

What Should Investors Care About? Mutual Fund Ratings by Analysts vs. Machine Learning Technique

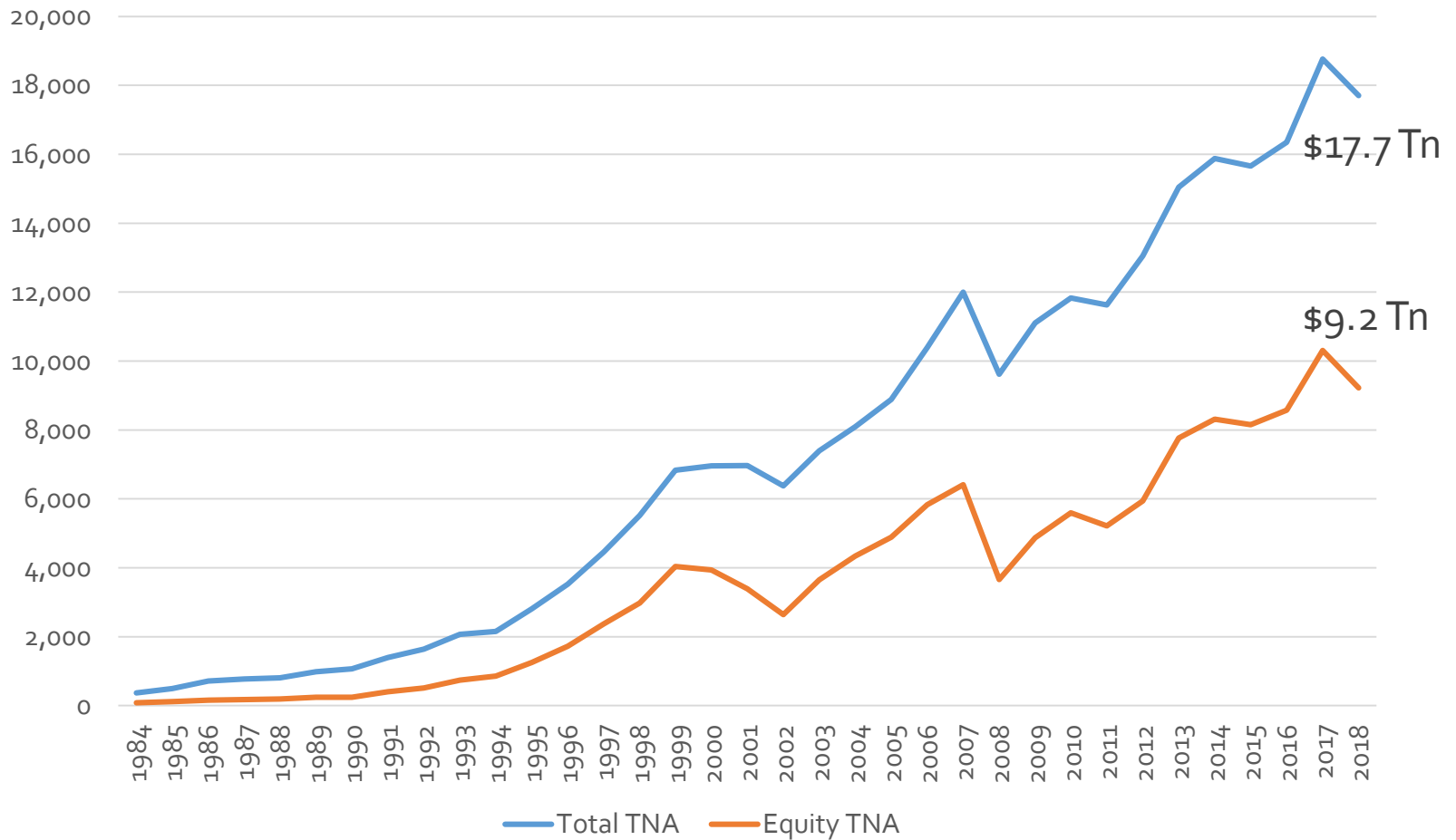
Si Cheng, Chinese University of Hong Kong

