

Change You Can Believe In? Hedge Funds Data Revisions

Andrew Patton
Duke

Tarun Ramadorai
Oxford

Michael Streatfield
Oxford

March 2012

Hedge fund disclosures are limited and voluntary

- Hedge funds are currently required to provide only **limited information**
 - 13-F filings (on long positions) when assets exceed US\$ 100MM.
 - Proposals (Dodd-Frank, EU directive) for enhanced disclosure by hedge funds. Strong pushback.
 - Concerns about **systemic risk** led to a recent proposal by the SEC for mandatory reporting of performance and positions by hedge funds.
- However many hedge funds **voluntarily report** performance information to publicly available databases (HFR, TASS, BarclayHedge, etc).
 - Jorion and Schwarz (2010, *wp*) suggest this is a means to partially circumvent the ban on **advertising** by hedge funds.
 - These voluntary disclosures are **not verified by a third party**.

Are hedge fund performance disclosures reliable?

- We find **direct evidence** that the returns reported by hedge funds are potentially unreliable.
- We merge five databases (HFR, TASS, CISDM, Morningstar and BarclayHedge) and obtain a universe of 18,000 individual funds, over the period 1994 to 2011.
- We study “**vintages**” of each of these databases through time
 - 40 vintages (monthly downloads) from July 2007 to May 2011.
 - Each vintage contains updates on recent returns, but more importantly, a **complete history** of returns for the fund
- By comparing the return reported for a given month across vintages we can **detect revisions** in historical returns

Are hedge fund performance disclosures reliable?

- Our analysis of these vintages of hedge fund databases reveals:

Are hedge fund performance disclosures reliable?

- Our analysis of these vintages of hedge fund databases reveals:
 - 40% of funds have revised at least one old return by at least 1 basis point.

Are hedge fund performance disclosures reliable?

- Our analysis of these vintages of hedge fund databases reveals:
 - 40% of funds have revised at least one old return by at least 1 basis point.
 - 20% have revised by at least 50 bps. (Avg return is 64 bps/mth.)

Are hedge fund performance disclosures reliable?

- Our analysis of these vintages of hedge fund databases reveals:
 - 40% of funds have revised at least one old return by at least 1 basis point.
 - 20% have revised by at least 50 bps. (Avg return is 64 bps/mth.)
- These revisions are **not random or mere corrections** of earlier mistakes:

Are hedge fund performance disclosures reliable?

- Our analysis of these vintages of hedge fund databases reveals:
 - 40% of funds have revised at least one old return by at least 1 basis point.
 - 20% have revised by at least 50 bps. (Avg return is 64 bps/mth.)
- These revisions are **not random or mere corrections** of earlier mistakes:
 - Revisions are **clustered** by style, fund characteristics and through time

Are hedge fund performance disclosures reliable?

- Our analysis of these vintages of hedge fund databases reveals:
 - 40% of funds have revised at least one old return by at least 1 basis point.
 - 20% have revised by at least 50 bps. (Avg return is 64 bps/mth.)
- These revisions are **not random or mere corrections** of earlier mistakes:
 - Revisions are **clustered** by style, fund characteristics and through time
 - On average, initial reported performance is revised **down**

Are hedge fund performance disclosures reliable?

- Our analysis of these vintages of hedge fund databases reveals:
 - 40% of funds have revised at least one old return by at least 1 basis point.
 - 20% have revised by at least 50 bps. (Avg return is 64 bps/mth.)
- These revisions are **not random or mere corrections** of earlier mistakes:
 - Revisions are **clustered** by style, fund characteristics and through time
 - On average, initial reported performance is revised **down**
 - Revisions provide *real-time* information on the **future poor performance** of a fund

An illustrative (and true) example: Hedge Fund “X”

- Hedge Fund X (HFX) incorporated in early 90s, began reporting returns and AUM four mths later.

An illustrative (and true) example: Hedge Fund “X”

- Hedge Fund X (HFX) incorporated in early 90s, began reporting returns and AUM four mths later.
- Around 2000 HFX had poor returns for a quarter, and AUM halved.

