
- Momentum strategy works here.
- About 1% per month excess return, but lots of variation.
- Only a 55/45 bet that last period's "winners" will have excess return next period.

Finding skill or avoiding disaster?

The momentum results of Carhart (1997) find the worst "losers" do very poorly.

- 8% per year difference between top decile and bottom decile.
- 2.65% is the difference just between decile 9 and 10.
- Much of the momentum return comes from shorting these poor funds.

Fees and expenses are strongly related to poor performance.

- About 1% of the momentum return come from lower fees and expenses of the "winners".

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Uncertainty of a fund's mean return

Suppose we observe a fund with returns satisfying the following:

- are independent, identically distributed (iid)
- have volatility, $\sigma_r = 15\%$.
- have been observed for $T = 5$ years.
- have an observed sample average of $\bar{r} = 10\%$

As investors, we cannot observe the population mean of returns, μ. We must try to infer it.

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CLT and inferring the mean of returns

According to the Central Limit Theorem (CLT), the sample mean has the following distribution:

$$\sigma\left(\bar{r}\right) = \frac{\sigma_r}{\sqrt{T}}$$

Thus, we have the following confidence interval on the fund's mean return:

$$\text{CI}\left(\bar{r}, 95\%\right) = \quad \bar{r} \pm 2\frac{15\%}{\sqrt{5}} \quad \approx 10\% \pm 13\%$$

We are not sure whether the fund's mean return is -3% or 23%!

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Biased mean estimate

Not only is mean estimate uncertain, but biased for several reasons:

- Survivor bias: Data often only available for surviving funds.
- Backfill bias: At time t, we look back at full history of any fund still surviving.
- Incubator bias: Funds will be incubating for a time before they are launched. Successful incubations launch and report their incubated history.

For hedge funds, death rate of about 20% annually, so significant.

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Backfill and survivor bias

Table: Mean return data, 1994-2003.

	Hedge Funds	Mutual Funds
Backfilled	14.65%	—
Not Backfilled	7.34%	—
Surviving	13.74%	9.73%
All	9.32%	8.49%

Source: Malkiel and Saha (2005)