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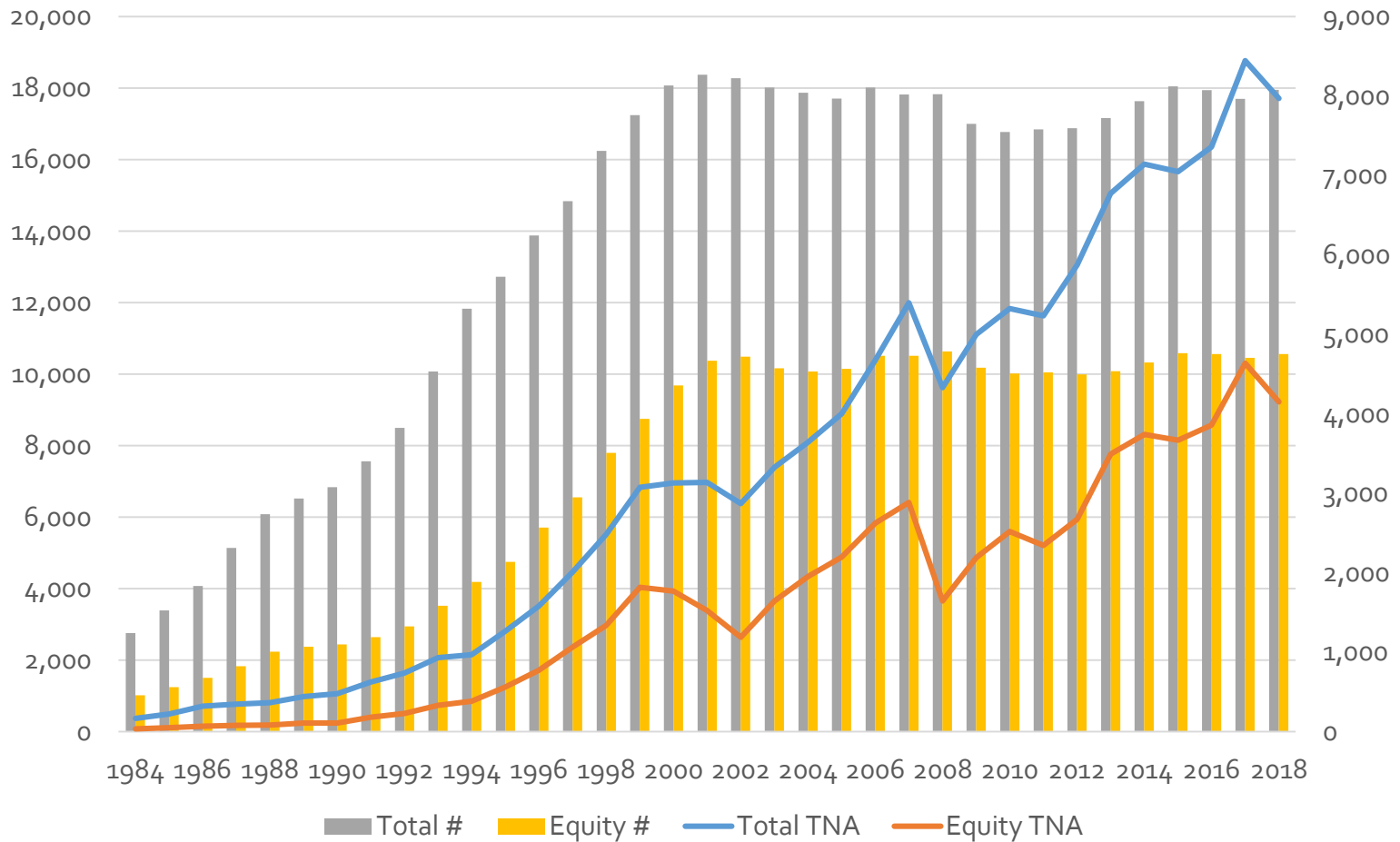
ABFER 8th Annual Conference, May 2021

U.S. Mutual Fund Industry (TNA, \$Bn)



Source: ICI Fact Book (2019)

U.S. Mutual Fund Industry



Source: ICI Fact Book (2019)

Challenges in Fund Selection

- By 2018, retail investors hold 89% of the U.S. mutual fund net assets.
- The average risk- and style-adjusted fund returns are often negative after-fee.
- Individual investors are **unsophisticated** in mutual fund investment.
 - Time the market poorly (Frazzini and Lamont 2008)
 - Advertising and media coverage (Barber, Odean, and Zheng 2005; Solomon, Soltes, and Sosyura 2014; Kaniel and Parham 2017)
 - Lottery-like features or holding lottery stocks (Bailey, Kumar, and Ng 2011; Agarwal, Jiang, and Wen 2020)

Star Rating

- Individual investors rely on Morningstar **star ratings** and chase recent performance (Ben-David, Li, Rossi, and Song 2019).



- Since 1985, mathematically derived, **backward-looking**, minimal usefulness due to little persistence of good performance



Analyst Rating

- Morningstar launched analyst ratings in **Nov 2011**.
- **Forward-looking**, reflects Morningstar's "conviction in the fund's ability to outperform its peer group and/or relevant benchmark on a risk-adjusted basis."
- **Independent**, five-tier scale, updated up to four times a year on a regular schedule

**Neutral****Negative**

- Based on five key areas: People, Process, Parent, Performance, and Price
- Correlation (analyst rating, star rating) = 0.41

Analyst Rating Example


Fidelity® Contrafund® FCNTX  

Analyst rating as of Feb 22, 2019

[Quote](#) [Fund Analysis](#) [Performance](#) [Risk](#) [Price](#) [Portfolio](#) [People](#) [Parent](#)

Star Rating

Analyst Rating

NAV / 1-Day Return 13.63 / 0.22%	Total Assets 119.7 Bil	Adj. Expense Ratio ⓘ 0.820%	Expense Ratio 0.820%	Fee Level Average	Load None
Category US Fund Large Growth	Investment Style  Large Growth	Minimum Initial Investment 0	Status Open	TTM Yield 0.00%	Turnover 32%

USD | NAV as of Dec 05, 2019 | 1-Day Return as of Dec 05, 2019, 9:26 AM GMT+8 | Analyst Rating as of Feb 22, 2019, 6:00 AM ⓘ

Morningstar's Analysis ⓘ

Analyst Take

Investment Objective

Performance Feb 22, 2019

 Positive

Price Feb 22, 2019

 Positive

Process Feb 22, 2019

 Positive

People Feb 22, 2019

 Positive

Parent Jul 6, 2018

 Positive

Analyst Rating Example



Robby Greengold
Senior Analyst

A solid choice for the long run.