An illustrative (and true) example: Hedge Fund “X”

- Hedge Fund X (HFX) incorporated in early 90s, began reporting returns and AUM four mths later.
- Around 2000 HFX had poor returns for a quarter, and AUM halved.
 - ☒ HFX ceased reporting AUM, but continued to report returns.

An illustrative (and true) example: Hedge Fund “X”

- Hedge Fund X (HFX) incorporated in early 90s, began reporting returns and AUM four mths later.
- Around 2000 HFX had poor returns for a quarter, and AUM halved.
 - ☒ HFX ceased reporting AUM, but continued to report returns.
- In 2008:Q4, HFX reported a great return for previous month, putting it in the top decile for that month.

An illustrative (and true) example: Hedge Fund “X”

- Hedge Fund X (HFX) incorporated in early 90s, began reporting returns and AUM four mths later.
- Around 2000 HFX had poor returns for a quarter, and AUM halved.
 - ☒ HFX ceased reporting AUM, but continued to report returns.
- In 2008:Q4, HFX reported a great return for previous month, putting it in the top decile for that month.
- One month later, another large positive return was reported for previous month.

An illustrative (and true) example: Hedge Fund “X”

- Hedge Fund X (HFX) incorporated in early 90s, began reporting returns and AUM four mths later.
- Around 2000 HFX had poor returns for a quarter, and AUM halved.
 - ☒ HFX ceased reporting AUM, but continued to report returns.
- In 2008:Q4, HFX reported a great return for previous month, putting it in the top decile for that month.
- One month later, another large positive return was reported for previous month.
 - ☒ But the the first return was revised to a large *negative* return.

An illustrative (and true) example: Hedge Fund “X”

- Hedge Fund X (HFX) incorporated in early 90s, began reporting returns and AUM four mths later.
- Around 2000 HFX had poor returns for a quarter, and AUM halved.
 - ☒ HFX ceased reporting AUM, but continued to report returns.
- In 2008:Q4, HFX reported a great return for previous month, putting it in the top decile for that month.
- One month later, another large positive return was reported for previous month.
 - ☒ But the the first return was revised to a large *negative* return.
 - ☒ In 2009:Q2 the second return was revised down, along with two others.

An illustrative (and true) example: Hedge Fund “X”

- Hedge Fund X (HFX) incorporated in early 90s, began reporting returns and AUM four mths later.
- Around 2000 HFX had poor returns for a quarter, and AUM halved.
 - ☒ HFX ceased reporting AUM, but continued to report returns.
- In 2008:Q4, HFX reported a great return for previous month, putting it in the top decile for that month.
- One month later, another large positive return was reported for previous month.
 - ☒ But the the first return was revised to a large *negative* return.
 - ☒ In 2009:Q2 the second return was revised down, along with two others.
- Hedge Fund X was liquidated in 2009:Q3.

Related research: Reliability of reported returns

- Several previous papers have found **statistical evidence** that the returns reported by hedge funds are potentially unreliable
 - Asness, Krail and Liew (2001, *JPM*), Getmansky, Lo and Makarov (2004, *JFE*)
 - Returns are smoother than most financial returns, leading to lower estimates of risk and correlation
 - Bollen and Pool (2008, *JFQA*), Bollen and Pool (2009, *JF*)
 - Negative returns tend to be “smoothed” more than positive returns; “too few” small negative reported returns, relative to the overall distribution.
 - Agarwal, Daniel and Naik (2011, *RFS*)
 - Spike in reported December returns relative to the rest of the year.
- We find **direct evidence** that the returns reported by hedge funds are potentially unreliable

- Brown, Goetzmann, Liang and Schwarz (2008, *JF*)
 - Use “Form ADV” filings, which were required for a brief period in 2006, to study impact of mandatory disclosures on operational risk (conflicts of interest, fraud)
 - Screening on information contained in Form ADV filings helps identify funds that subsequently performed better; information in these filings is correlated with other flags for operational risk.
- Jin and Leslie (2003, *QJE*)
 - Mandatory restaurant hygiene “grade” cards in LA. Customers substitute away from low hygiene establishments, raising hygiene levels across all restaurants.
- Similar to Brown *et al.*, we find that identifying funds that revise old returns is a significant (negative) predictor of future performance
- Akin to the latter, we suggest that mandatory, verified disclosure is essential for raising ‘hygiene’ in hedge funds.

