



Modified Information Ratio to Predict Fund Performance

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Research Objectives:

- The modified IR as a predictor of future fund performance.
- Superiority of diversified over concentrated funds.

IR is modified to include a required target alpha.

- This is a preference choice, not a parameter in the optimization problem.
- It combines momentum, tracking error, and a minimum return beyond the benchmark.

Empirical Design and Results:

- We selected domestic funds with 36 months of prior returns from the CRSP Survivorship Bias Free Mutual Fund database.
- We examined the performance of these funds in the subsequent year.
- We compared the predictive ability of the modified IR measure to measures suggested in the literature, and found it superior to these measures.

We compared funds in the top quintile of modified IR which also exceeded their target alpha in the prior 36 months for various levels of target alpha

The higher the target alpha:

- The higher the tracking error, expense ratio and turnover ratio.
- The lower is the size and number of positions.
- Surprisingly, future performance is **not** better.

Conditioning on both top quintile of modified IR and ability to exceed target alpha in the prior 36 months, we found that:

- Funds with fewer than 100 positions (concentrated) underperform funds with more than 100 positions (diversified).

Acknowledgements

- Active share data obtained from Antti Petajisto's website which relates to his 2013 FAJ study.
- Recent active share data provided by Joseph Mezrich at Nomura Securities.

Short Literature Survey

- Momentum and tracking error were shown to be predictive of future fund returns.
- Sparse work on IR.
- Regression of fund returns on FF factors to identify manager's skill.
- Active share and activeness of a fund.

Investor Selection of Funds - Conceptual Foundation

Available options:

- Mean – Variance optimization
- Risk preferences
- Specifying a target Alpha

Specifying a target Alpha (beyond benchmark) has implications for:

- The kinds of funds that are likely to deliver this Alpha
- Their characteristics
- Their actual performance

Modified IR

The conventional IR is alpha (α) divided by tracking error (σ), i.e.

$$\mathbf{IR = \alpha / \sigma}$$

We modify IR by subtracting a target alpha (α^*) from the numerator:

$$\mathbf{IR^* = (\alpha - \alpha^*) / \sigma}$$

Note that to achieve a higher modified IR^* , a fund is likely to have a higher tracking error (σ).

Fund Choice

Which fund should you choose?

Fund A has an IR of 3. Fund B' IR is 0.5.

Fund Choice

Which fund should you choose?

Fund A has an IR of 1. Fund B' IR is 0.5.

Fund A has an alpha of 1BP and tracking error of 1BP.

Fund B has an alpha of 200BP and tracking error of 400BP.

You cannot pay your mortgage with IR.

Modified IR – Pros and Cons

- Combines momentum and tracking error.
- Requires a minimum return.
 - A passive index investment has an infinite negative IR if there is a cost to the investor.
- Can be calculated from past returns and does not need holdings data as in active share.
- However, it typically requires a long history of data to make meaningful comparisons.

Future Performance of Funds

- We examine only funds that have 36 months of returns.
- We assume selection of funds takes place at the end of December.
- We examine excess returns for the following year ($t+1$).
- Excess returns are cumulative fund returns minus cumulative returns on the fund's benchmark.