Summary | by Robby Greengold, CFA [Feb 22, 2019](#)

Fidelity Contrafund has excelled during manager Will Danoff's nearly three-decade tenure, supporting its Morningstar Analyst Rating of Silver.

Danoff looks for best-of-breed companies with **good** business models, competitive **advantages** and **improving** earnings potential, placing much emphasis on company management. While that premise could define many large-growth competitors, the fund's process has been successful because of Danoff's execution. He's hands-on, participating in many of the hundreds of company meetings that occur at Fidelity every year. He also has Fidelity's large global analyst team at his disposal, which helps him keep tabs on the sprawling portfolio of 300-plus names and feeds him ideas that can help distinguish the fund from its relevant benchmarks.

Indeed, Danoff consistently crafts a seemingly inimitable portfolio. The fund's stake in the Morningstar technology sector, which has ranged from 30%-40% of assets over the past three years, looks hefty next to the fund's S&P 500 prospectus benchmark but modest relative to the Russell 1000 Growth Index

Summary

Performance

Price

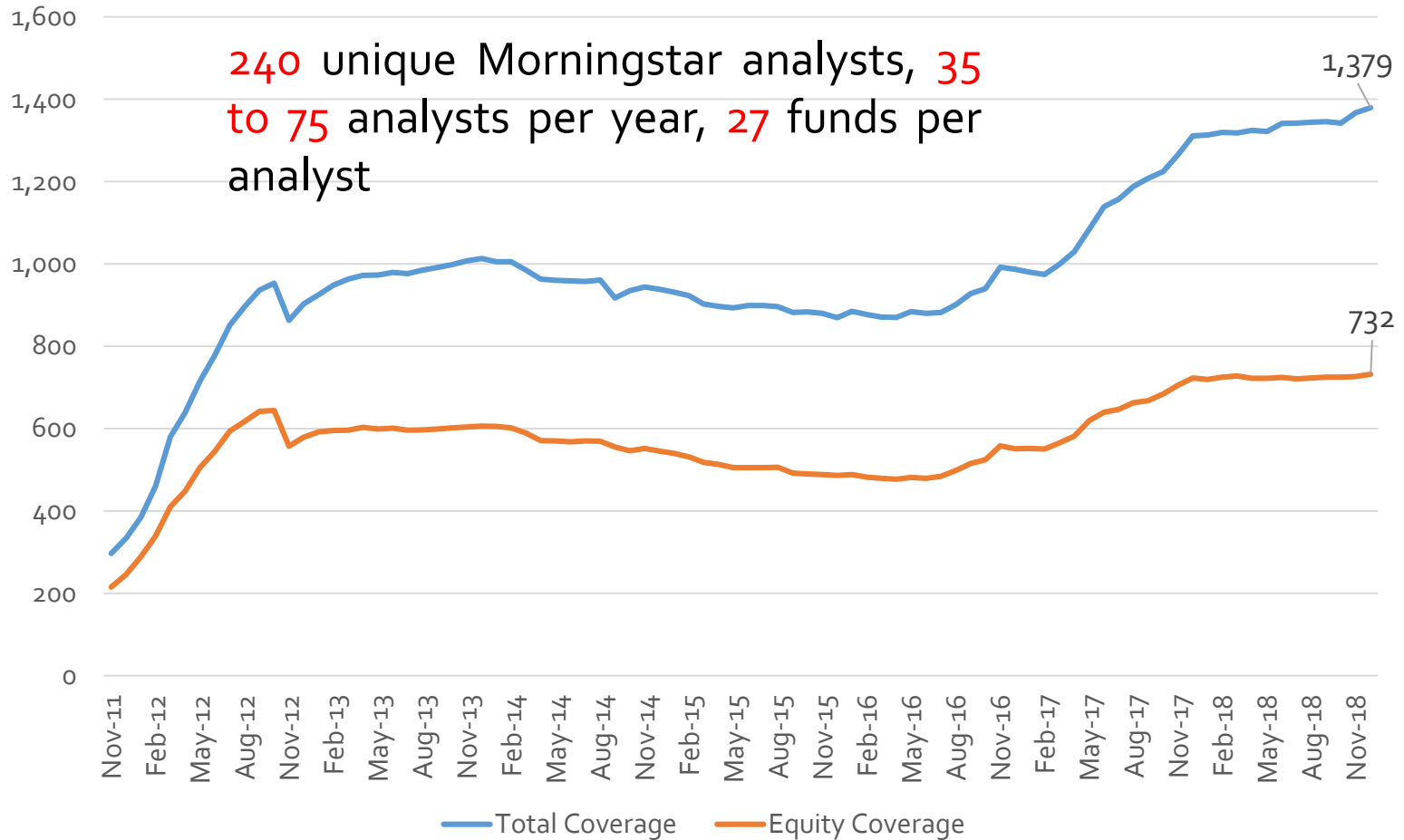
Process

People

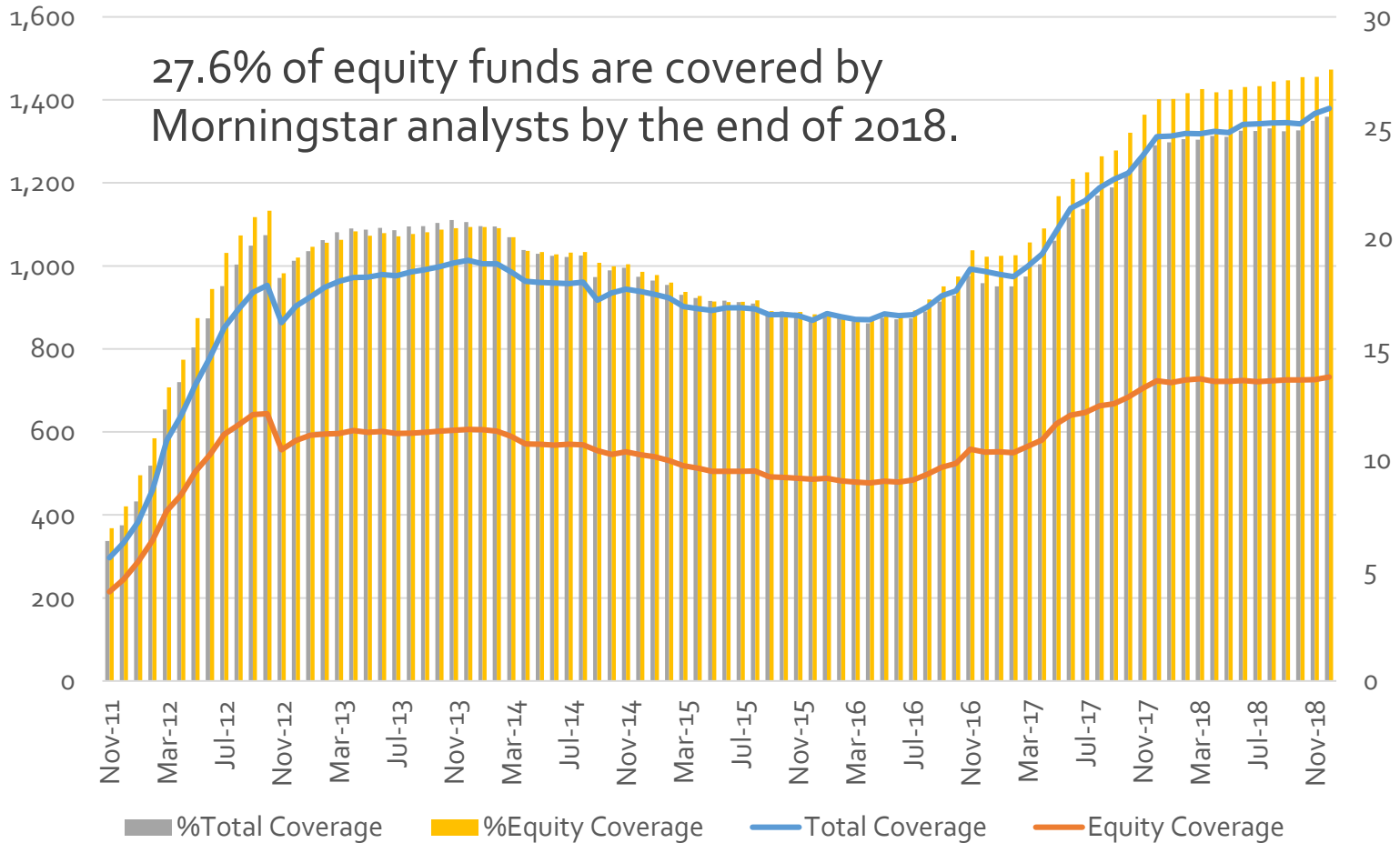
Parent

Close Full Analysis [^](#)

Analyst Coverage Over Time



Analyst Coverage Over Time



Quantitative Rating


