Heterogeneous Asset Pricing Model Preferences by Investor Type: Evidence from Separate Accounts

Valeria Fedyk[1]

[1]Department of Finance PhD, London Business School

Outline

Motivation

Which Asset Pricing Model do Investors Actually Care About?

- Capital Asset Pricing Model (CAPM)
- Fama-French 3 Factor Model
- Fama-French-Carhart 4 Factor Model
- Or something else...?

Using Fund Flows to Assess Preferences

- $21.3tn invested in US mutual funds as of the end of 2019
- Fund flows can be used to assess which asset pricing models most closely correspond to investor preferences
- I use a flow sign test, look at dollar value flows, and run a regression of flows on model alphas to assess which model is closest to the one investors use

Flow Sign Test

Preview of Main Results

Summary of main findings

1. For both US separate account composites and US mutual funds, Morningstar rating is the best predictor of flows
2. There is a slight increase in the degree of sophistication of the model investors use over time
3. Investors in value funds, growth funds, and blend funds behave similarly to each other in terms of flow drivers
4. Passive investors also appear to care about Morningstar ratings when allocating capital
5. There is no consistent outperformance (either net or gross) by the separate account composites

Literature Review

Berk and van Binsbergen (2004, 2015, 2016) - proposed a theoretical framework saying that mutual fund managers do have skill, but it should be measured as value added rather than by alpha; introduced the flow sign test

Barber, Huang, and Odean (2016) - find that CAPM supercedes factor models in explaining mutual fund flows

Ben-David, Li, Rossi & Song (2019 wp) - showed that Morningstar ratings supercede CAPM and factor models in explaining mutual fund flows

Gorbatikov (2018 wp) - within mutual funds, institutional investors use more sophisticated factor models than retail investors

Evans and Sun (2020) - Morningstar rating change of June 2002 affected aggregate risk adjustment by retail mutual fund investors

Data - US Separate Account Composites

Dataset Description

- Actively managed and passively managed US Equity Separate Account Composites from Morningstar
- Separate account investors such as institutions, endowments, sovereign wealth funds, pension funds, and so forth; separate accounts in the dataset have an average Minimum Investment of $10mm
- A Composite is an aggregation of one or more separate accounts running the same strategy under the same investment manager
- Novel dataset that has not been previously used in the literature
- Time period of Jan 1991 - Sept 2020
- Dataset includes over 3,000 composites
- Includes Net Assets, Gross and Net Returns, Morningstar ratings, Morningstar Category, Management Approach, Product Focus, Minimum Investment Amount

Descriptive Statistics - US Separate Account Composites

	Morningstar Rating				
	1 Star	2 Stars	3 Stars	4 Stars	5 Stars
Fund-month observations	14,152	53,715	99,069	68,793	21,836
Fund size ($mm)	627	850	1,403	1,968	2,570
Fund age (years)	16.24	16.2	15.93	15.34	13.43
Fund flow	-1.64%	-1.12%	0.13%	1.23%	3.53%
Market-Adjusted Return	-0.26%	-0.14%	-0.06%	0.00%	0.07%
Excess Return	0.60%	0.68%	0.76%	0.83%	0.90%
Return Volatility (1yr)	5.12%	4.60%	4.44%	4.30%	4.36%
Return Volatility (5yr)	5.40%	4.84%	4.62%	4.45%	4.34%
Market beta	1.03	1.00	0.98	0.96	0.94
Size beta	0.34	0.26	0.24	0.24	0.23
Value beta	0.09	0.09	0.10	0.10	0.08
Momentum beta	0.01	0.02	0.02	0.02	0.02
Fraction of positive flows	27.83%	28.96%	33.56%	43.76%	60.60%

Data - US Mutual Funds

Dataset Description

- Actively managed and passively managed US Equity Mutual Funds from Morningstar
- Benchmarked to the major S&P, Russell, and Nasdaq indices
- Benchmark return data also comes from Morningstar
- Time period of Jan 1991 - Sept 2020
- Dataset includes over 3,000 mutual funds
- As for Separate Account Composites, remove funds with AUM less than $10mm or flows less than 90% or greater than 1000%

