Alpha and Performance Measurement: The Effects of Investor Heterogeneity

Presentation Slides

By:

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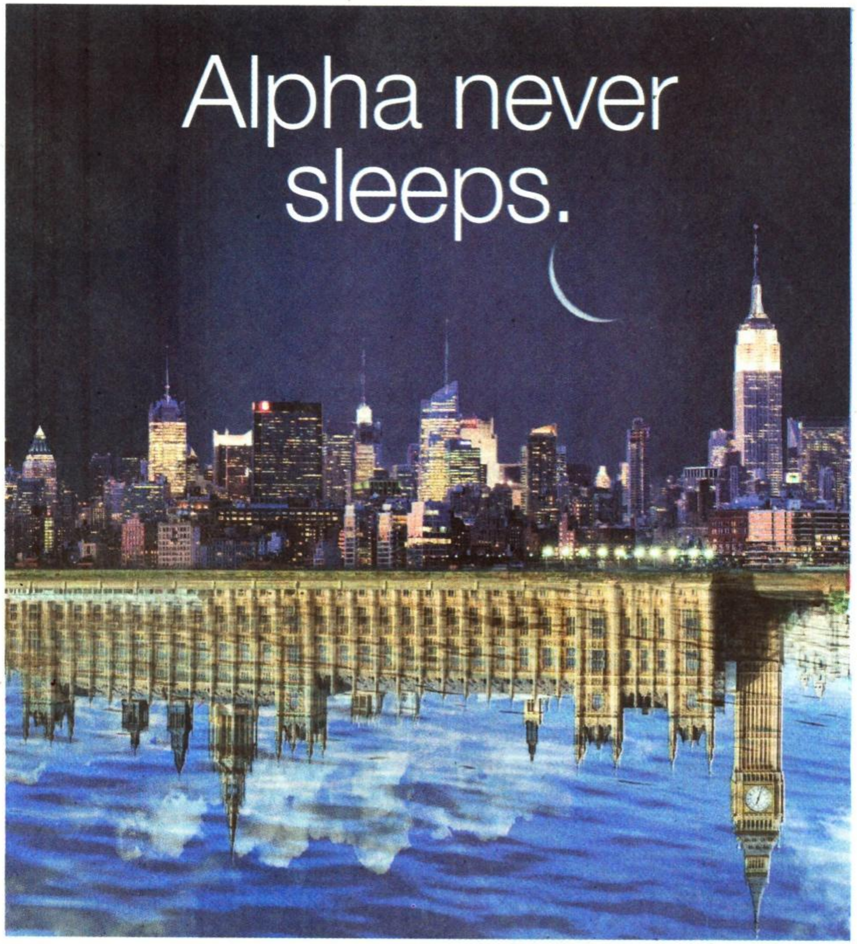
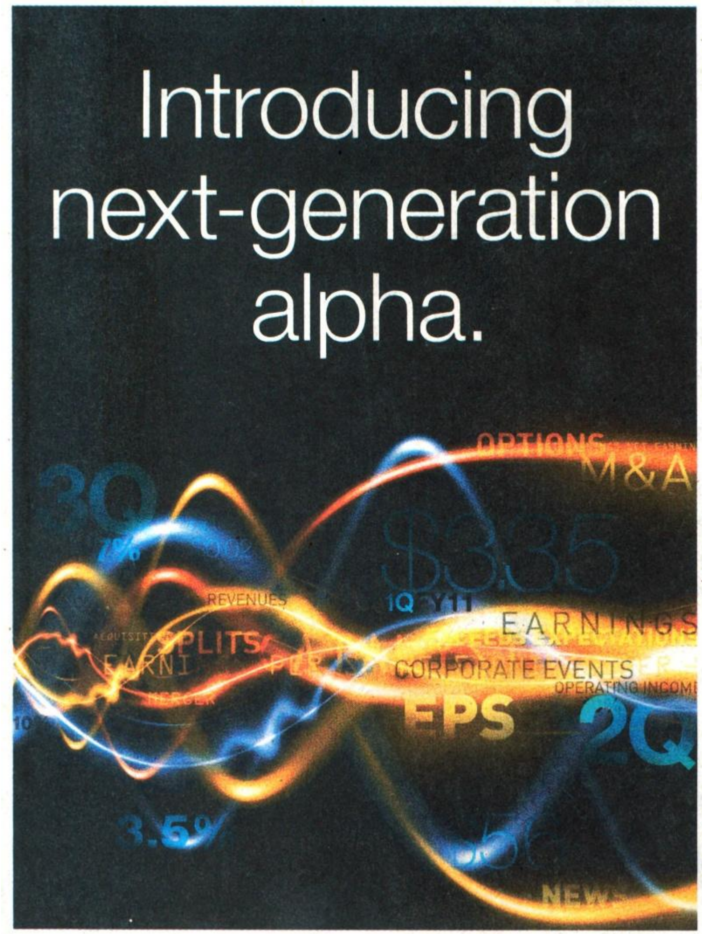
- MOTIVATION:
- We have easy familiarity with “Alpha:”