- To expand the number of covered funds, Morningstar developed a **machine-learning** model that uses the decision-making processes of their analysts, their past ratings decisions, and the data used to support those decisions.
- Morningstar introduced quantitative ratings in **June 2017**.
- Similar to analyst rating: forward-looking, independent, five-tier scale, five key areas
- Replicate the analyst output without regard for the analyst thought process, no analyst report

Quantitative Rating Example

AQR TM Large Cap Multi-Style N QTLNX ★★

Quantitative rating as of Oct 31, 2019

[Quote](#) [Fund Analysis](#) [Performance](#) [Risk](#) [Price](#) [Portfolio](#) [People](#) [Parent](#)

NAV / 1-Day Return 13.63 / 0.81%	Total Assets 323.4 Mil	Adj. Expense Ratio ⓘ 0.700%	Expense Ratio 0.700%	Fee Level Average	Load None
Category US Fund Large Blend	Investment Style  Large Blend	Minimum Initial Investment 1,000,000	Status Open	TTM Yield 0.71%	Turnover 59%


USD | NAV as of Dec 05, 2019 | 1-Day Return as of Dec 05, 2019, 9:26 AM GMT+8 | Quantitative Rating as of Oct 31, 2019, 5:00 AM

Morningstar's Analysis ⓘ


Quantitative Take

Investment Objective


Process^Q Oct 31, 2019

 Above Average

People^Q Oct 31, 2019

 Above Average

Parent^Q Oct 31, 2019

 Above Average

Access to Ratings

Fidelity® Contrafund® FCNTX ★★★★★ [+ Morningstar Analyst Rating](#)

Analyst rating as of Feb 22, 2019

Only available to Premium users, \$199 per year

[Quote](#) [Fund Analysis](#) [Performance](#) [Risk](#) [Price](#) [Portfolio](#) [People](#) [Parent](#)