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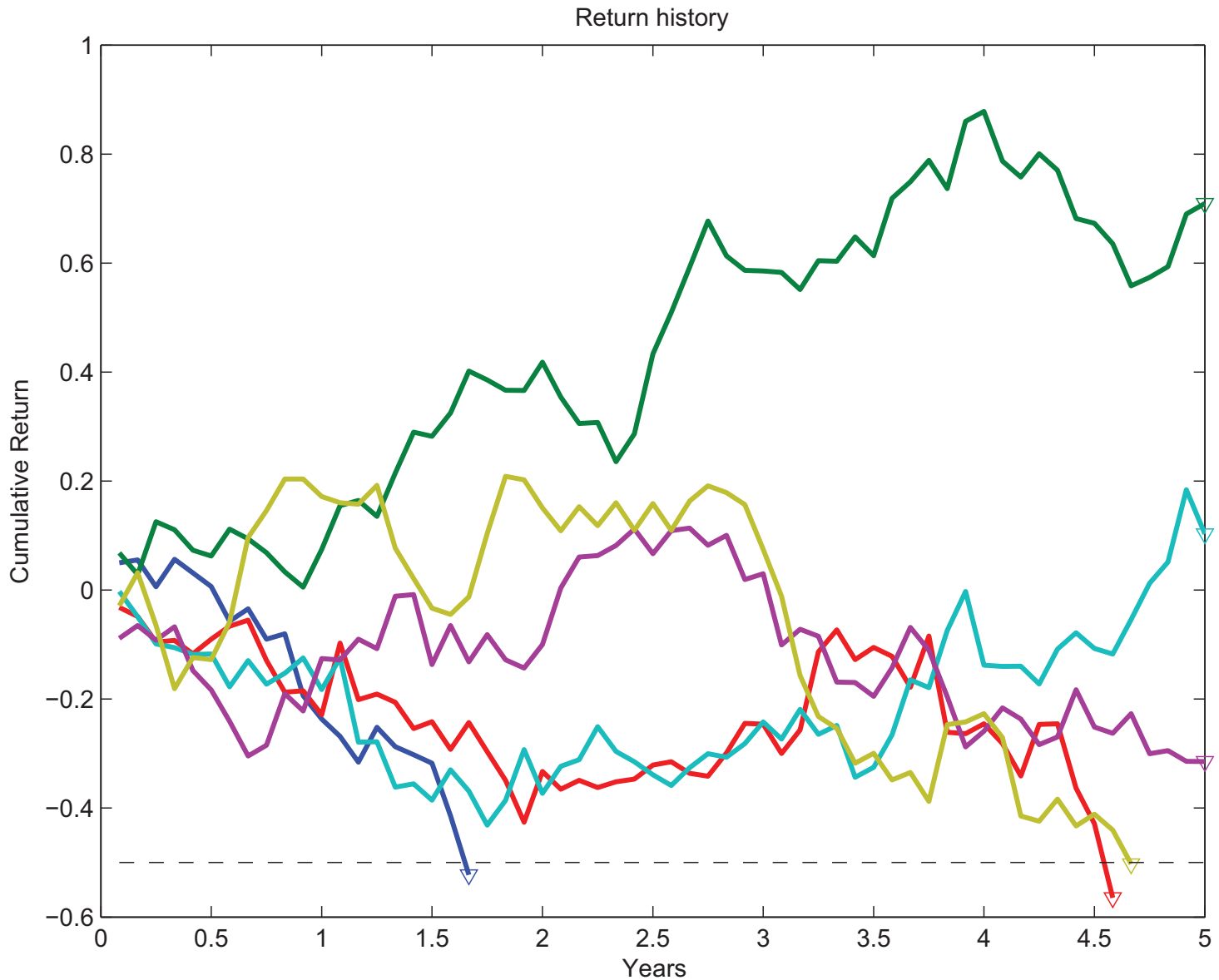
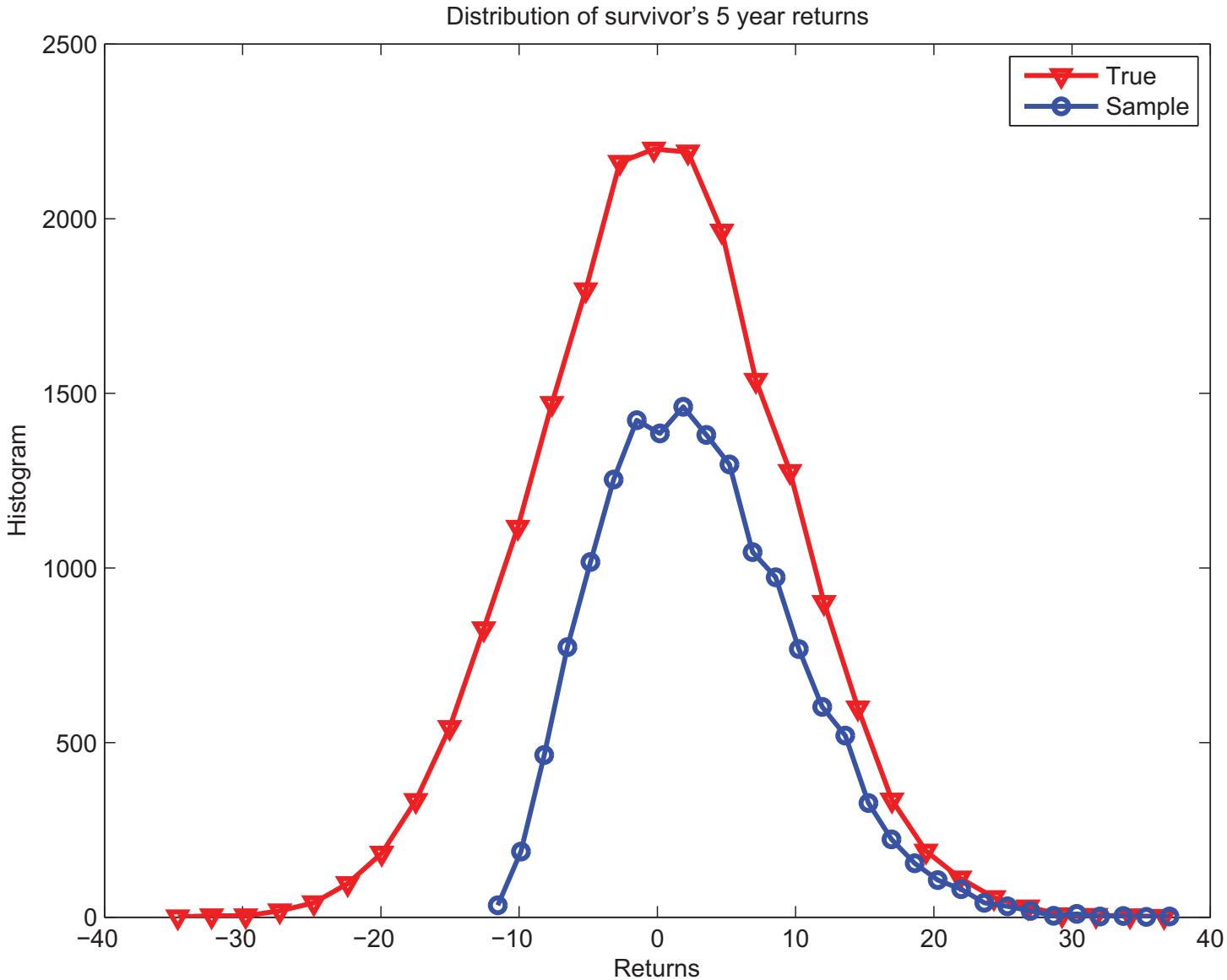
Simulation: cumulative returns and survival



Simulation: return distribution



Simulation: survival bias

From the simulation above,

Statistics across funds	Raw	Selected
Mean	0.05%	3.12%
Std. Dev	8.87%	7.00%

Figure: Source: Cochrane

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Reporting returns

Returns reported by hedge funds may be "stale", rather than reflective of current market info.

- They hold many illiquid securities, including OTC products which are hard to price.
- Thus, hedge funds often have discretion in how to mark prices on their book for month-end reporting.
- Stale prices could cause the effects of market movements to show up in later months.