- Ljungqvist, Malloy and Marston (2009, *JF*) study changes in the widely-used IBES database of **analysts' stock recommendations**.
 - Like us, they compare historical records across vintages (annually, 2001-2007) and look for changes.
 - They find that up to 20% of recommendations are later revised, and that these revisions are not random
 - Recommendations that were further from the consensus, or those from “all star” analysts were more likely to be revised
- Given the limited disclosures currently required of hedge funds and recent regulatory proposals related to this, our analysis also has broad potential impact.

Outline of the talk

- 1 Background and motivation
- 2 **Data: Hedge fund databases and vintages**
- 3 Empirical methodology and results
 - 1 What types of hedge funds revise returns?
 - 2 Performance implications of revising returns
 - 3 Extensions and robustness checks
- 4 Conclusions

Merging hedge fund databases

- Given the number of different hedge fund databases, and the limited coverage of any single one, we first merge the largest ones
 - TASS, HFR, CISDM and BarclayHedge (Morningstar was dropped)
 - 74,742 entries in total, covering 18,382 unique hedge funds
 - January 1994 to May 2011 = 209 months of data
- We map the declared strategies of the funds into nine broad strategies (plus one "other")

Descriptive statistics: Database breakdown

	<i>Count</i>	<i>Prop'n</i>
TASS	6,604	35.9%
HFR	4,742	25.8%
CISDM	1,698	9.2%
BarclayHedge	5,339	29.0%
TOTAL	18,382	100.0%

Descriptive statistics: Strategy breakdown

	<i>Count</i>	<i>Prop'n</i>
Security Selection	3,009	16.4%
Macro	1,201	6.5%
Relative Value	250	1.4%
Directional Traders	2,358	12.8%
Funds of Funds	4,846	26.4%
Multi-Process	1,877	10.2%
Emerging	821	4.5%
Fixed Income	957	5.2%
Managed Futures/CTA	2,889	15.7%
Other	174	1.0%
TOTAL	18,382	100.0%

Types of hedge fund return changes

- Let $R(i, t, v)$ denote the return on hedge fund i in month t , as recorded in database vintage v .
 - We look for changes by comparing $R(i, t, v)$ and $R(i, t, v + 1)$
 - To simplify, we only compare consecutive vintages, v and $v + 1$.
- We define three types of changes across vintages:
 - 1 **Revisions:** $R(i, t, v) \neq R(i, t, v + 1)$ for some v
 - 2 **Additions:** $R(i, t, v)$ is missing but $R(i, t, v + 1)$ is available
 - 3 **Deletions:** $R(i, t, v)$ is available but $R(i, t, v + 1)$ is missing
- Note: to rule out labelling late reporting as an “addition” we only look for additions that relate to returns at least 12 months *before* vintage v

Descriptive statistics: Changes breakdown by type

Around 40% of funds have changed one of their returns at least once

	<i>Count</i>	<i>Prop'n</i>
Any changes	7,421	40.4%
Revisions	6,906	37.6%
Additions	370	2.0%
Deletions	1,078	5.9%
No changes	10,961	59.6%
TOTAL	18,382	100.0%

Descriptive statistics: Potentially innocuous revisions

Around 92% of observed revisions are *not* obvious data entry errors

	<i>Count</i>	<i>Prop'n</i>
Revisions	6,906	37.6%
Sign change	246	1.3%
Decimal change	74	0.4%
Digit transposition	340	1.9%
Any of above	604	3.3%
No changes	10,961	59.6%
TOTAL	18,382	100.0%