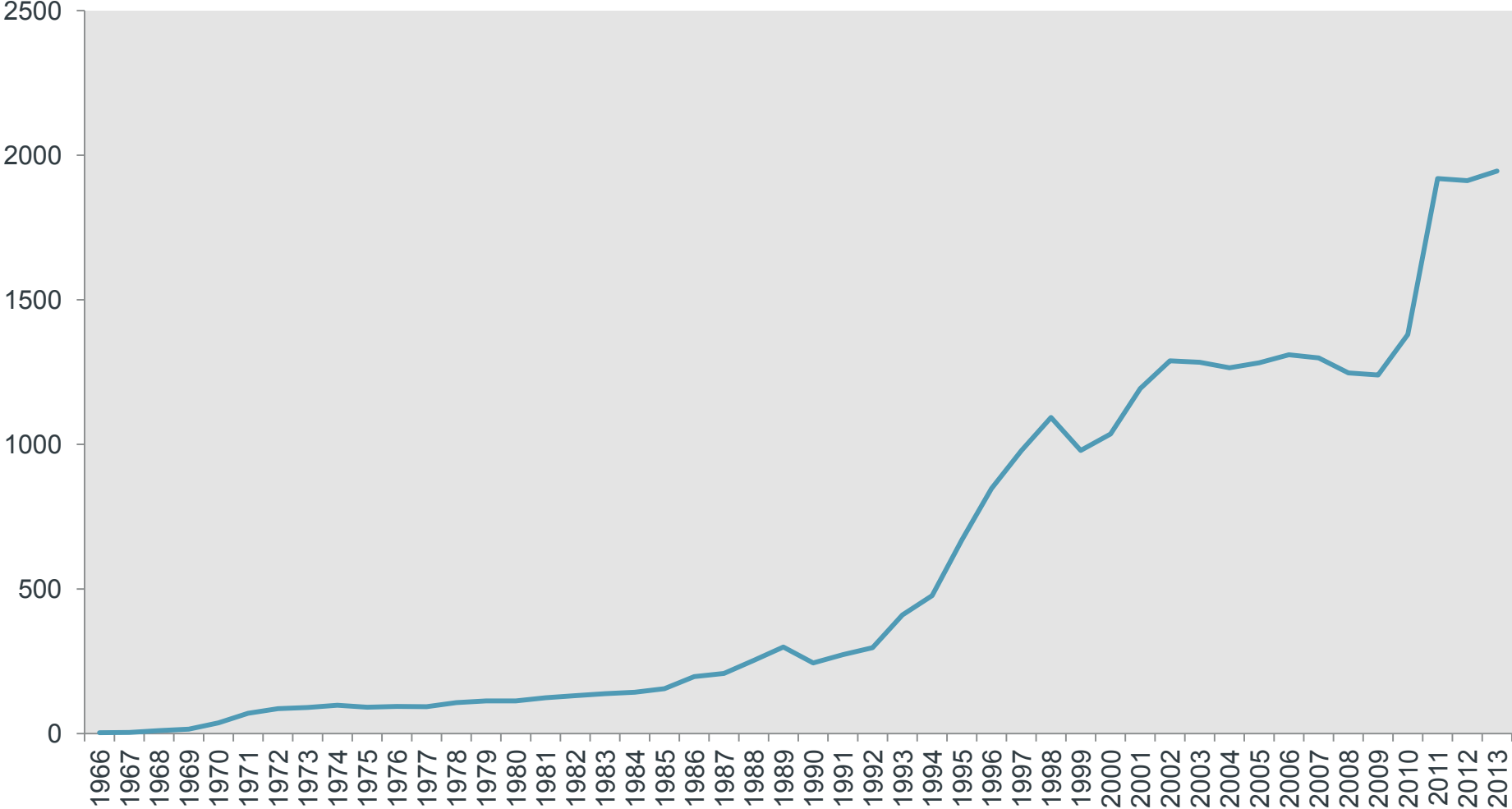
- Data are from CRSP survivorship bias free database.
- Fund benchmark is from Petajisto's active share data. If unavailable, we use the benchmark from Nomura's active share data. Otherwise, we assume the S&P 500 Index.
- We also examine the results of regressing the fund returns on the FF factors of market, value, size, momentum and short-term reversals.
- All variables are weighted averages over all classes of shares, where the weight is TNA.

Selection Criteria

- Funds are domestic equity funds.
- Eliminate index or sector funds.
- Eliminate funds with assets below \$15 million.
- Monthly returns are from CRSP.
- Fund data (such as expense ratios, turnover ratios, number of positions, etc.) are all from CRSP.

Distribution of Sample Funds

Number of Funds



As of 2014.
Source QMA, CRSP Survivorship Bias Free Mutual Fund Database.
This is shown for illustrative purposes only. Please see 'Notes to Disclosure' page for Important Information including risk factors and disclosures.

Variables Used to Select Funds

Momentum - The cumulative return on the fund in the past 36 months minus the cumulative return on the benchmark.