Descriptive Statistics - US Mutual Funds

	Morningstar Rating				
	1 Star	2 Stars	3 Stars	4 Stars	5 Stars
Fund-month observations	23,243	85,901	150,463	108,629	39,900
Fund size ($mm)	489	815	1,555	2,470	3,323
Fund age (years)	9.96	10.53	10.65	10.17	8.51
Fund flow	-1.63%	-1.02%	-0.28%	0.96%	3.14%
Market-Adjusted Return	-0.40%	-0.13%	0.01%	0.18%	0.52%
Excess Return	0.22%	0.54%	0.70%	0.85%	1.06%
Return Volatility (1yr)	5.33%	4.62%	4.33%	4.28%	4.61%
Return Volatility (5yr)	5.72%	5.04%	4.73%	4.57%	4.55%
Market beta	1.05	1.01	0.99	0.97	0.97
Size beta	0.31	0.23	0.19	0.18	0.21
Value beta	-0.01	0.03	0.05	0.07	0.05
Momentum beta	0.00	0.01	0.01	0.01	0.01
Fraction of positive flows	18.78%	22.42%	32.77%	51.21%	71.97%

Separate Account Composites vs Mutual Funds

Separate Account Composites

- Predominantly institutional investors such as endowments, pension funds, insurance companies, sovereign wealth funds
- Average Minimum Investment is around $10mm and for 80% of composites the Minimum Investment is over $100k
- Median of 10 separate accounts per composite
- Customizable by the investors (e.g. for specific exclusions such as Tobacco companies, etc.)
- Average composite size of nearly $2bn
- Total AUM in sample of over $3tn

Mutual Funds

- 70% / 30% split between retail and institutional investors by AUM (split more uneven for active mutual funds and more equal for passive mutual funds)
- Typically thousands of investors per mutual fund; over 100mm Americans are invested in US mutual funds
- Not customizable by individual investor
- Average mutual fund size of over $3bn
- Total AUM in sample of nearly $6tn

Computing Flows

Fund-Level Aggregation

$$\text{TNA}_t^F = \sum_{\text{Fund F's Share Classes i}} \text{TNA}_t^i$$

$$R_t^{F,Net} = \sum_{\text{Fund's Share Classes i}} R_t^{i,Net} * \frac{\text{TNA}_t^i}{\text{TNA}_t^F}$$

$$\text{Morningstar Rating}_t^F = \sum_{\text{Fund's Share Classes i}} \text{Morningstar Rating}_t^i * \frac{\text{TNA}_t^i}{\text{TNA}_t^F}$$

Computing Flows

$$\text{Flows}_t^F = \frac{TNA_t^F}{TNA_{t-1}^F} - (1 + R_t^{F,Net})$$

Computing Benchmark-Adjusted Return, Market-Adjusted Return, and Excess of Risk-Free Rate Returns

Benchmark-Adjusted Return

- Benchmark used is as indicated by Manager Preferred Benchmark in Morningstar
- Benchmark-adjusted return: $R_t^{F,BmkAdj} = R_t^{F,Net} - R_t^{F,Bmk}$

Market-Adjusted Return

- Market used is value-weighted return of all CRSP firms incorporated in the US
- Market-adjusted return: $R_t^{F,MktAdj} = R_t^{F,Net} - R_t^{Mkt}$

Excess of Risk-Free Rate Return

- One month Treasury bill rate (from Ibbotson Associates)
- Excess return: $R_t^{F,ExcRet} = R_t^{F,Net} - R_t^{RF}$

Computing Factor Loadings and Model Alphas

Factor Loadings

- 3F model loadings ($\hat{\beta}_t^{F,3F}$, $\hat{s}_t^{F,3F}$, and $\hat{h}_t^{F,3F}$) obtained from following 60 months rolling window regression:

$$(R_\tau^{F,Net} - R_\tau^{RF}) = \alpha_t^{F,3F} + \beta_t^{F,3F}(R_\tau^{Mkt} - R_\tau^{RF}) + s_t^{F,3F}(SMB_\tau^{3F}) + h_t^{F,3F}(HML_\tau^{3F}) + \epsilon_t^F$$