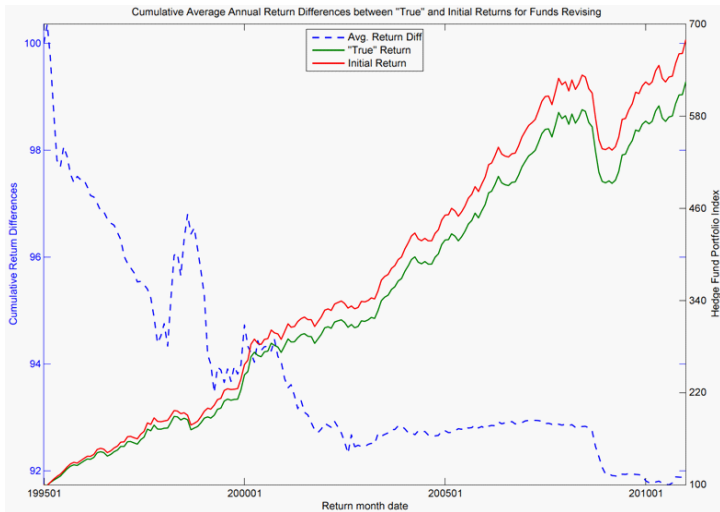
Descriptive statistics: Changes breakdown by size

Over 20% of funds have changed one of their returns by at least 50bp (avg return = 64bp)

	<i>Count</i>	<i>Prop'n</i>
Revision \geq 1 b.p.	6,906	37.6%
Revision \geq 10 b.p.	5,803	31.6%
Revision \geq 50 b.p.	3,972	21.6%
Other change	515	2.8%
No changes	10,961	59.6%
TOTAL	18,382	100.0%

What you see is not what you get

Cumulative difference between initially reported and 'true' history.



Outline of the talk

- 1 Background and motivation
- 2 Data: Hedge fund databases and vintages
- 3 **Empirical methodology and results**
 - 1 What types of hedge funds revise returns?
 - 2 Performance implications of revising returns
 - 3 Extensions and robustness checks
- 4 Conclusions

What types of funds revise their returns?

- Having documented that revisions of returns across vintages is widespread, we now see whether there are systematic patterns to these revisions
- Our first approach is a simple cross-sectional *probit* regression:

$$\text{Change}_i = \alpha + X_i' \beta + u_i$$

- As regressors we include variables that track:
 - 1 **Performance:** Rank of AUM, avg return, std dev of returns, autocorrel of returns
 - 2 **Characteristics:** strategy, offshore dummy, lockup dummy, audit dummy, age

What types of funds revise their returns?

Answer: Larger, older, more illiquid, worse performing, more volatile funds

	dF/dX	z-stat	Signif
AUM	0.247	4.48	***
AvgRet	-0.081	-1.84	*
StdDev	0.073	1.77	*
AutoCorr	0.119	6.90	***
NumObs	0.002	4.36	***
Offshore	-0.021	-4.04	***
Lockup	0.000	7.13	***
Audit	0.172	1.66	*
⋮			
Obs	18,382		
Pseudo R^2	11.6%		

What types of funds revise their returns?

Answer: Funds in BarclayHedge, not so much HFR (relative to TASS)

	dF/dX	z-stat	Signif
⋮			
HFR	-0.015	-2.02	**
CISDM	-0.043	-0.52	
BarclayHedge	0.118	10.76	***
⋮			
Obs	18,382		
Pseudo R^2	11.6%		

What types of funds revise their returns?

Answer: FOFs, Emerging, Macro and Multi-Process (relative to Security Selection)

	dF/dX	z-stat	Signif
⋮			
Macro	0.080	12.050	***
Relative Value	0.179	3.18	***
Directional Traders	-0.006	-0.54	
Funds of Funds	0.209	19.69	***
Multi-Process	0.066	3.68	***
Emerging	0.112	19.82	***
Fixed Income	0.018	0.47	
Managed Futures/CTA	0.113	1.07	
Other	0.124	2.81	***
Obs	18,382		
Pseudo R^2	11.6%		

What types of funds revise their returns?

- We now employ regressors measured at the **previous vintage**, rather than simply using data at the final available vintage

$$Change_{i,v} = \alpha + X'_{i,v-1}\beta + u_{i,v}$$

- As regressors we include variables that track:
 - 1 **Performance:** Rank of AUM, avg return, std dev of returns, autocorrel of returns, **revision in previous vintage**
 - 2 **Characteristics:** strategy, offshore dummy, lockup dummy, audit dummy, age

What types of funds revise their returns?