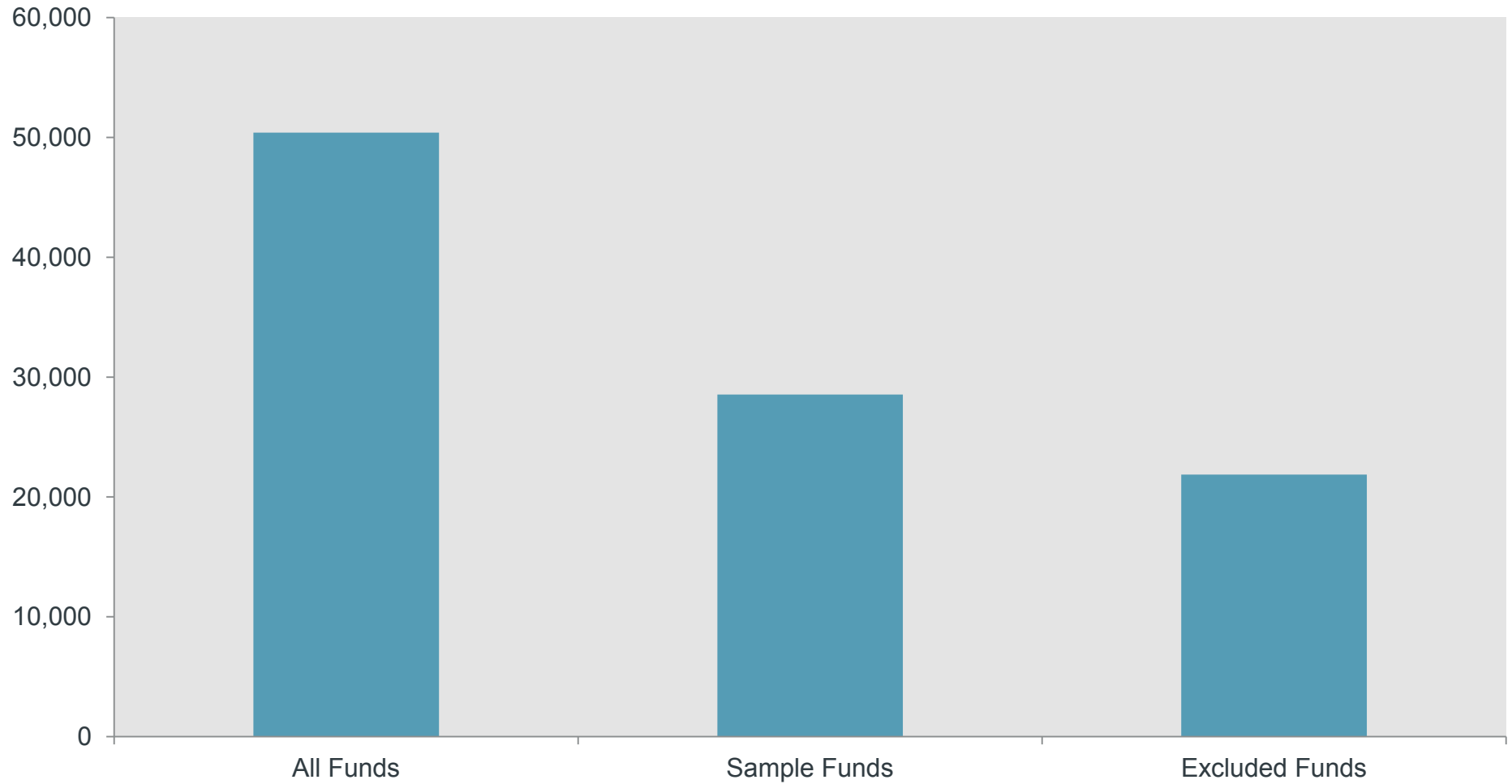
Tracking error – The standard deviation of the fund return minus the benchmark return during the past 36 months.

Information Ratio – The average monthly excess return (over benchmark) divided by tracking error.