Alpha

- Net alphas computed as net return less the product of estimated factor loadings and the current month's factor returns:

$$\hat{\alpha}_t^{F,3F} = (R_t^{F,Net} - R_t^{RF}) - \left[\hat{\beta}_t^{F,3F}(R_t^{Mkt} - R_t^{RF}) + \hat{s}_t^{F,3F}(SMB_t^{3F}) + \hat{h}_t^{F,3F}(HML_t^{3F})\right]$$

Weighted Alphas

Methodology

- Weighted alphas are computed from estimated monthly alphas according to the methodology described in Barber et al.:

$$\alpha_t^{F,M,Weighted} = \frac{\sum_{s=1}^{18} e^{-\lambda(s-1)} \hat{\alpha}_{t-s}^{F,M}}{\sum_{s=1}^{18} e^{-\lambda(s-1)}}$$

- where $\hat{\alpha}_{t-s}^{F,M}$ is the estimated alpha for fund F at time t using model M, and λ is a decay parameter in the return-flow relation over time. Barber et al. calibrate this decay parameter to $\lambda = 0.20551497$

Morningstar Ratings

Key Characteristics

- Introduced in 1985 and widely used by investors and advisors alike
- Compares funds against other funds in the same Morningstar category
- Combines return, risk, and load adjustments into a single rating

Computation of MRAR

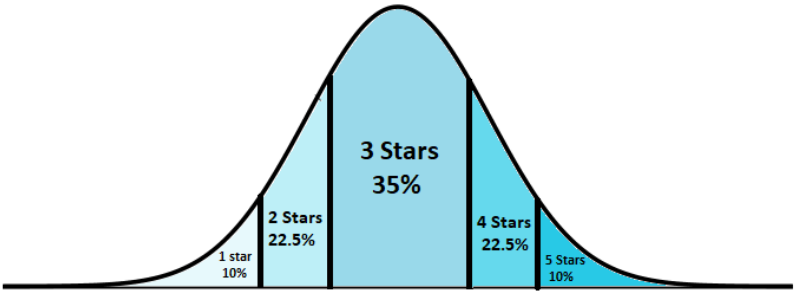
- Formula for the Morningstar Risk-Adjusted Return calculated over 3 year, 5 year, and 10 year time periods:

$$MRAR(\gamma) = \left[\frac{1}{T}\sum_{t=1}^{T}(1+ER_t)^{-\gamma}\right]^{\frac{12}{\gamma}} - 1$$

where γ is the degree of risk aversion (set to 2 by Morningstar analysts), and ER_t is the excess return in time period t

Morningstar Ratings (cont.)

Computation of Overall Rating from MRARs



For a given time period, a fund's MRAR is then plotted on a bell curve within its category group. The Overall Morningstar Rating is a weighted average of the 3 year, 5 year, and 10 year ratings

Sharpe Ratio and Information Ratio

Sharpe Ratio

- The Sharpe Ratio is a very well-known, easily understood, and generally accepted measure of a fund's performance
- I compute Sharpe Ratio using returns since inception through the current period and annualize

$$SR_t^F = \frac{\bar{R}_t^F - \bar{R}_t^{RF}}{\sigma_t^{F,ann}}$$

Information Ratio

- Similarly well known, well-understood, and well-regarded measure of fund performance
- Measures fund performance against its designated benchmark which is likely to be more relevant for the fund's investors

$$IR_t^F = \frac{\bar{R}_t^F - \bar{R}_t^{Bmk}}{TE_t^{F,ann}}$$

Results - Flow Sign Test

What is the Flow Sign Test?

A simple test that uses flow sign and model alpha sign to infer the model closest to the one investors actually use in their capital allocation decisions

Economic Rationale

- Investors compete with each other to allocate capital into positive net present value opportunities, or into funds with positive alphas

I then consider the regression:

$$\text{sign}(F_t^i) = \beta_0^M + \beta_1^M \text{sign}(A_t^{i,M}) + \epsilon_t^i$$

The frequency with which the flow sign and the model alpha sign agree is then $\frac{\hat{\beta}_1^M + 1}{2}$

Back to Motivation

Results - Flow Sign Test - US Separate Accounts

US Active Separate Account Composites - Flow Sign Test Results

- Morningstar rating top predictor of flow sign
- Fama-French 3 Factor model and Fama-French-Carhart 4 Factor model outperform the CAPM