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Illustration of return smoothing

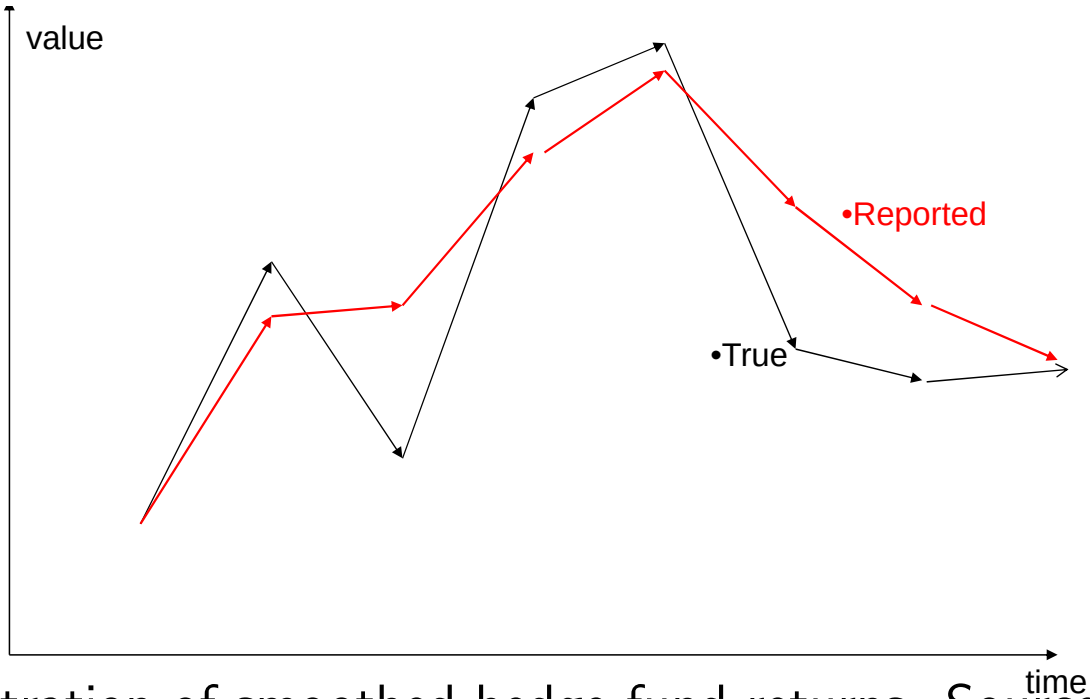

Figure: Illustration of smoothed hedge-fund returns. Source: Cochrane

- Due to illiquidity, (or managed accounting,) reported fund returns may be too smooth.
- Lowers volatility, market beta. Induces serial correlation.

Mis-measured risk

Asness (2001) argues funds report stale prices, bias market beta down.

- Runs tests on combined return over several periods.
- If these lagged returns have market exposure, indicative that smoothing is hiding important factor exposure.
- Alternatively, factor exposure on these lagged returns could indicate market timing.

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Hedge-funds and lagged market risk

Portfolio	(1) Simple Monthly Regression Beta (Exhibit 2)	(2) Betas from Lagged S&P 500 Regressions (Exhibit 4A) Contemporaneous Beta (β_0)	(3) Sum of Lagged Betas ($\beta_1+\beta_2+\beta_3$)	(4) Total Summed Beta ($\beta_0+\beta_1+\beta_2+\beta_3$)	(4) – (1) Difference in Beta
Aggregate Hedge Fund Index	0.37	0.40	0.44	0.84	0.47
Convertible Arbitrage	0.04	0.08	0.35	0.43	0.38
Event-Driven	0.28	0.31	0.30	0.61	0.33
Equity Market-Neutral	0.12	0.13	0.08	0.20	0.09
Fixed-Income Arbitrage	0.02	0.05	0.31	0.36	0.33
Long/Short Equity	0.55	0.57	0.42	0.99	0.45
Emerging Markets	0.74	0.79	0.46	1.25	0.51
Global Macro	0.37	0.41	0.57	0.98	0.61
Managed Futures	0.01	-0.01	-0.17	-0.19	-0.20
Dedicated Short Bias	-0.99	-1.01	-0.25	-1.27	-0.28

Figure: Source: Asness (2001). Data covers 1994-2000.

Estimates of

$$R_t^i = \alpha_i + \beta_{i,0} R_t^m + \beta_{i,1} R_{t-1}^m + \beta_{i,2} R_{t-2}^m + \beta_{i,3} R_{t-3}^m + \beta_{i,4} R_{t-4}^m + \epsilon_t^i$$

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Hedge funds taking tail risk

Many hedge-funds take on tail risk.

- Sometimes done explicitly through trades such as merger-arbitrage or the other "event" strategies mentioned in the table of slide 29.
- But also take tail risk without explicitly trading options.
- As we know from the proof of Black-Scholes, actively trading a stock and bond can lead to option-like returns.

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Why trade in the distribution tails?

- First, selling puts earns a significant premium in normal times. (Hence the volatility "smile".)
- Nothing wrong with selling insurance to the market. In some ways, it is sensible that rich investors are selling "disaster" insurance to the market.
- But it is important that we understand the risks associated with the trades!

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Measuring distribution tails

We mentioned above, that for any security, measuring mean returns can be difficult given the high volatility.

- Measuring the tail of a distribution is considerably harder!
- In short samples, we may no very little about rare events. Even in longer samples, how "rare" of events have we seen?
- Such nonlinear payoffs are challenging for statistical inference. The betas, correlations, etc. will jump in large market downturns.
- Thus, estimation will overestimate excess returns, underestimate risk.