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Morningstar's Analysis ⓘ

[Analyst Take](#) [Investment Objective](#)

Performance Feb 22, 2019
[PREMIUM](#)

Price Feb 22, 2019
[PREMIUM](#)

Process Feb 22, 2019
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People Feb 22, 2019
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[+ Read Full Analysis](#) ▾

Man vs. Machine

	Analyst Rating	Quantitative Rating
Selective Coverage	cover popular, easy-to-rate funds 😊	cover the remaining funds
Information Collection	hard + soft information 😊	hard information
Information Processing	cognitive constraints	detect complex patterns 😊
Output	rating + research report 😊	rating

Research Questions

- Can analyst ratings and quantitative ratings identify outperforming funds? Any difference and why?
- What is the information content in return predictability?
 - Public vs. private information
 - Analyst rating vs. report
- Do mutual fund investors react to various ratings?
 - Institutional vs. individual investors

Data

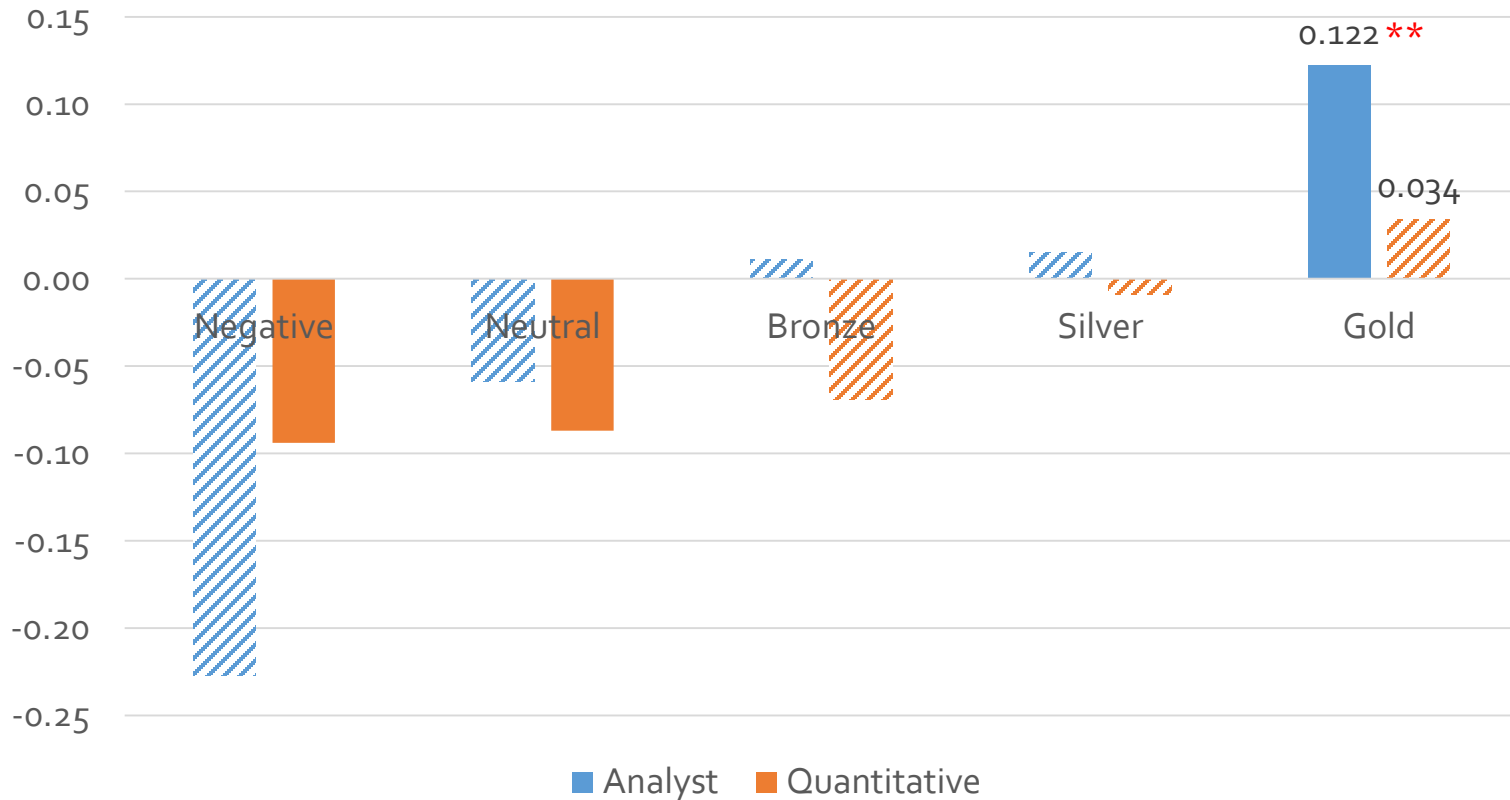
- Morningstar Direct: monthly ratings
- Morningstar website: analyst reports
- CRSP mutual fund database: monthly and quarterly fund characteristics
- Sample: U.S. actively managed equity mutual funds from 2011 to 2018
- **3,256** unique funds, **1,056** funds being rated by analysts at least once, 556 out of 2,475 funds are rated each month

Analyst Covered vs. Noncovered Funds

	Covered	Noncovered	Diff
Star Rating	3.436	2.846	0.590***
Fund Return	0.658	0.695	-0.037**
Style-adjusted Return	-0.015	-0.048	0.033***
Fund Flow	-0.536	-0.389	-0.147***
Log(Fund TNA)	8.060	5.693	2.367***
Expense Ratio	0.888	1.033	-0.145***
Turnover	0.576	0.762	-0.187***
Log(Fund Age)	5.456	5.196	0.259***

- Analyst covered funds: larger and older, lower fees and turnover, higher star rating and style-adjusted return

Analyst vs. Quantitative Rating



- Gold-rated funds recommended by analysts outperform the benchmark by 1.46% per year.