Variables Used to Select Funds

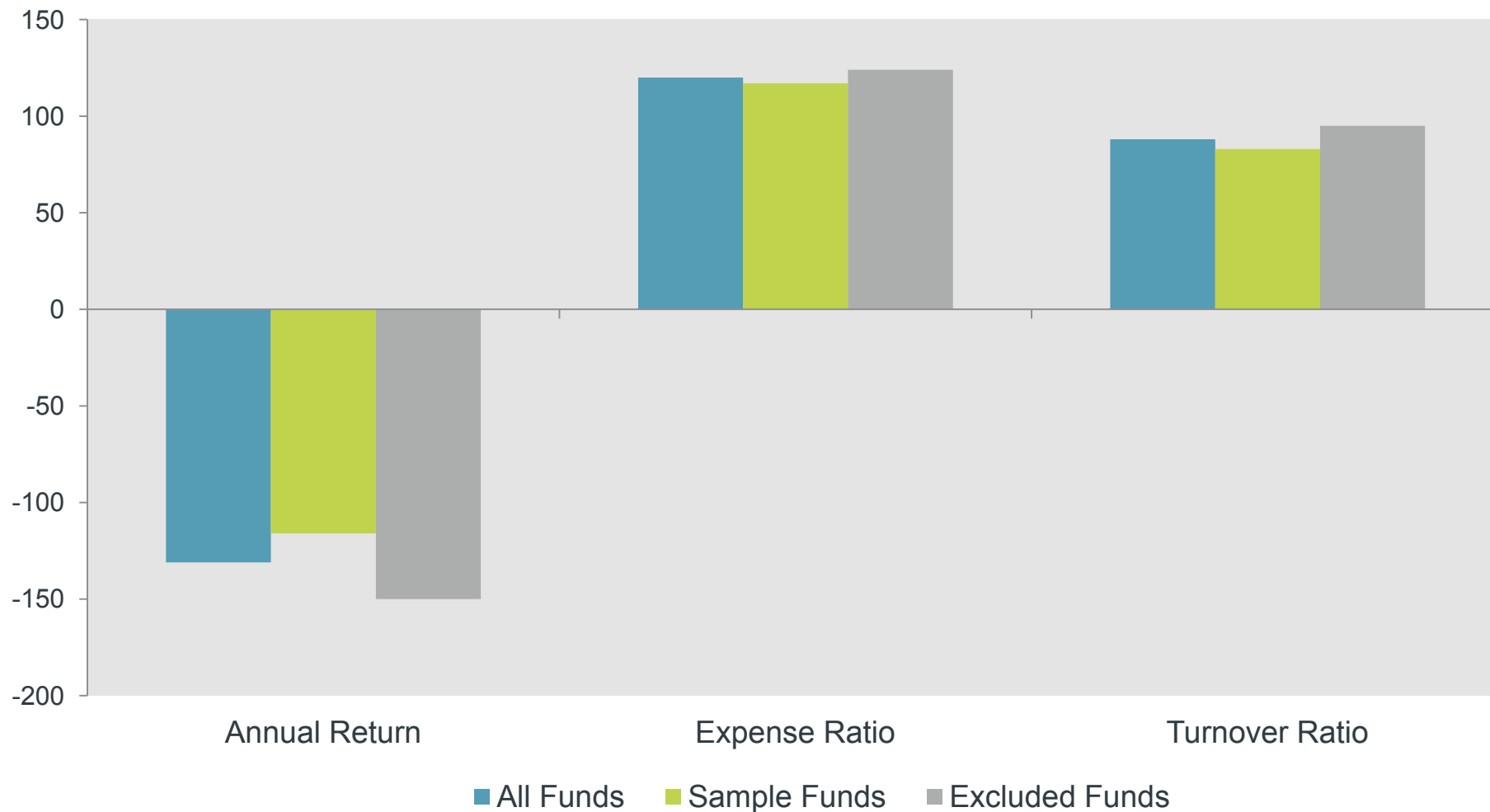
- Active share from Petajisto, or from Nomura if unavailable.
- Intercept from FF regression.
- Intercept t-statistic from FF regression.
- R-square from FF regression. This is the only selection variable where low values are preferred; most of the fund return cannot be explained by the FF risk factors.