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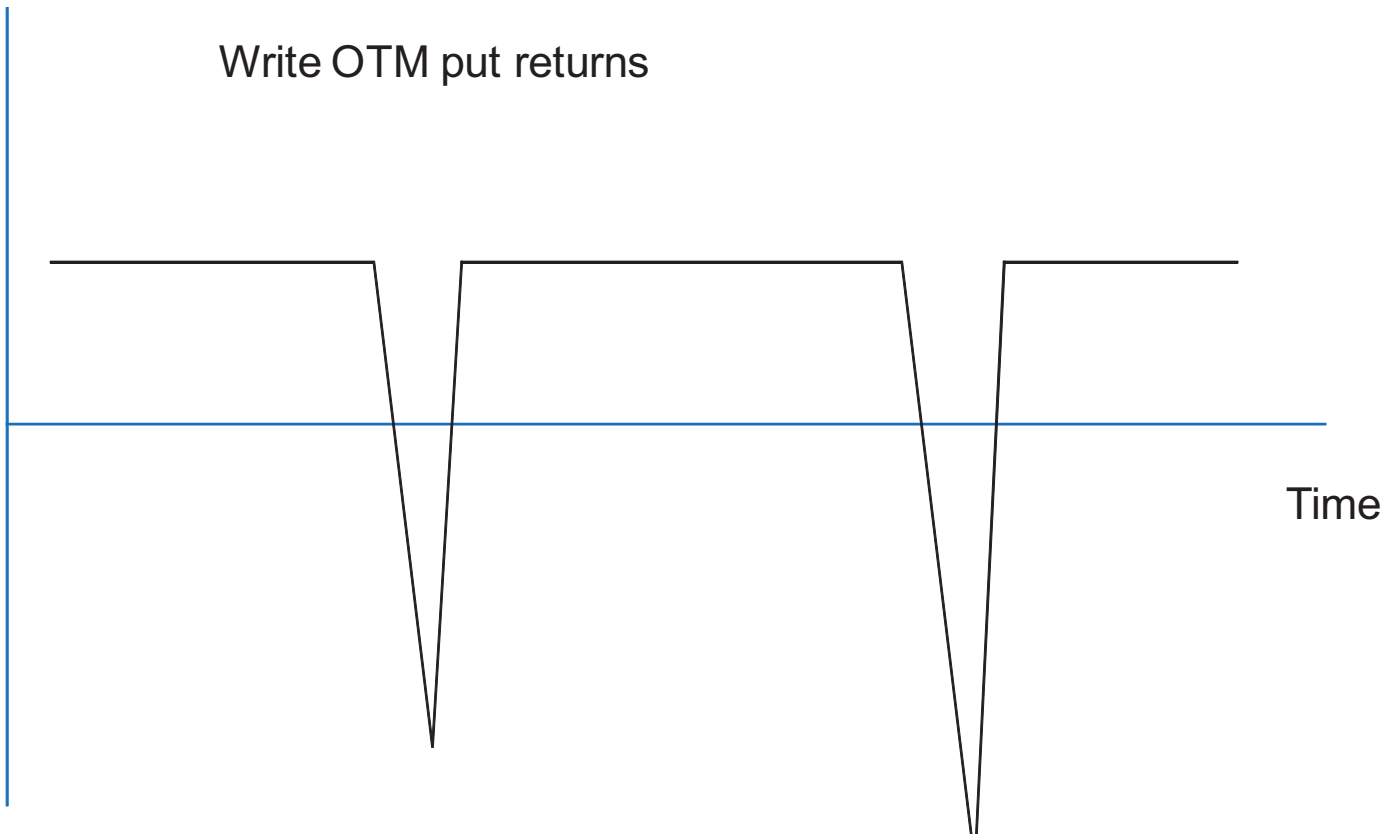
Time-series of returns for writing OTM puts



Detecting option-like strategies: quadratic

Treynor-Mazuy regression:

$$\tilde{r}_t^i = \alpha + \beta_0 \tilde{r}_t^m + \beta_1 \left(\tilde{r}_t^m\right)^2 + \epsilon_t$$

In a down market,

- $\beta_1 > 0$ is like buying put options
- $\beta_1 < 0$ is like selling put options.

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Detecting option-like strategies: piecewise options

Option-based benchmarks:

$$\tilde{r}_t^i = \alpha + \beta_0 \tilde{r}_t^m + \beta_1 \max\left(\tilde{r}^m - k_1, 0\right) + \\ + \beta_2 \max\left(k_2 - \tilde{r}_t^m, 0\right) + \epsilon$$

- $\beta_1 \neq 0$, is like being long (short) a call option.
- $\beta_2 \neq 0$, is like being long (short) a put option.

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Hedge funds

- Hedge funds are legal entities: investing partnerships.
- HF have relatively few regulations.
- Open only to institutions and large investors.
- Funds are illiquid—redemptions are restricted.
- Funds engage in active trading strategies, and charge fees.