Analyst vs. Quantitative Rating

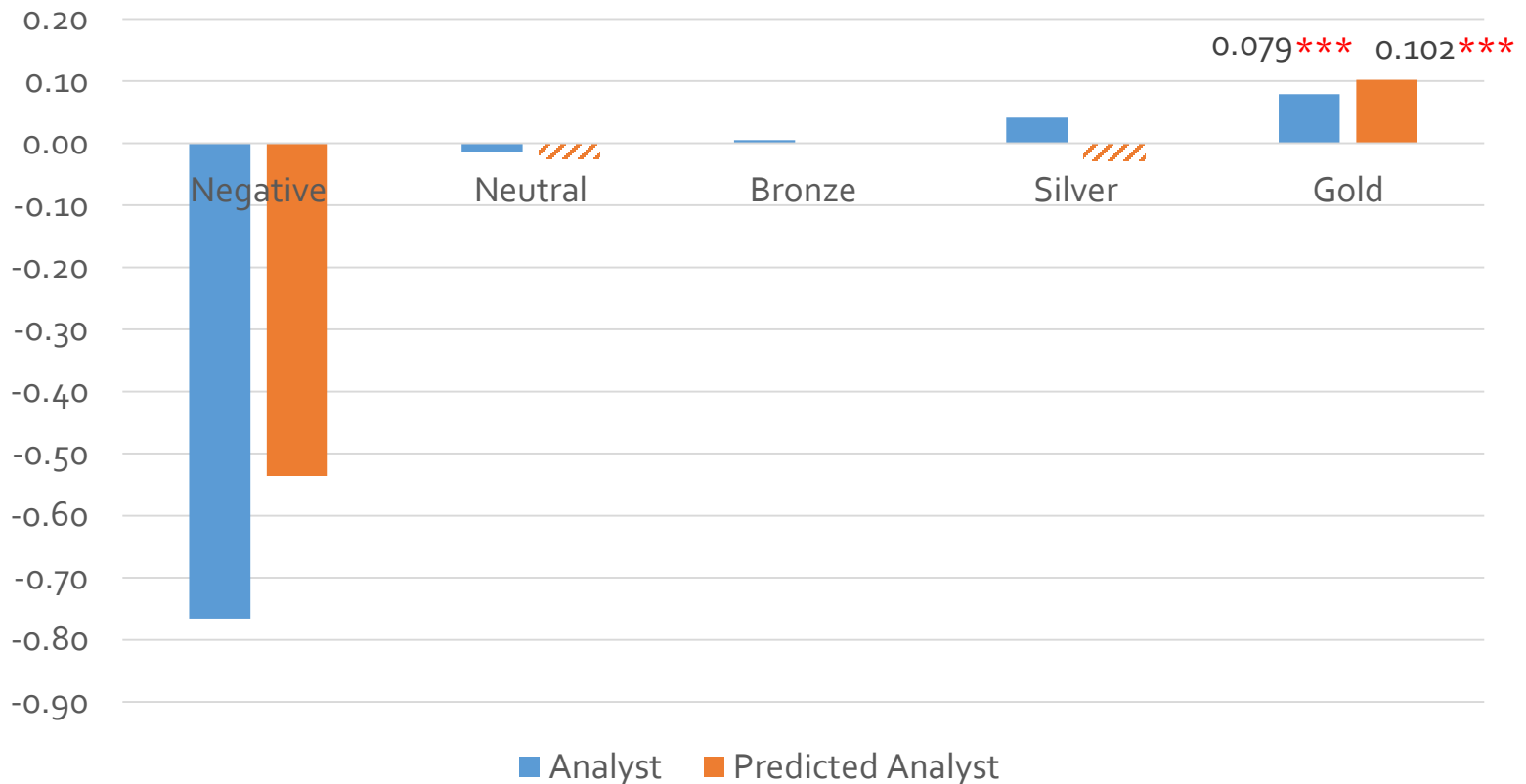
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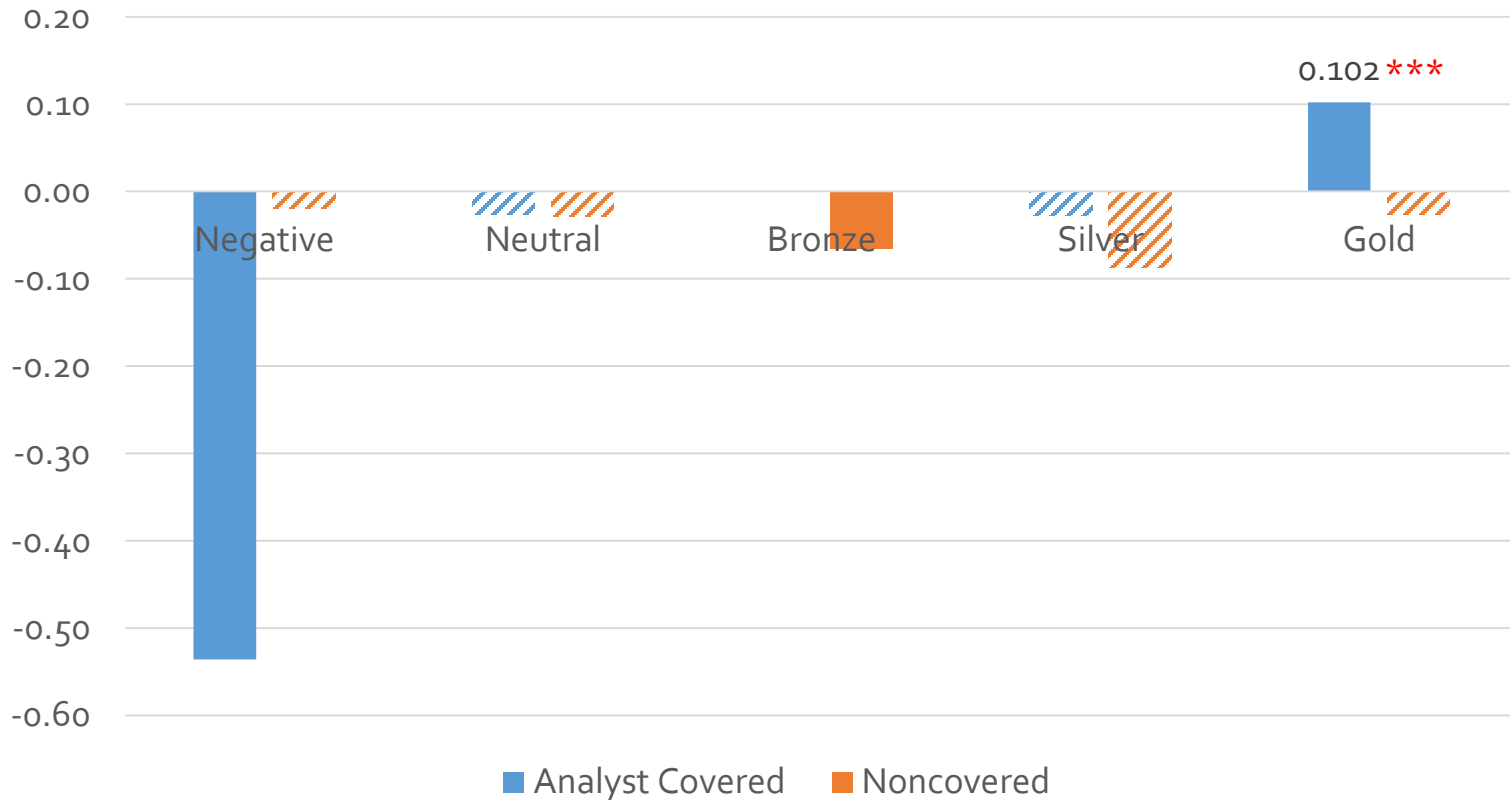
- Replicate the Morningstar methodology (random forest) and reconstruct the quantitative ratings for **all** funds
- Analyst covered funds: analyst rating $>$ predicted analyst rating \rightarrow informational advantage