  - Capm Alpha
  - Three-factor Alpha
  - Four-factor Alpha
  - DGTW Alpha

- But, is this justified?


Alpha never
sleeps.


Introducing
next-generation
alpha.
OPTIONS
M&A
3Q
$3.35
REVENUES
1Q
EARNINGS
SPLITS
CORPORATE EVENTS
OPERATING INCOME
EPS
2Q
NEWS

- Two Fundamental Questions about Alpha:

1. If an investor sees a positive Alpha, should he or she buy?

2. If a Manager has better information, will he or she generate a positive Alpha?

- **First Question:**
  Does positive Alpha => Buy?

  - MEAN VARIANCE CASE: Sometimes, *at the Margin* (Dybvig and Ross 1985), but not necessarily given a discrete adjustment (e.g. Gibbons et al. 1989).

  - DIFFERENTIAL INFORMATION: You would ***use*** the fund (But, maybe short a positive alpha fund!) (Chen and Knez, 1996)

  - And, you can have (Positive or Negative) alpha with Neutral Performance!

    egs: Jagannathan and Korajczyk (86), Roll (78), Green (86), Leland (99), Dybvig and Ross (85), Hansen and Richard (87), Ferson and Schadt (96), Goetzmann et al (2007), ….

  -- **And**, you might buy even with negative alpha (Glode, 2011).

- **Second Question:**
  Does superior info. => positive Alpha?

  - Mayers and Rice (1979): **Yes**, assuming…
  - Dybvig and Ingersoll (1982): **No**, can't assume ***that***!
  - Verrechia (1980): **No** (Counterexample).
  - Connor Korajczyk (1986): **Yes, ** assuming…
  - Grinblatt and Titman (1989): **No**, mean-variance
    Yes: Positive Period Measure, assuming…"

This Literature mostly Dies in the late 1980s!

Not Encouraging! What justifies our "easy familiarity?" Our interpretations of empirical results?

Theory: The "Stochastic Discount Factor Approach" Can Justify Alpha

Price = E{ m * Payoff |Z},

m = Stochastic Discount Factor,[e.g. $\beta u'(c)/u'(c_0)$)],

Z = Client's Information.

The "Right" Alpha: $\alpha_p = E(mR_p|Z) - 1$

Theoretical Results / Conclusions:

1. With the "Right" (i.e. SDF) Alpha, Positive Alpha Does Mean Buy a discrete amount.

2. In special cases, an informed manager delivers positive alpha.

3. One Size Does not fit all!

The Setting:

$$J(W_t,\text{info})=\text{Max}_{\{c,x\}}\, U(C)+E\{\beta J(W_{t+1},s_{t+1})|\text{info}\}$$

$$\text{s.t. } W_{t+1} = (W_t - C)\, x'R_{t+1},\ x'\underline{1}=1$$

Info = Z (client), $s_t \,\varepsilon\, Z$,

Info = Ω (manager), $Z \,\varepsilon\, \Omega$

The "Right" Alpha:

$$\alpha_p = E(mR_p|Z) - 1,$$

$$m = \beta\, J_w(W_{t+1,} s_{t+1})/U_c(C_t)$$

The Model:

Start at $E(mR|Z)=\underline{1}$, introduce $R_p = x(\Omega)'R$. Manager's better information, Ω, study optimal purchase by client, Δ. Assume: price-taking clients, managers don't affect prices

Proposition 1:

$\Delta = \alpha_p A$,

$A = U_c(C_t)/[-U_{cc}^* - E(\beta J_{ww}^* [Q] | Z)] > 0$

Assuming:

$Q = [R_{pt+1} + (W_t - C_t)(\partial x(\Delta)/\partial \Delta)'R]\,[R_{pt+1} + (W_t - C_t)(x(\Delta) - x)/\Delta)'R] > 0$

Then Δ (>=<) 0 when α_p (>=<) 0.