Number of Observations



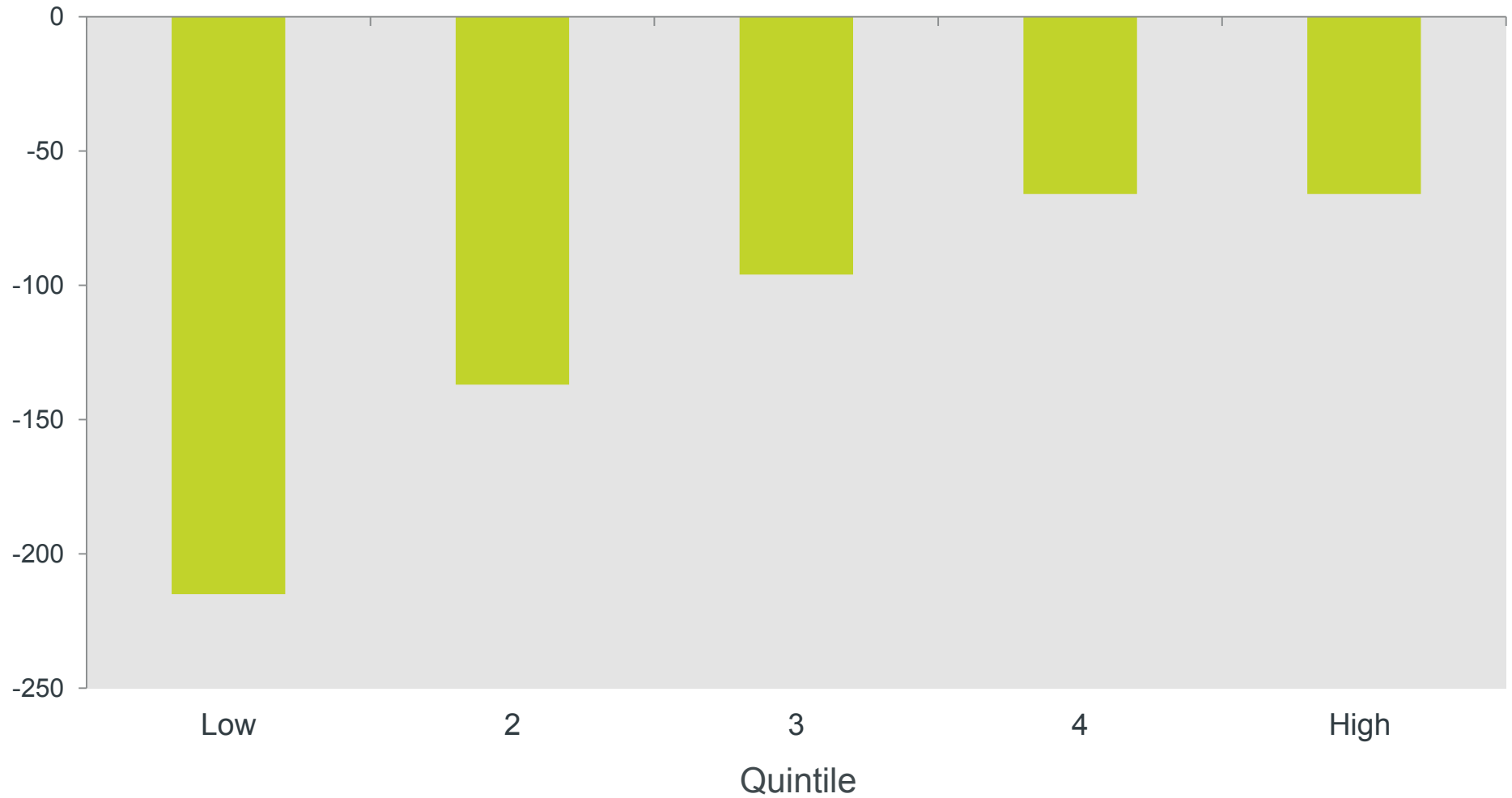
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Fund Characteristics