Analyst Covered Funds: Analyst Rating vs. Predicted Analyst Rating



- Machine learning matches the analyst performance → not driven by the information channel

Predicted Analyst Rating: Analyst Covered vs. Noncovered Funds



- Analyst rating outperforms the quantitative rating mainly through the **selective coverage** channel.

Analyst vs. Quantitative Rating

- Investors should not treat the quantitative rating as an equivalent substitute for the analyst rating.
- Caveat: machine learning algorithm is trained on analyst covered funds and analyst ratings
- Potential avenues to enhance the rating quality: **randomize** the analyst coverage, or set an alternative objective function to **predict performance**

Analyst Rating is a Useful Indicator

	Gold Analyst Rating	5-Star Star Rating
Style-adjusted Return		
Net-of-Fee	0.91%	0.46%
Gross-of-Fee	0.98%	0.54%
No. of Funds	67	200

- Break-even portfolio size: $199 / (0.91\% - 0.46\%) = \$44,222$

Regression: Style-adjusted Return

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Analyst Rating	0.002 (0.16)		-0.001 (-0.10)			
Negative		-0.138 (-1.11)		-0.123 (-1.00)	-0.256 (-1.29)	-1.074 (-1.15)
Bronze		-0.009 (-0.48)		-0.019 (-0.90)	-0.019 (-0.92)	-0.021 (-0.86)
Silver		-0.018 (-0.59)		-0.028 (-0.86)	-0.029 (-0.88)	-0.051 (-1.35)
Gold		0.010 (0.26)		0.000 (0.01)	0.284*** (3.18)	0.390*** (2.99)
PosTone			0.034** (2.46)	0.036** (2.54)	0.043*** (2.78)	0.044* (1.92)
NegTone			-0.020 (-1.11)	-0.017 (-0.98)	-0.001 (-0.03)	0.016 (0.59)
Negative × PosTone					0.180** (2.10)	0.580** (2.09)
Negative × NegTone					-0.056 (-0.80)	-0.169 (-0.82)
Gold × PosTone					-0.063* (-1.70)	-0.108** (-2.42)
Gold × NegTone					-0.116*** (-3.82)	-0.126** (-2.13)
Controls	Y	Y	Y	Y	Y	Y