- Pretty general: [discrete response not just marginal, multiperiod not static, does not restrict timing information, consumption, constant risk aversion or require normality.]

We have a theoretical justification for alpha as a normative investment indicator!

The cost: ***Investor heterogeneity*** must be confronted.

The Empirical question: How big a deal is investor heterogeneity?

Summary of the Empirical Part:

1. **Bounds on** expected investor disagreement with a traditional alpha.

=> Comparable in effect to benchmark choice

=> Comparable in effect to statistical imprecision.

2. Flow-performance Regressions:

=> Funds for which likely disagreement is greater have a more muted flow response to alpha.

=> A separate effect from imprecision about alpha estimates.

3. New Results! Both Analytical and Empirical

Bounding Investor Disagreement:

Regress: $r_p = a_p + \Sigma_j \beta_j r_j + \varepsilon_p$,

passive benchmarks *excess returns* r_j.

Take the unconditional expectation of $\alpha_p = E(mr_p|Z)$ and substitute:

$$\mathbf{E(\alpha_p) = E(m)a_p + \Sigma_j \beta_j E(mr_j) + E(m\varepsilon_p)}$$

$E(mr_j|Z)=0$, so $E(mr_j)=0$,

$$\mathbf{\Rightarrow E[\alpha_p / E(m) - a_p] = E(m\varepsilon_p)/E(m)}$$

The Bounds on Expected Disagreement:

Use:

$\sigma(m)/E(m) = (-1/\rho_{mrj})[E(r_j)/\sigma(r_j)]$ for *all* r_j,

ρ_{mrj} = correlation between m and r_{j},
$\sigma(.)$ = standard deviation.
$\rho_{\epsilon m}$ = correlation between m and ε_p.

=> $\mathbf{|E(\alpha_p)/E(m)- a_p|} = |\rho_{\epsilon m}\, \sigma(\varepsilon_p)\, [\sigma(m)/E(m)]\,|$
$= |\rho_{\epsilon m}\, \sigma(\varepsilon_p)\, (-1/\rho_{mrj})[E(r_j)/\sigma(r_j)]|$ for all passive r_j.

Insert $\{(-1/\rho_{mrj}^*)[E(r_j^*)/\sigma(r_j^*)\}$, where r_j^* achieves the maximum squared Sharpe ratio in the passive benchmark assets:

$$\mathbf{|E(\alpha_p)/E(m)- a_p| = |(-\rho_{\epsilon m} /\rho_{mrj}^*)|\, \sigma(\varepsilon_p)\ \ SR_{max}}$$

$$|\rho_{\epsilon m}|\, \sigma(\varepsilon_p)\ \ SR_{max} \le \mathbf{|E(\alpha_p)/E(m)- a_p|} \le \sigma(\varepsilon_p)\ \ SR_{max}$$

Empirical Magnitude of Disagreement?

Passive benchmark proxies

ISSUES:

(1) $E(mr_j)=0$
(2) Compare to traditional alphas
(3) How many $\{r_j\}_j$?
(4) Trading costs

CHOICES:

1. Market Index, Rm
2. FF3 Factors
3. 6 Portfolios of Index Funds
4. 8 individual ETFs
5. EW portfolio of the index funds
6. EW portfolio of the ETFs

Conditioning Variables:

* Key assumption: investors all know this much:

1. One-month US Tbill yield
2. Baa - Aaa Bond yield
3. 10-year less 3-month Tbill yield
4. Dividend yield, S&P500

Upper Bound versus Benchmark Choice:

(Unconditional Models)