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Hedge fund strategies

Broadly speaking, most hedge-fund strategies fall into one of four categories:

- Relative value (arbitrage)
- Event-driven
- Directional
- Global macro

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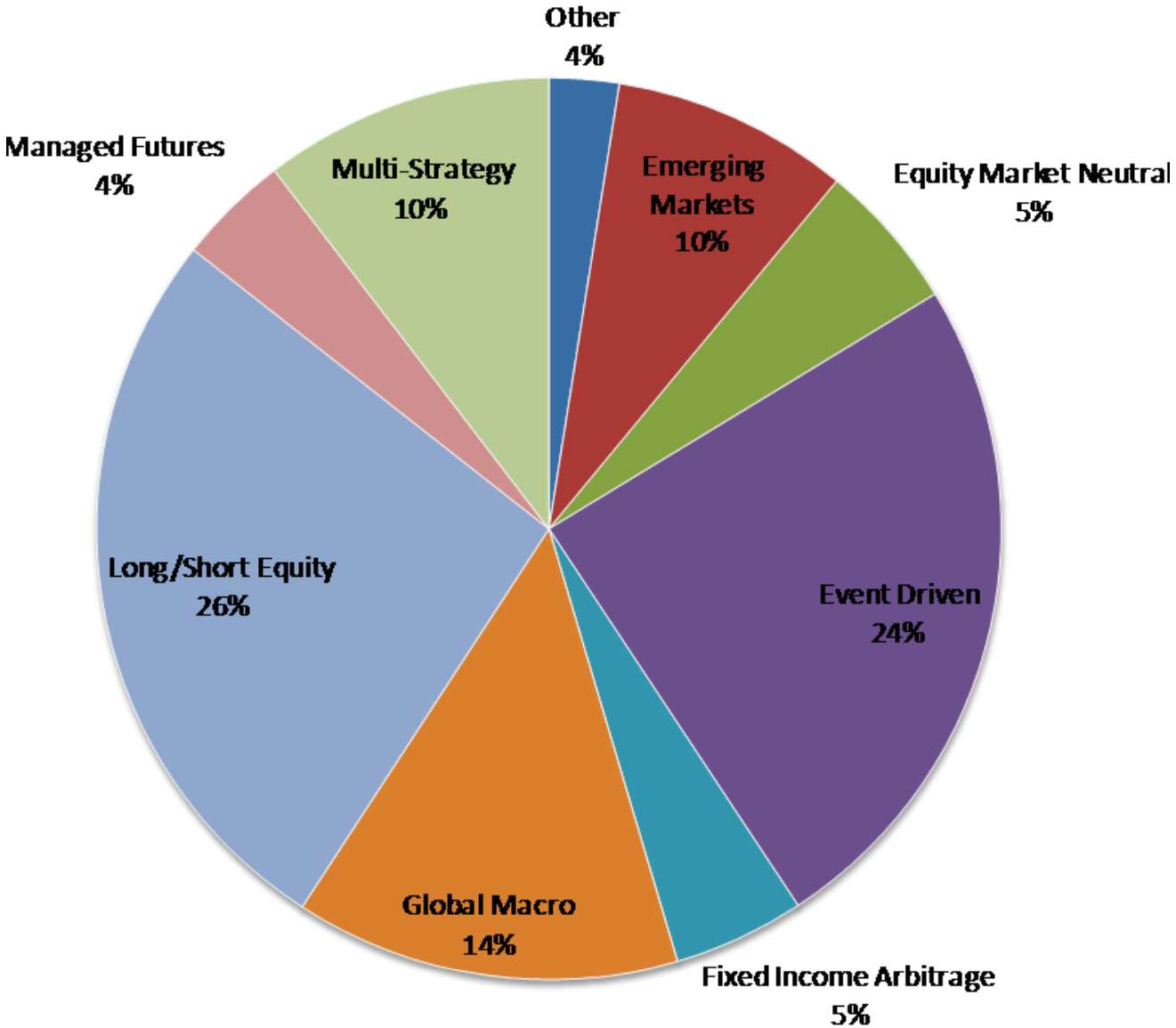
Hedge fund composition - by strategy



Hedge fund strategies - return stats

Table: Credit Suisse Index. March 1994 - June 2012.

Fund	Mean	Vol.	Sharpe	CAPM alpha
Total Index	0.0581	0.0743	0.7811	0.0402
Convertible Arb	0.0453	0.0691	0.6545	0.0345
Dedicated Short	-0.0560	0.1700	-0.3293	-0.0030
Emerging Mkts	0.0468	0.1474	0.3173	0.0134
Equity Mkt Neutral	0.0243	0.1024	0.2369	0.0124
Event Driven	0.0584	0.0626	0.9322	0.0422
Distressed	0.0685	0.0655	1.0449	0.0522
Multi-Strategy	0.0537	0.0679	0.7911	0.0373
Risk Arb	0.0344	0.0410	0.8402	0.0257
Fixed Income Arb	0.0250	0.0572	0.4374	0.0172
Global Macro	0.0910	0.0954	0.9536	0.0818
Long-Short Equity	0.0630	0.0989	0.6370	0.0347
Managed Futures	0.0345	0.1176	0.2936	0.0389
Multi-Strategy	0.0473	0.0535	0.8847	0.0386

Why hedge funds?

Some oft-cited reasons...

- enhance returns
- add diversification
- get into alternative investments

Are these sensible?

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Alternative assets?

Commonly cited as diversifying into "alternative assets".

- You cannot be more diversified than holding the market portfolio!
- Only diversify if they offer some new asset in this market portfolio that you could not get before.
- If long assets A and B, and then through hedge-fund add a position long A and short B, no gain in diversification.

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Diversifying over managers

Diversifying over investment managers just combines a lot of active positions back into a passive market position.