Portfolio Sort: Analyst Rating + Tone

Rank	PosTone				NegTone			
	Low	Med	High	HML	Low	Med	High	HML
Negative	-0.548** (-2.35)	-0.071 (-0.64)	-0.080 (-1.47)	0.467* (1.90)	-0.063 (-0.82)	-0.143 (-1.33)	-0.487** (-2.06)	-0.424* (-1.69)
Neutral	-0.016 (-0.62)	0.010 (0.33)	0.044 (1.30)	0.061* (1.78)	0.008 (0.39)	-0.005 (-0.16)	0.024 (0.91)	0.016 (0.66)
Bronze	-0.017 (-0.55)	0.021 (0.94)	0.057** (2.00)	0.074* (1.86)	0.013 (0.49)	0.041* (1.74)	0.018 (0.71)	0.005 (0.16)
Silver	0.012 (0.49)	0.048* (1.88)	0.039 (1.28)	0.028 (0.71)	0.044** (2.40)	0.036 (1.48)	0.029 (1.06)	-0.016 (-0.50)
Gold	0.140 (1.57)	0.038* (1.86)	0.083*** (3.02)	-0.057 (-0.61)	0.156*** (3.87)	0.082*** (3.30)	0.014 (0.48)	-0.143*** (-2.66)

- Gold-rated funds with low negative tone outperform the benchmark by 1.87% per year (0.91% for average Gold rating)
- Analyst report (soft information) augments analyst rating (known fund characteristics) → **man plus machine**

Regression: Fund Flow

Rating =	Analyst Rating			Quantitative Rating		
	Model 1	Model 2	Model 3	Model 7	Model 8	Model 9
Rating	0.104*** (6.13)	-0.012 (-0.65)		0.242*** (8.49)	0.063** (2.64)	
Negative			0.137 (1.08)			-0.004 (-0.07)
Bronze			0.064* (1.67)			0.044 (0.72)
Silver			0.012 (0.23)			0.145** (2.41)
Gold			-0.052 (-0.86)			0.264* (1.89)
Star Rating		0.395*** (15.88)	0.394*** (15.69)		0.314*** (9.54)	0.320*** (9.38)
1M Return	0.078*** (7.27)	0.071*** (6.46)	0.071*** (6.48)	0.057*** (4.04)	0.051*** (3.67)	0.051*** (3.66)
Controls	Y	Y	Y	Y	Y	Y

- 1 std.dev. increase in quantitative (star) rating → 3% (16%) higher fund flows

Regression: Fund Flow by Investor Type

	Model 5	Model 6
PosTone	0.022 (0.78)	0.023 (0.75)
NegTone	-0.039 (-1.34)	-0.046 (-1.47)
Negative × PosTone × INST		0.029 (0.15)
Negative × NegTone × INST		0.207 (1.19)
Negative × PosTone × INDV		-0.107 (-0.56)
Negative × NegTone × INDV		0.344* (1.88)
Gold × PosTone × INST	0.013 (0.15)	0.012 (0.13)
Gold × NegTone × INST	-0.239** (-2.47)	-0.232** (-2.06)
Gold × PosTone × INDV	-0.125* (-1.71)	-0.126 (-1.51)
Gold × NegTone × INDV	-0.117 (-1.26)	-0.110 (-1.17)
INST	-0.044 (-0.93)	-0.044 (-0.91)
Controls	Y	Y

Robustness Test: Tone in Summary and Title

	Style-adjusted Return		Flow	
	Model 3	Model 4	Model 5	Model 6
Analyst Rating	-0.002 (-0.15)		-0.012 (-0.65)	
Negative		-0.124 (-1.01)		0.185 (1.47)
Bronze		-0.020 (-0.96)		0.057 (1.43)
Silver		-0.030 (-0.91)		0.009 (0.17)
Gold		-0.002 (-0.05)		-0.045 (-0.73)
PosTone	0.036* (1.90)	0.037* (1.95)	-0.030 (-0.89)	-0.035 (-1.00)
NegTone	-0.026 (-1.21)	-0.023 (-1.07)	0.038 (0.92)	0.036 (0.89)
PosTone_Summary	-0.002 (-0.21)	-0.002 (-0.17)	0.032* (1.80)	0.031* (1.73)
NegTone_Summary	0.004 (0.41)	0.005 (0.45)	-0.061*** (-3.25)	-0.061*** (-3.25)
PosTone_Title	0.001 (1.11)	0.001 (1.22)	0.001 (1.38)	0.001 (1.28)
NegTone_Title	0.000 (0.07)	0.000 (0.09)	-0.004** (-2.28)	-0.004** (-2.29)
Controls	Y	Y	Y	Y

Robustness Tests

- Alternative investment horizon: up to 3 years
- Alternative proxies for performance and tone
- Rating switch
- 5 Pillars
- Propensity-matched sample
- Predicted analyst score
- Initial analyst coverage
- Expanded sample including hybrid funds and bond funds

Conclusion

- Morningstar analyst rating improves the investment outcome.
 - 5-Star: 0.46%
 - Gold: 0.91%
 - Gold + less negative tone: 1.87%
 - Machine-learning-based quantitative rating differs from analyst rating due to the selection of analyst coverage.
 - Analyst rating → observable fund characteristics
 - Tone in analyst reports → soft information
 - Individual investors chase star rating, quantitative rating, and recent performance.
- } man plus
} machine