Distributions of Sample Measures Across Funds

	Range of Traditional Alphas across six Benchmark Models (% per month)	Sample Upper Bound on Hetero. in FF3: $[SR_{max} * \sigma(\epsilon_p)]$
Bottom 10%	0.24	0.14
25%	0.32	0.20
Median	0.43	0.31
Top 25%	0.66	0.46
10%	1.06	0.66

Upper Bound versus Benchmark Choice:

(Conditional Models linear mean, fixed variance)

	Range of Traditional Alphas across six Benchmark Models (% per month)	Sample Upper Bound on Hetero. in FF3: [$SR_{max} * \sigma(\epsilon_p)$]

Distributions of Sample Measures Across Funds

Bottom 10%	0.21	0.28
25%	0.31	0.40
Median	0.43	0.61
Top 25%	0.61	0.86
10%	0.91	1.18

Upper Bound versus Benchmark Choice:

(OTHER Conditional Models)

		Range of Traditional Alphas across six Benchmark Models (% per month)	Sample Upper Bound on Hetero. in FF3: [SR_{max} * $\sigma(\epsilon_p)$]	DC	GARCH
Bottom	10%	0.21	0.28	.24	.31
	25%	0.31	0.40	.35	.44
Median		0.43	0.61	.53	.65
Top	25%	0.61	0.86	.75	.91
	10%	0.91	1.18	1.04	1.26

Upper Bound versus Statistical Imprecision:

(Unconditional Models: ***Median Fund***)

Benchmark Model	α (% per month)	σ(α) (% per month)	Sample Upper Bound [SR_{max} * σ(ϵ_p)]
CAPM	-.043	.248	.216
FF3	-.090	.209	.313
6 Index	-.069	.212	.324
EW Index	-.004	.248	.233
8 ETF	-.117	.161	.214
EW ETF	-.206	.269	.196

Upper Bound versus Statistical Imprecision:

(Conditional Models, fixed variances: ***Median Fund***)

Benchmark Model	α	σ(α)	Sample Upper Bound
	(% per month)		$[SR_{max} * \sigma(\epsilon_p)]$
CAPM	-.036	.222	.412
FF3	-.094	.177	.607
6 Index	-.034	.189	1.069
EW Index	-.008	.220	.353
8 ETF	-.060	.145	.724
EW ETF	-.162	.235	.326

Upper Bound versus Statistical Imprecision:

(OTHER Conditional Models: ***Median Fund***)

Benchmark Model	α	σ(α)	Sample Upper Bound $[SR_{max} * \sigma(\epsilon_p)]$	DC	Garch
	(% per month)				
CAPM	-.036	.222	.412	.311	.297
FF3	-.094	.177	.607	.529	.647
6 Index	-.034	.189	1.069	.868	1.67
EW Index	-.008	.220	.353	.237	.211
8 ETF	-.060	.145	.724	.563	1.16
EW ETF	-.162	.235	.326	.281	.312

New Results:

Disagreement vs. Heterogeneity and Flow

Expected Disagreement =

$$E(\alpha_p)/E(m) - a_p = (-\rho_{\epsilon m} / \rho_{mrj}^*)\, \sigma(\epsilon_p)\ SR_{max.}$$

Flow = $\Sigma_i(\Delta_{ip})$,

So, $\Sigma_i A_i [E(\alpha_p)/E(m) - a_p] = Flow/E(m) - \Sigma_i A_i$

=> Positive Level Effect of Average Disagreement on Flow for a given traditional alpha.

New Results:

Heterogeneity Effects on Flow

Heterogeneity = Var(Δ_{ip}) across *i*.

In general, ambiguous (e.g. vary σ, fixed μ).

Ambiguous for unrestricted symmetric disn's.

Specific Flow effects if Δ truncated, say below Δ_L.

New Results:

Heterogeneity Effects on Flow

Let Δ ~ Normal or Uniform = f(Δ).

"$" flow = μ . FLOW(σ), Flow(σ) = $\int_{\Delta>\Delta L} f(\Delta)d\Delta$,

Then $\text{sgn}[\partial \text{Flow}(\sigma)/\partial\sigma] = \text{sgn}[\Delta_L - \mu]$

=> *Interaction effect between expected disagreement and heterogeneity* !