- But now you pay large fees to hold a passive position!
- Same idea applies to diversifying over mutual funds, but lower fees.

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Are hedge funds "hedged"?

Are hedge-fund strategies hedged against market movements?

- What about other commonly known factors?
- Could get large returns through levering on market beta.
- Or could load on other risk factors: carry trade, momentum, value, etc.

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Fund growth

How do investors respond to realized returns?

- Investors seek funds with not just large returns, but large α.
- Funds seek investors, as the fee includes 2% of assets under management.

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Fund flow as a function of returns

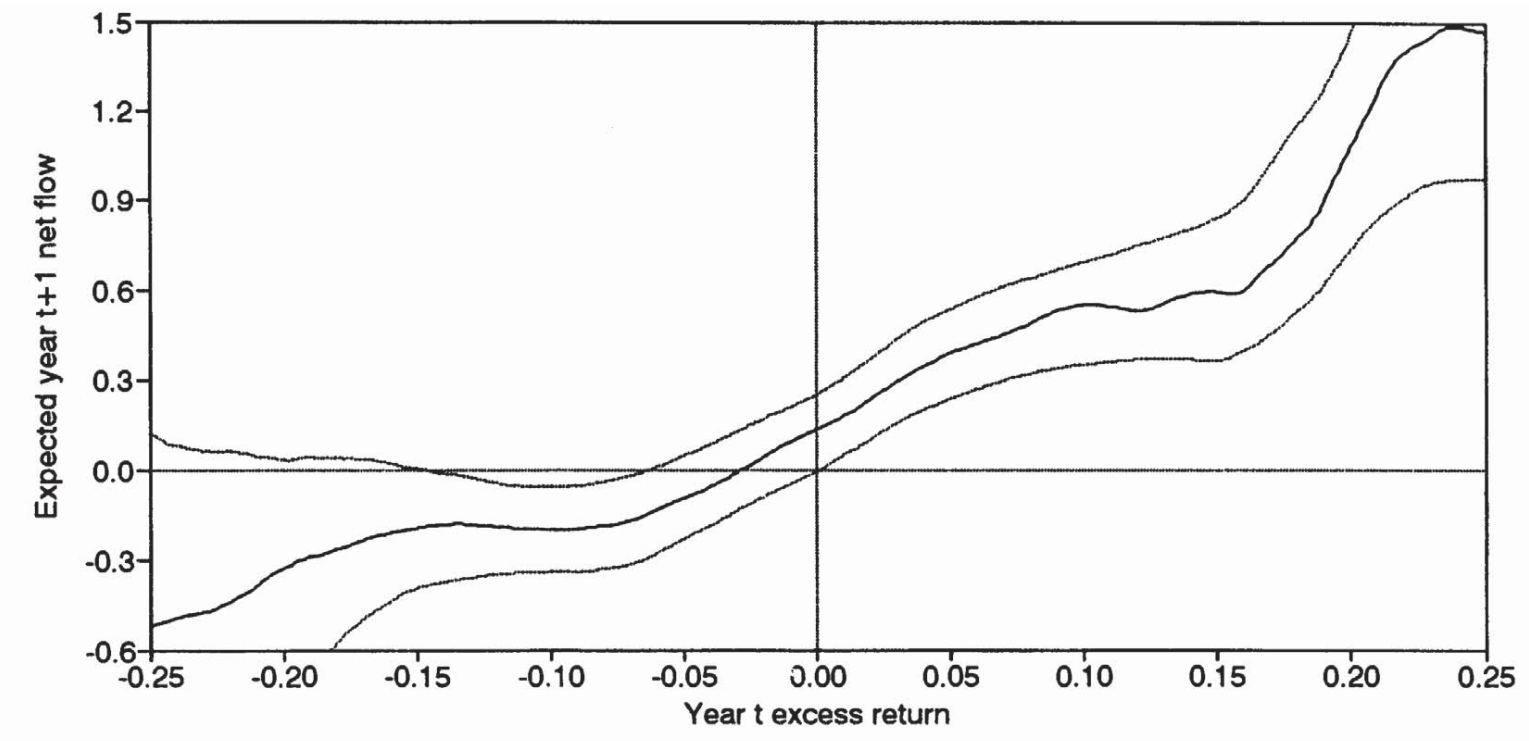

Figure: Flow of assets as function of the fund's prior return, for **young** funds. With 90% confidence interval. Flow measures proportional asset growth, net of internal growth from portfolio gains.
$\text{Flow}^i_{t+1} \equiv \left(\text{Assets}^i_{t+1} - \text{Assets}^i_t\right) / \text{Assets}^i_t - R^i_{t+1}$. Source: Chevalier and Ellison (1997).