Answer: Funds who have done it before...

	dF/dX	z-stat		dF/dX	z-stat	
AUM	0.050	19.64	***	0.031	15.26	***
AvgRet	0.016	4.16	***	0.014	4.06	***
StdDev	0.005	1.66	*	0.002	0.61	
AutoCorr	0.017	4.70	***	0.009	3.55	***
NumObs	0.000	7.46	***	0.000	3.92	***
Offshore	-0.005	-3.76	***	-0.003	-2.65	***
Lockup	0.000	11.49	***	0.000	6.45	***
Audit	0.031	11.90	***	0.022	10.52	***
Lag dep var	—	—		0.235	16.99	***
⋮						
Obs	571,477			560,428		
Pseudo R^2	9.74%			21.58%		

What determines revision size and direction?

- For all calendar years in which at least one revision is detected, we compare the annual return based on the first vintage and the last vintage (“true”), both in absolute value and in levels:

$$\begin{aligned} \left| R_{i,t}^{true} - R_{i,t}^{first} \right| &= \alpha_t + X'_{i,t-1} \beta + u_{i,t} \\ R_{i,t}^{true} - R_{i,t}^{first} &= \alpha_t + X'_{i,t-1} \beta + u_{i,t} \end{aligned}$$

- We condition on fund characteristics, and introduce dummies for the 1998 crisis, the 2000 crisis, and the 2008 crisis.
 - Note that these dummies refer to the time of the return, not the time that the revision was detected

What determines revision size?

Answer: Smaller, offshore, high incentive fee funds during crises.

	Coeff	t-stat	Signif
Constant	1.087	6.18	***
Crisis 1: 1998-99	1.767	3.29	***
Crisis 2: 2000-01	0.773	2.58	***
Crisis 3: 2008-09	0.571	9.06	***
⋮			
Offshore	0.222	2.63	***
Audit	0.212	1.80	*
Incentive Fee	0.016	2.80	***
AUM	-0.905	-5.88	***
⋮			
Obs	10,004		
R^2	2.33%		

What determines revision direction?

Answer: More negative for smaller, low management fee funds during crises.

	Coeff	t-stat	Signif
Constant	-0.135	-0.82	
Crisis 1: 1998-99	-0.402	-0.63	
Crisis 2: 2000-01	-0.791	-2.52	***
Crisis 3: 2008-09	-0.347	-5.23	***
⋮			
Management Fee	0.134	2.13	***
AUM	0.214	1.85	*
⋮			
Obs		10,004	
R^2		0.50%	

Outline of the talk

- 1 Background and motivation
- 2 Data: Hedge fund databases and vintages
- 3 Empirical methodology and results
 - 1 What types of hedge funds revise returns?
 - 2 **Performance implications of revising returns**
 - 3 Extensions and robustness checks
- 4 Conclusions

Hedge fund revisions and future performance

- We next study whether information about having revised past returns is informative about future performance
 - **Null Hypothesis:** Revisions provide no information about future performance
 - **Alternative 1:** Revisions are a sign of poor operational controls or dishonesty, both of which are negative
 - **Alternative 2:** Revisions are a sign of honesty (confessing to previous errors), and so perhaps positive (?)

Hedge fund revisions and future performance

- We set up two portfolios of hedge funds: “Revisers” and “Non revisers”
 - All funds start as non-revisers. Once a revision is detected, the fund is classified as a “reviser” and all its subsequent returns are tracked in the reviser portfolio
- This is a real time strategy: we label a fund as a “reviser” only once we detect it via one of our vintages.
- We have 40 months of observations for this study (beginning in our second vintage, Jan 2008, to the end of the sample period, May 2011)

Hedge fund revisions and future performance

Non-reviser portfolio outperforms Reviser portfolio by around 25 bp per month

	<i>Const</i>	<i>Mkt</i>	<i>FH4</i>	<i>FH7</i>	<i>FH8</i>
Const	0.256 (3.388)	0.252 (4.202)	0.235 (2.993)	0.229 (2.877)	0.228 (2.922)
SP500	–	0.02	0.02	0.02	0.02
SMB	–	–	0.03	0.03	0.03
TermSpr	–	–	-0.16	-0.29	-0.28
CreditSpr	–	–	0.04	-0.03	-0.00
PTFSBD	–	–	–	-0.29	-0.29
PTFSFX	–	–	–	0.95	0.94
PTFSCM	–	–	–	-1.47	-1.46
Emerg	–	–	–	–	0.00
R^2_{adj}	–	6.11%	2.69%	7.38%	4.49%