Flow Sign Test - US Separate Account Composites, Active

	$\frac{\beta+1}{2}$	T-stat	Rating ≥ 4	Rating ≥ 3	FF3	FFC4	CAPM	Bmk-Adj	Mkt-Adj	IR	Exc Ret	SR
Rating ≥ 5	62.26%	19.02	6.78	8.86	11.71	11.84	12.08	12.74	12.83	12.05	13.64	5.76
Rating ≥ 4	57.94%	19.47		6.00	9.37	9.38	9.76	10.11	10.61	9.18	10.31	4.58
Rating ≥ 3	55.64%	13.66			2.83	2.95	3.59	4.58	4.85	5.55	7.95	3.71
FF 3-factor	54.51%	16.02				0.62	2.02	3.64	4.69	3.80	7.69	3.01
FFC 4-factor	54.44%	15.64					1.59	3.19	4.26	3.69	7.48	2.98
CAPM	54.07%	12.69						1.28	3.48	2.87	7.12	2.71
Bmk-Adj.	53.67%	14.07							0.90	2.37	6.31	2.46
Mkt-Adj.	53.45%	11.62								1.85	6.20	2.31
Info. Ratio	52.43%	4.82									2.47	1.53
Exc. Ret.	50.78%	1.67										0.17
Sharpe Ratio	50.58	0.51										

US Active Mutual Funds - Flow Sign Test Results

- Morningstar rating top predictor of flow sign
- CAPM outperforms 3 Factor and 4 Factor models at the 1% significance level

Flow Sign Test - US Mutual Funds, Active

	$\frac{\beta+1}{2}$	T-stat	Rating ≥ 4	Rating ≥ 3	CAPM	Mkt-Adj	FF3	FFC4	Bmk-Adj	Exc Ret	IR	SR
Rating ≥ 5	68.65%	41.18	6.82	10.59	6.65	16.07	8.48	8.74	19.49	16.67	23.07	25.25
Rating ≥ 4	65.22%	46.13		10.13	11.11	16.57	13.72	14.23	21.06	13.55	25.70	23.84
Rating ≥ 3	62.41%	40.97			5.67	8.97	8.73	9.29	13.20	10.99	17.21	19.70
CAPM	59.68%	28.03				3.40	3.64	4.21	5.65	8.94	10.71	14.69
Mkt-Adj.	59.16%	31.17					1.45	2.11	6.55	7.21	7.91	13.54
FF 3-factor	58.63%	29.42						1.28	2.79	7.78	8.50	13.03
FFC 4-factor	58.47%	29.66							2.23	7.50	8.24	12.97
Bmk-Adj.	57.81%	30.59								5.02	4.57	11.02
Exc. Ret.	54.65%	9.04									-2.01	4.73
Info. Ratio	56.07%	16.29										7.30
Sharpe Ratio	51.83%	4.16										

Results - Dollar Flows - US Mutual Funds

Do Flow Signs Tell the Whole Story? Looking at Flow Magnitude

- At each point in time, I sort funds into the top-ranked and bottom-ranked funds according to the Morningstar rating, CAPM alpha, and other performance metrics
- I then compute the average fraction of positive flows next period, the average fund flows as a percent next period, and the average dollar value of fund flows next period for the top-ranked and bottom-ranked groups

	Fraction Positive Flows			Fund Flows (%)			Fund Flows ($mm)		
	High	Low	Diff	High	Low	Diff	High	Low	Diff
Morningstar	67.52%	14.86%	52.66%	1.91%	-1.60%	3.51%	$39.33	-$9.29	$48.62
Mkt-Adj.	61.50%	14.59%	46.91%	1.89%	-2.13%	4.02%	$22.87	-$24.02	$46.89
Bmk-Adj.	56.66%	14.83%	41.83%	1.57%	-2.13%	3.70%	$19.56	-$23.89	$43.45
CAPM	61.64%	13.12%	48.52%	1.95%	-2.20%	4.15%	$23.80	-$23.73	$47.53
FF 3-factor	58.60%	12.36%	46.25%	1.77%	-2.15%	3.91%	$19.29	-$24.17	$43.46
FFC 4-factor	58.57%	12.92%	45.65%	1.78%	-2.07%	3.86%	$19.93	-$21.88	$41.81