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Fund flow as a function of returns

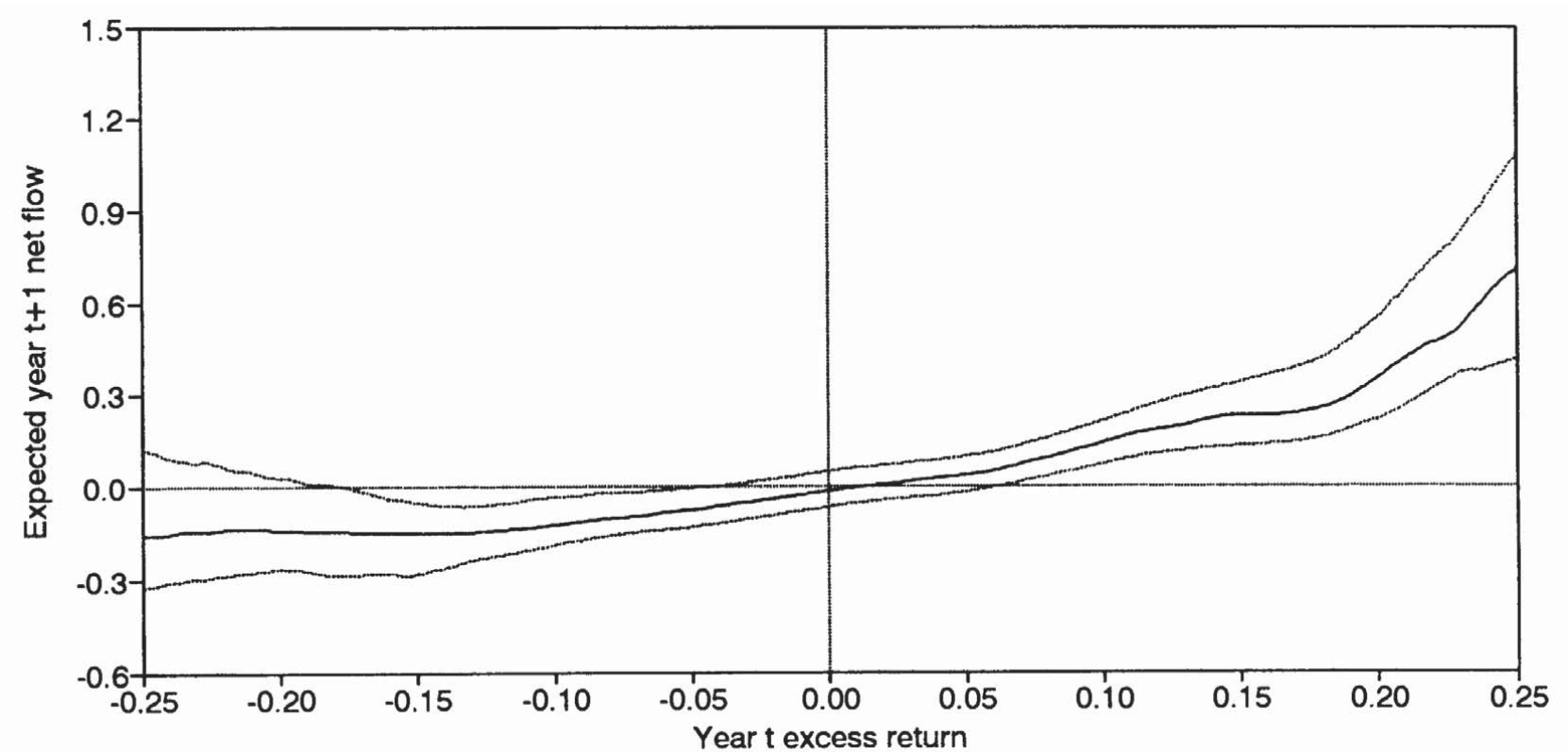

Figure: Flow of assets as function of the fund's prior return, for **old** funds. Flow measures proportional asset growth, net of internal growth from portfolio gains. Source: Chevalier and Ellison (1997).

Chasing performance

From the previous two figures, it appears that investors chase performance.

- But little evidence of persistence!
- Though above we did note a potential momentum strategy.
- Is moving between funds due to learning manager's skill?
- Or could be avoiding funds that are prone to managerial gambling due to being below high-water.

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Fragile funds

Managed funds are fragile due to investor's chasing performance.

- When asset values are already low, investors want to pull out.
- Due to marking-to-market, first investors to leave will redeem at a higher price.
- Later withdrawals will be forced to liquidate at "fire-sale" prices.
- This makes funds prone to bank-runs.

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Lock-ups

Most hedge funds deal with this fragility with lockups.

- Lockups may restrict that withdrawals can only come once-per-year, or perhaps after some vesting.
- While they are restrictive, these lock-ups could indeed be enhancing value for individual investors.
- They keep your fellow-investors locked in so that a run does not begin, with "fire-sale" prices as a result.
- Also may allow fund to enjoy rebound, as bad times may have high expected returns.

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Hedge fund fees

We have discussed the risk and return characteristics of hedge fund returns—but the gross and net are very different.

- Typical fees are 2% of assets under management plus 20% of profits.
- High-water marks require that a fund make up previous losses before designating profits.
- Funds of funds charge another 1% plus 10% on top of all this!