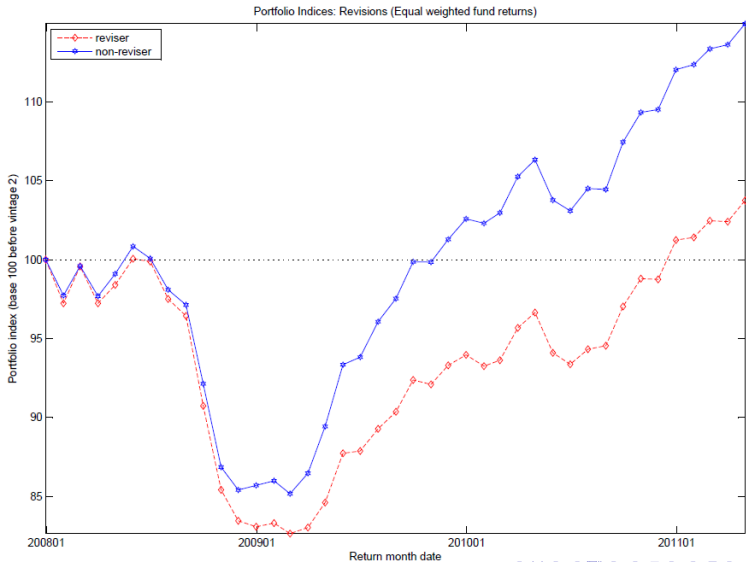
Hedge fund revisions and future performance

Non-reviser portfolio outperforms Reviser portfolio by around 25 bp per month

	<i>Const</i>	<i>FF3</i>	<i>FF3</i> <i>+Mom</i>	<i>FF3+Mom</i> <i>+PSliq</i>
Const	0.256 (3.388)	0.246 (3.152)	0.213 (3.963)	0.244 (4.982)
Mkt	–	0.755	-0.60	0.24
SMB	–	1.186	1.85	2.21
HML	–	3.112	0.47	-2.65
UMD	–	–	-3.66	-3.42
PSliq	–	–	–	-2.34
R^2_{adj}	–	15.21%	9.47%	8.95%

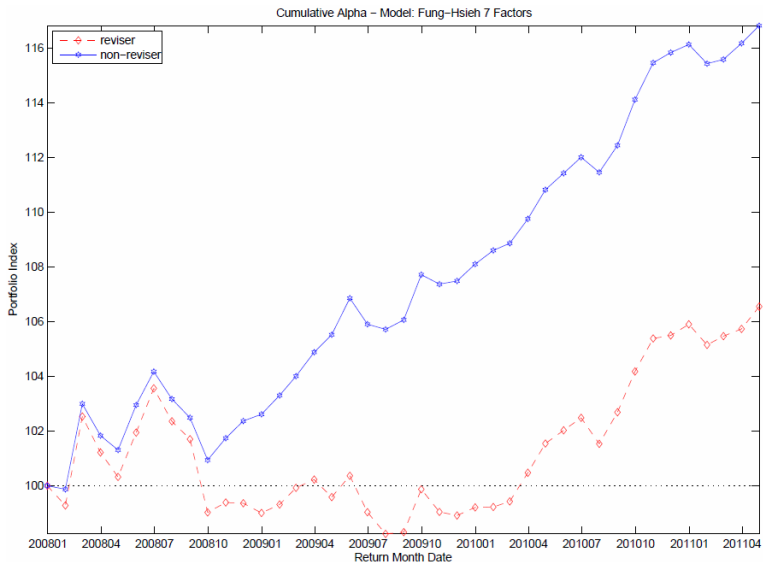
Hedge fund revisions and future performance