Results - Regression Analysis

Regression Set-Up

- Control variables: past fund flows over past 18 months, log fund age previous period, log fund size previous period
- Time fixed effects
- Standard errors double clustered by fund and time

$$Flow_t^F = a + \sum_{m=1}^{M} b_m \alpha_t^{F,m} + cX_t^{F,Controls} + \mu_t + e_t^F$$

Main Results

- Within factor models, CAPM alpha has the highest coefficient and significance for US Mutual Fund flows while the 4 Factor alpha has the highest coefficient and significance for US Separate Account Composites

US Active Mutual Funds - Regression Results

- CAPM model best explains flows within the factor models

	Flow (1)	Flow (2)	Flow (3)	Flow (4)	Flow (5)	Flow (6)
CAPM Alpha	1.03***				0.63***	0.51***
	(19.46)				(12.28)	(10.02)
3 Factor Alpha		1.26***			0.41***	0.31***
		(20.65)			(4.46)	(3.33)
4 Factor Alpha			1.26***		0.33***	0.22**
			(20.10)		(3.75)	(2.47)
Morningstar Rating				0.009***		0.006***
				(26.87)		(15.92)
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	259,530	259,530	259,530	387,943	259,530	259,106
R-squared	2.09%	2.05%	2.01%	2.46%	2.18%	2.49%

Results - Regression - US Separate Accounts

US Active Separate Account Composites - Regression Results

- 4 Factor model best explains flows within the factor models, but Morningstar rating is most significant predictor overall

	Flow (1)	Flow (2)	Flow (3)	Flow (4)	Flow (5)	Flow (6)
CAPM Alpha	0.86***				0.31	-0.22
	(8.22)				(1.60)	(-0.70)
3 Factor Alpha		1.30***			-0.12	0.29
		(10.08)			(-0.26)	(0.41)
4 Factor Alpha			1.38***		0.93**	1.19*
			(10.50)		(1.97)	(1.67)
Morningstar Rating				0.011***		0.011***
				(9.44)		(7.94)
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	103,671	103,671	103,671	92,715	103,671	29,515
R-squared	3.70%	3.72%	3.73%	4.04%	3.74%	2.29%

Results - Change over Time, Active vs Passive

	Active, Full Period	Passive, Full Period	Active, 1st Period	Active, 2nd Period
Rating ≥ 5	68.65% (41.18)	62.54% (7.29)	68.11% (36.56)	67.78% (21.16)
Rating ≥ 4	65.22% (46.13)	56.01% (4.17)	65.45% (40.53)	63.57% (27.70)
Rating ≥ 3	62.41% (40.97)	55.81% (3.90)	63.13% (36.61)	60.67% (25.65)
CAPM	59.68% (28.03)	55.02% (5.28)	60.32% (22.58)	58.19% (19.00)
Market-Adjusted	59.16% (31.17)	55.53% (7.21)	59.05% (23.33)	57.87% (22.36)
FF 3-factor	58.63% (29.42)	53.59% (4.22)	58.48% (21.34)	58.42% (20.33)
FF 4-factor	58.47% (29.66)	53.39% (4.14)	58.29% (21.00)	58.31% (20.79)
Benchmark-Adjusted	57.81% (30.59)	54.41% (3.95)	57.56% (23.82)	57.46% (21.73)
Excess Return	54.65% (9.04)	51.11% (1.24)	56.82% (11.45)	53.72% (3.93)
Information Ratio	56.07% (16.29)	53.61% (2.20)	57.41% (16.81)	52.90% (5.62)
Sharpe Ratio	51.83% (4.16)	51.78% (2.45)	53.19% (5.69)	50.48% (0.91)

Results - Value vs Growth vs Blend

Hypothesis

Value investors are likely to be the ones who believe in value, size, and other more sophisticated model factors. Growth investors might be return chasing and more prone to allocating capital according to more simplistic measures of performance such as market or benchmark-adjusted return.

Main Takeaway

As seen in results on the next slide, value, growth, and blend investors actually behave similarly to each other, giving priority to Morningstar ratings

Results - Value vs Growth vs Blend (cont.)