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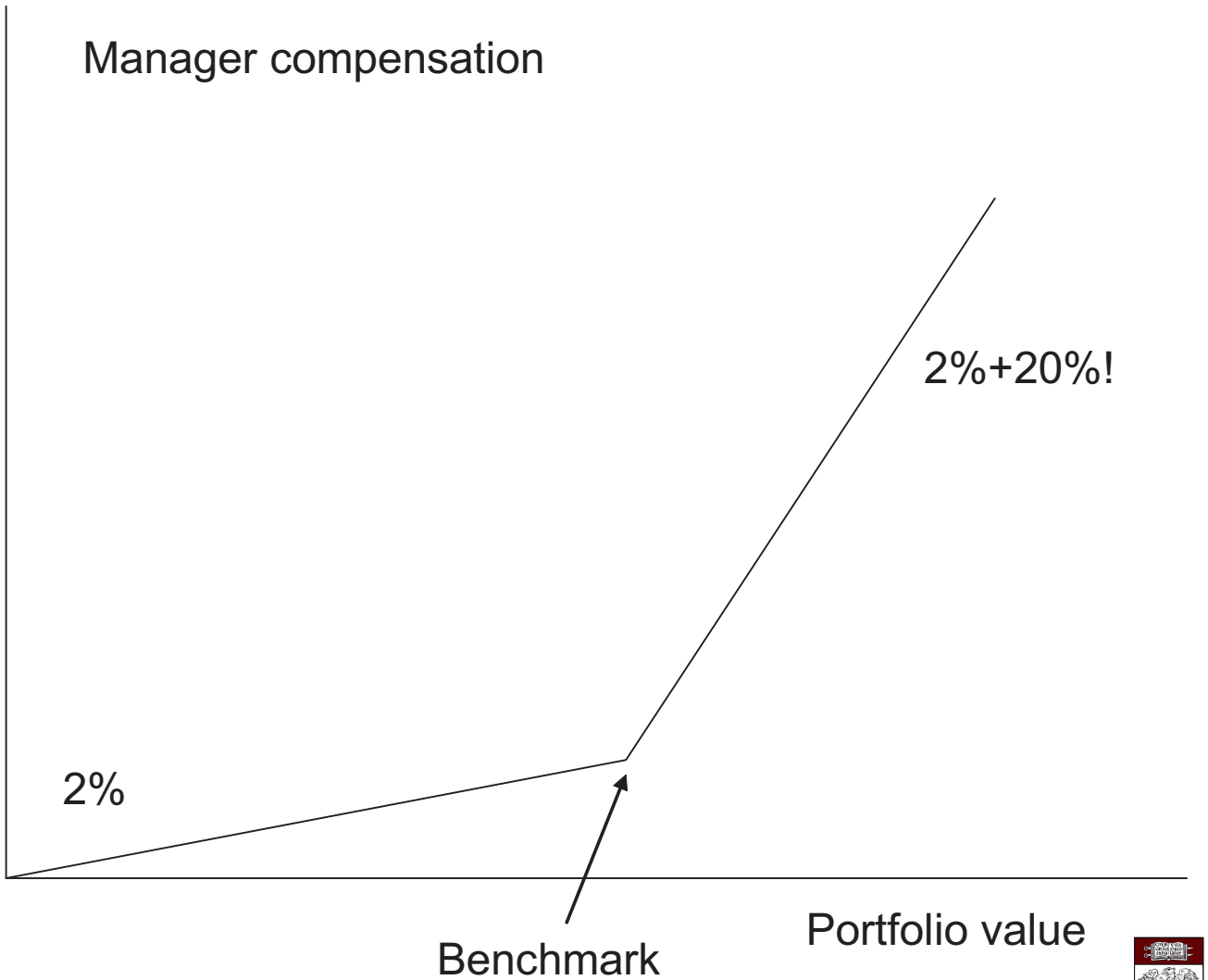
Hedge fund management payoff



Managerial incentives

The payoff to management looks a lot like a call option!

- Management would prefer volatility of returns.
- High-water marks, and large positions of the managing partners are meant to re-align incentives.
- But maybe high-water marks just increase the "strike" of the compensation and encourage greater volatility!
- Besides, funds to close rather than work back up to high-water.

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Example for compensation

Have \$1000 assets under management and 2/20 fee.

- Do nothing, then $\mathbb{E}[\text{fee}] = 20$.
- Take a 50/50 bet on \$500, then $\mathbb{E}[\text{fee}] = 70$.
- Take a 99/1 bet on plus \$1000, minus \$100,000. Then

$$\mathbb{E}[\text{fee}] = \$1000 \times 2\% + 0.99 \times \$1000 \times 20\% = \$218$$

So in last case, getting a big reward for an investment with negative expected value!

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Rewarding risk or skill?

Fees should reward skilled allocation—not for loading up risk.

- A manager could always earn excess returns just by loading up on commonly known factors.
- ie. Don't reward a fund simply leveraging the market index, value stocks, small stocks, etc.
- Nor do we want to reward known strategies such as the carry trade or Expectations Hypothesis.

If regression of fund return on factors gives high R^2, then we are paying fees for the equivalent of a mutual fund!

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Benchmarking

Benchmark to obvious factors, such as the market:

$$R_t^i = \alpha + \beta^m R_t^m + \epsilon_t$$

- Benchmarking compensates managers for only the unexplained portion of returns: $\alpha + \epsilon_t$.
- No reason to compensate for the factor-driven portion, $\beta^m R_t^m$, which we can easily replicate.

Unfortunately, little statistical power in this test. We have a small time series of fund returns, yet many factors which we would like to benchmark.

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Tracking mutual funds

With mutual funds, the opposite: supposed to track factors and charge low fees.

- For a portfolio of funds, Carhart (1997) finds R^2 of up to 95% using just the market index.
- Mutual fund variation driven by difference in style—not selection of stocks within a style.
- That is, most funds have high tracking R^2 using just a few common factors.

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Skill in factors?

Is it really proper to benchmark for every known factor?

- Maybe the skill of a fund is to manage all these known factors.
- Just because a return can be explained by factors, it is not clear that investors would find it convenient to build such returns themselves.

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