Cumulative returns on the “Reviser” and “Non reviser” portfolios



Hedge fund revisions and future performance

Cumulative FH7 alpha on the “Reviser” and “Non-reviser” portfolios



Outline of the talk

- 1 Background and motivation
- 2 Data: Hedge fund databases and vintages
- 3 Empirical methodology and results
 - 1 What types of hedge funds revise returns?
 - 2 Performance implications of revising returns
 - 3 **Extensions and robustness checks**
- 4 Conclusions

Varying the minimum size and age of a “revision”

- We consider changing the minimum **size** of a revision for it to be flagged
 - Analysis above used 1 basis point as the threshold
 - We consider increasing this to 10, 50 and 100 basis points
- We then consider varying the minimum **age** of a revision
 - Analysis above used a minimum age of 1 month (ie, all revisions)
 - We consider giving a “free pass” to returns that are revised within k periods of initial announcement, for $k = 3, 6, 12$ months

Hedge fund revisions and future performance

Non-reviser portfolio outperforms Reviser portfolio by slightly more for larger thresholds

<i>Threshold</i>	<i>1 bp</i>	<i>10 bp</i>	<i>50 bp</i>	<i>100 bp</i>
Const	0.229 (2.877)	0.252 (3.043)	0.241 (2.768)	0.258 (2.741)
FH7 factors	✓	✓	✓	✓
R_{adj}^2	7.38%	1.54%	6.90%	15.17%

Hedge fund revisions and future performance

Non-reviser portfolio outperforms Reviser portfolio by more for older revisions

<i>Min age</i>	<i>1 mth</i>	<i>3 mth</i>	<i>6 mth</i>	<i>12 mth</i>
Const	0.229 (2.877)	0.284 (3.396)	0.301 (3.459)	0.247 (2.881)
FH7 factors	✓	✓	✓	✓
R_{adj}^2	7.38%	-4.25%	0.71%	8.41%

Two-way sorts on fund characteristics

- Our initial probit analyses revealed that “reviser” funds have different characteristics than “non-reviser” funds
 - Reviser funds tended to be larger and less liquid than non-revisers
- The factor model (FH7 and FF3) results above are one method for controlling for these differences.
- We next sort funds by these characteristics, and then sort into revisers and non-revisers
 - 1 Liquid vs illiquid (using return autocorrelation)
 - 2 Liquid vs illiquid (using length of lock-up)
 - 3 Size (using previous period AUM)

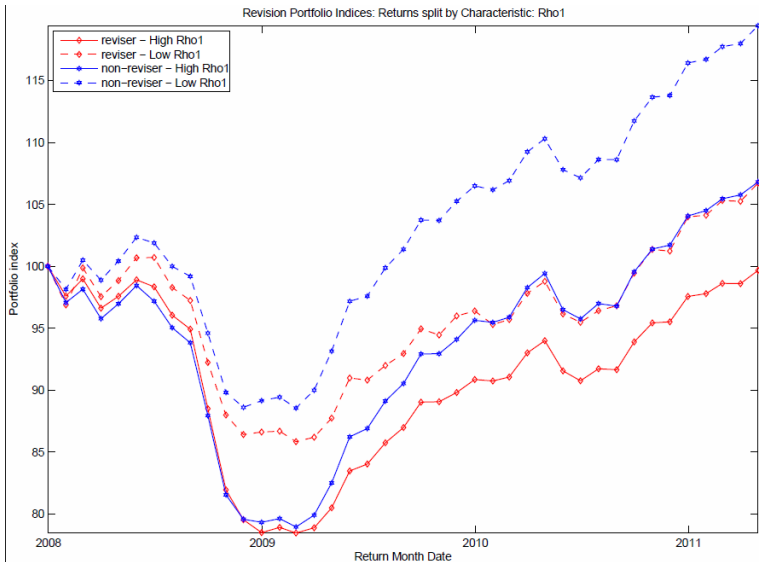
Hedge fund revisions and future performance

Non-reviser outperformance is signif in all sorts, stronger for illiquid funds

	<i>Autocorr</i>		<i>Lockup</i>		<i>Size</i>	
	High	Low	High	Low	High	Low
Const	0.283 (3.479)	0.111 (1.689)	0.331 (3.646)	0.139 (1.928)	0.207 (2.746)	0.220 (2.190)
FH7 factors	✓	✓	✓	✓	✓	✓
R^2_{adj}	35.1%	28.4%	50.8%	20.6%	14.1%	4.5%