	Active, All	Active, Value	Active, Growth	Active, Blend
Rating ≥ 5	68.65% (41.18)	68.12% (23.62)	69.37% (29.53)	68.33% (20.04)
Rating ≥ 4	65.22% (46.13)	65.00% (24.34)	65.92% (34.80)	64.54% (23.03)
Rating ≥ 3	62.41% (40.97)	62.75% (23.66)	62.24% (29.13)	62.54% (21.05)
CAPM	59.68% (28.03)	60.69% (19.00)	59.39% (21.81)	59.48% (16.61)
Mkt-Adj	59.16% (31.17)	60.29% (20.95)	58.87% (23.17)	58.96% (21.35)
FF 3-factor	58.63% (29.42)	59.06% (18.55)	58.72% (23.16)	58.22% (17.34)
FF 4-factor	58.47% (29.66)	58.88% (18.57)	58.55% (24.15)	58.02% (16.53)
Bmk-Adj	57.81% (30.59)	57.24% (17.52)	58.44% (26.44)	57.47% (18.68)
Excess Return	54.65% (9.04)	55.87% (9.46)	53.81% (6.71)	54.90% (8.42)
Information Ratio	56.07% (16.29)	56.32% (9.79)	56.21% (12.24)	56.57% (9.87)
Sharpe Ratio	51.83% (4.16)	52.32% (4.21)	51.60% (3.37)	51.71% (3.40)

Additional Results - Separate Account Performance over Time

Main Takeaway

Gerakos et al. document outperformance of separate accounts over 2000-2012. In my sample I corroborate that gross and net alphas are on average positive over 1991-2011, but become negative over the most recent time period 2012-2020

Gross and Net Alphas, by model

	1991-2020		1991-2011		2012-2020	
Model Alpha	Gross	Net	Gross	Net	Gross	Net
Market Adjusted Return	1.4%	0.5%	3.1%	2.2%	-0.5%	-1.5%
Benchmark Adjusted Return	1.2%	0.2%	2.0%	1.1%	-0.5%	-1.3%
CAPM Alpha	0.3%	-0.6%	2.5%	1.6%	-1.1%	-2.0%
3F Alpha	0.0%	-0.9%	0.8%	-0.1%	-0.2%	-1.1%
4F Alpha	0.1%	-0.8%	1.0%	0.1%	-0.2%	-1.2%

Robustness Checks

List of Tests

1. Previous month alphas vs weighted alphas
2. Only using funds with all consecutive monthly observations
3. Using simple average (instead of value-weighting) fund-level Morningstar ratings

Links to Theoretical Foundations

Possible Explanations

1. Bounded Rationality
   - Human decision-making is fraught with practical limitations and difficulties
   - Exposed to limited information which often includes Morningstar rating
   - Limited by time constraints in analyzing more sophisticated performance measures
2. The Power of Morningstar Ratings?
   - On the flip-side, is it actually possible that the Morningstar rating is an extremely good measure of fund manager skill?
3. Frictions and Rigidity
   - Is the intermediation channel (i.e. sub-advisors, retirement plans, brokers, and other intermediaries) only marketing funds with higher Morningstar ratings?

Conclusion

The Major Fund Flow Driver

- Morningstar ratings are the most important driver of flows for both US Mutual Funds and US Separate Account Composites

Heterogeneity in Investor Preferences

- Separate account investors care about Morningstar ratings relatively less than mutual fund investors
- Surprisingly, even passive funds appear to care about Morningstar ratings, though to a lesser extent
- Over time, the 3 Factor and 4 Factor models have become increasingly important drivers of fund flows relative to the CAPM
- Flows driven by similar performance measures for Value, Growth, and Blend funds

Future Research Directions

Proposed Extensions, Improvements, and Additional Tests

- Determine whether Morningstar ratings are actually a good measure of fund manager skill, and if so, why
- Dig deeper into the empirical finding that passive funds also allocate capital according to Morningstar ratings
- Apply a variable selection algorithm technique to the regression to determine subset of best explanatory variables for flows, standardize predictor variables, include style fixed effects and calculate IRs based on different models
- Determine what proportion of mutual fund assets are received from platforms that only include certain options such as highly Morningstar rated funds

Thank you for your attention!