Expected Disagreement =

$$E(\alpha_p)/E(m) - a_p = (-\rho_{\epsilon m} / \rho_{mrj}^*)\ \sigma(\varepsilon_p)\ SR_{max.}$$

- What about $\boldsymbol{\rho_{\epsilon m}}$ **?**

"Electricity consumption and asset Prices," Zhi Da and Hayong Yun, 2010

Annual from 1984, 51 "States" - Measures of **Heterogeneity** ("Disgreement" in the draft)

- $Het1_p = \sigma(\varepsilon_p)\ \sigma_G[|\rho(\varepsilon_p,G)|]$
- $Het2_p = \sigma(\varepsilon_p)\ \sigma_G[|\rho(\varepsilon_p,G)/\rho(r_j^*,G)|]$,

$\sigma_G[.]$=cross-state std, G = electricity consumption

Electricity Consumption Correlation with Median Fund's Residual (u) and with Max Sharpe ratio (r_j*) Portfolio Return:

Model:	Median "State"		top 10% State	
	u	r_j*	u	r_j*
CAPM	.070	.131	.134	.297
FF3	.095	.385	.193	.611
6 Index	.083	.734	.145	.866
EW Index	.068	.182	.178	.366
EW ETF	.121	.233	.271	.468

"Flow-Performance" Regressions:

$$Flow_{pt} = a + b\ \alpha_{pt-1} + c\ \alpha_{pt-1}^{\ 2} + controls + u_{pt}$$

Our first Conjecture was:

$b = b_0 + b_1\ Het_P$; $b_1 < 0$

$c = c_o + c_1\ Het_P$; $c_1 < 0$

T-ratios on the ***"HET"*** interaction terms

Traditional Alpha	Linear Term constant HET	Linear Term rolling HET	Quadratic Term constant HET	Quadratic Term rolling HET
CAPM:				
HET1	-9.6	-8.9	-1.9	-2.7
HET2	-8.9	-8.3	-1.2	-1.9
FF3:				
HET1	-8.9	-8.6	-2.3	-3.4
HET2	-8.7	-8.4	-2.1	-3.0

Something NEW: Individual versus Institutional Share Classes (HET2):

Traditional	Linear Term		Quadratic Term	
Alpha	constant HET	rolling HET	constant HET	rolling HET
CAPM:				
Retail	-9.3	-8.6	-1.2	-1.9
institutional	-1.2	-1.1	0.1	-0.2
FF3:				
Retail	-9.0	-8.6	-2.1	-3.0
institutional	-1.1	-1.1	-0.3	-0.8

"Nonparametric" Flow-Performance:

Sort α_{pt-1} = D(high), D(med), low=reference

$Flow_{pt} = a + b\ Dhi_{pt-1} + c\ Dmed_{pt-1} + controls + u_{pt}$

Conjecture:

$b = b_0 + b_1\ HET_P$; $b_1 < 0$?

$c = c_o + c_1\ HET_P$; $c_1 < 0$?

T-ratios on the ***"HET"*** interaction terms

Traditional Alpha	Medium Performance	High Performance
CAPM:		
HET1	-1.7	-2.2
HET2	-1.6	-1.8
FF3:		
HET1	-1.1	-2.2
HET2	-1.4	-2.1

Heterogenity Ranked:

HET = D(Hi), D(Med), Low=reference

$Flow_{pt} = a + b\ \alpha_{pt-1} + c\ \alpha_{pt-1}{}^{2} + controls + u_{pt}$

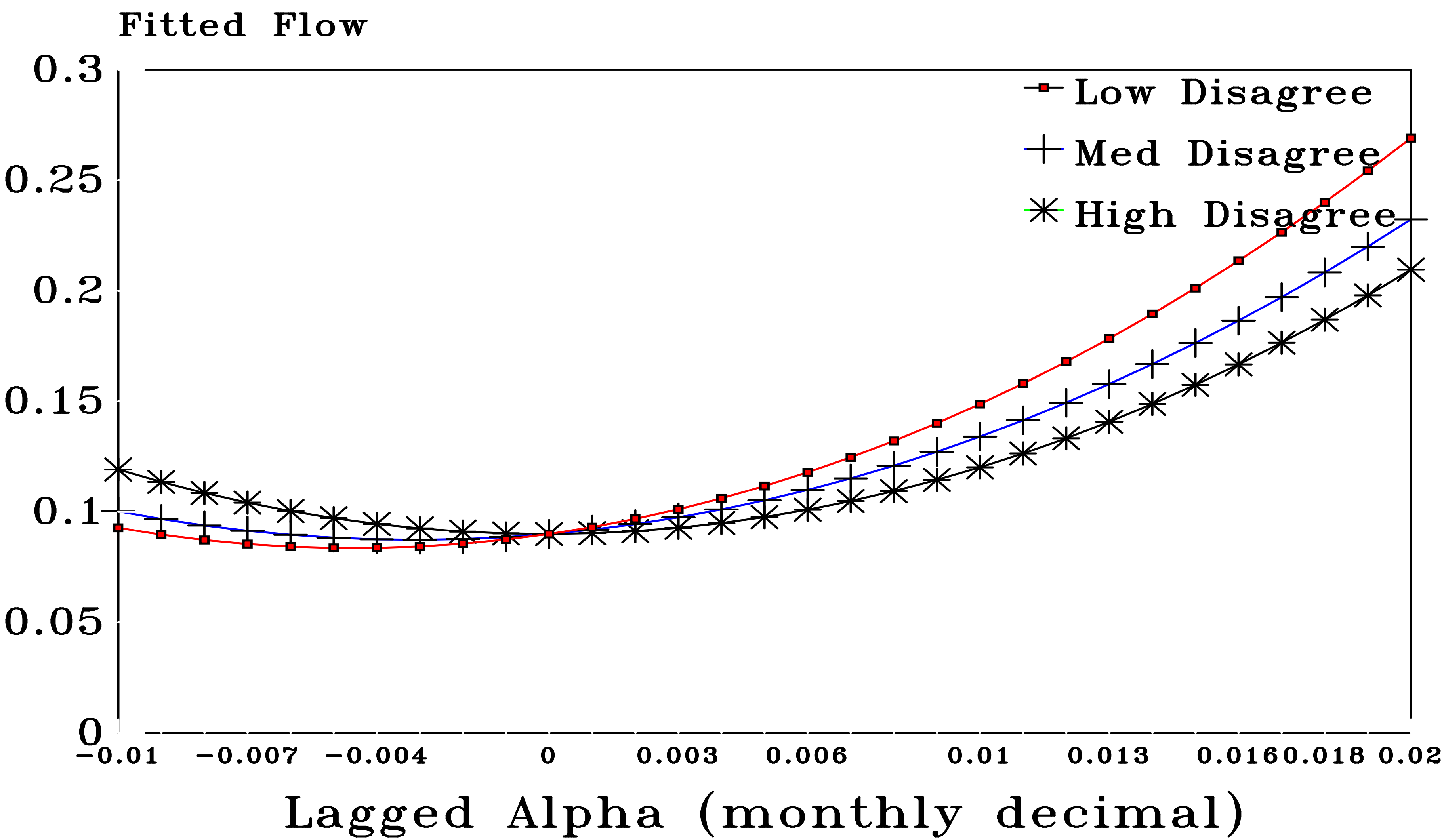
Model:

$b = b_0 + b_1\ D(Hi_P) + b_2\ D(Med_p)$

c = similarly…

Fitted Flow Performance

CAPM, Disagree1



Orthogonalized HET

Regress HET_p on $\sigma(\acute{\alpha}_p)$, use residuals

T-ratios on ***"Orthogonal Heterogeneity"*** interaction terms

Traditional Alpha	Linear Term Uncond.	Linear Term Cond.	Quadratic Term Uncond.	Quadratic Term Cond.
CAPM:				
HET1	-2.8	0.1	-4.5	0.6
HET2	0.5	2.3	-3.5	-0.1
FF3:				
HET1	-4.2	-4.0	-4.8	-5.1
HET2	-1.9	-2.5	-4.1	-4.9

Summary and Conclusions:

- The theoretical literature has sought "unanimity," about alpha, but this leads to ***a big mess!***
- The "Right" (SDF) Alpha resolves the question: Does a positive alpha mean I should buy?
- The right alpha is investor specific.
- Empirical Bounds on heterogeneity Developed
- Economically Significant
- Disagreement Shows up in the cross section of fund flows