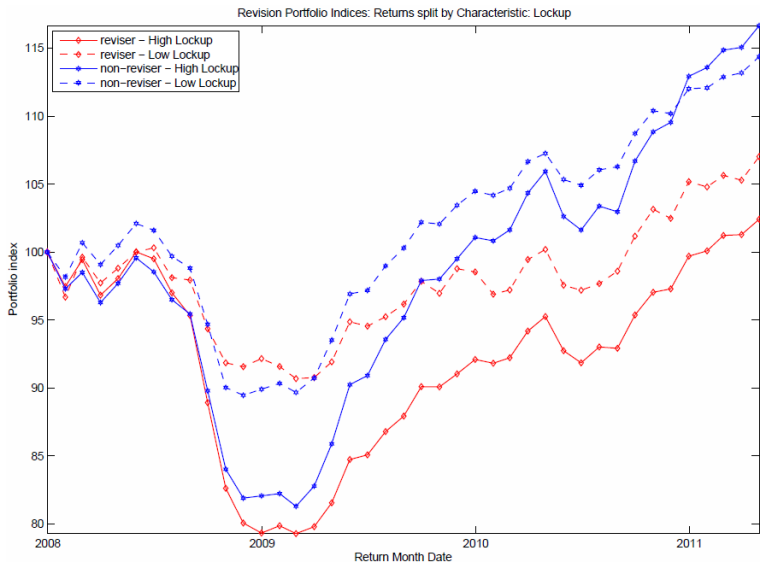
Cross-Section of HF Revisions

Sort funds (above, below median) on first autocorrelation of returns as at Dec 2007



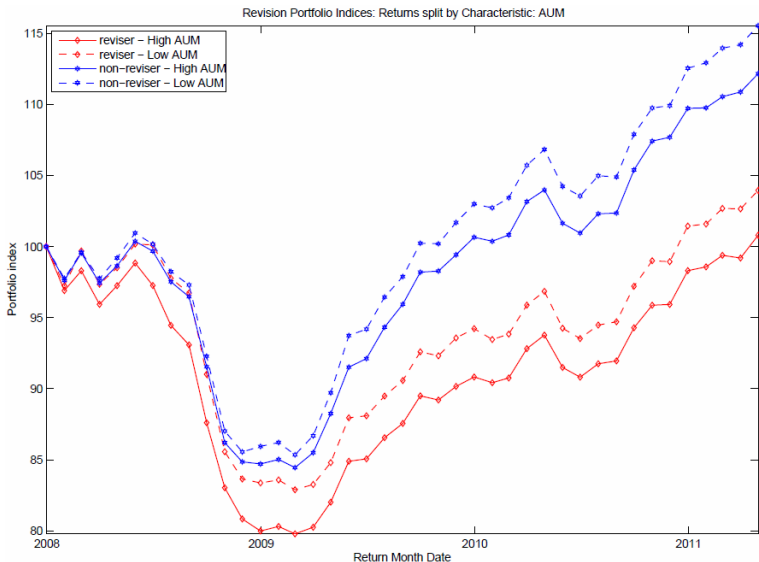
Cross-Section of HF Revisions

Sort funds (above, below median) on total lockup period length as at last vintage



Cross-Section of HF Revisions

Sort funds (above, below median) on AUM, lagged by one month



Summary and conclusions

- Hedge fund databases are widely used in academic research, followed by current/potential investors, but are *voluntary and not verified*
- Using vintages of hedge fund databases we examine their reliability:
 - We cover over 18,000 individual funds, from Jan 1994 to May 2011
 - Around 40% of funds have made at least one revision of an old return, 20% have revised by over 50 bps
- Revisions appear *not* to be mere corrections of errors or random:
 - 1 More likely to have revised if large, illiquid, have low average returns
 - 2 More likely to initially post high returns and then revise down
 - 3 Are a significant predictor of poor future performance
- These results suggest that mandatory, audited disclosures by hedge funds would be beneficial for investors and regulators.