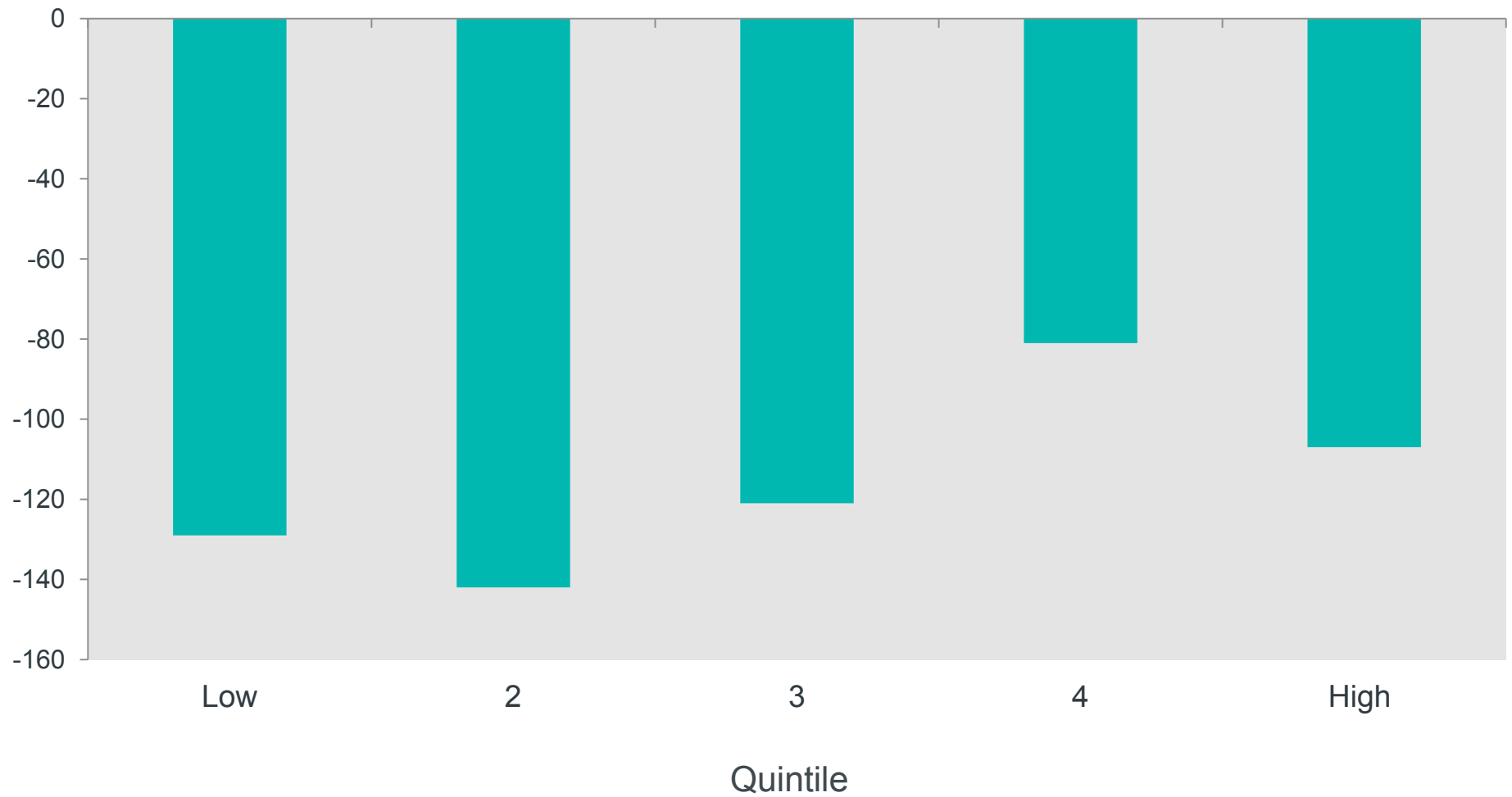
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Mean Annual Return - Momentum



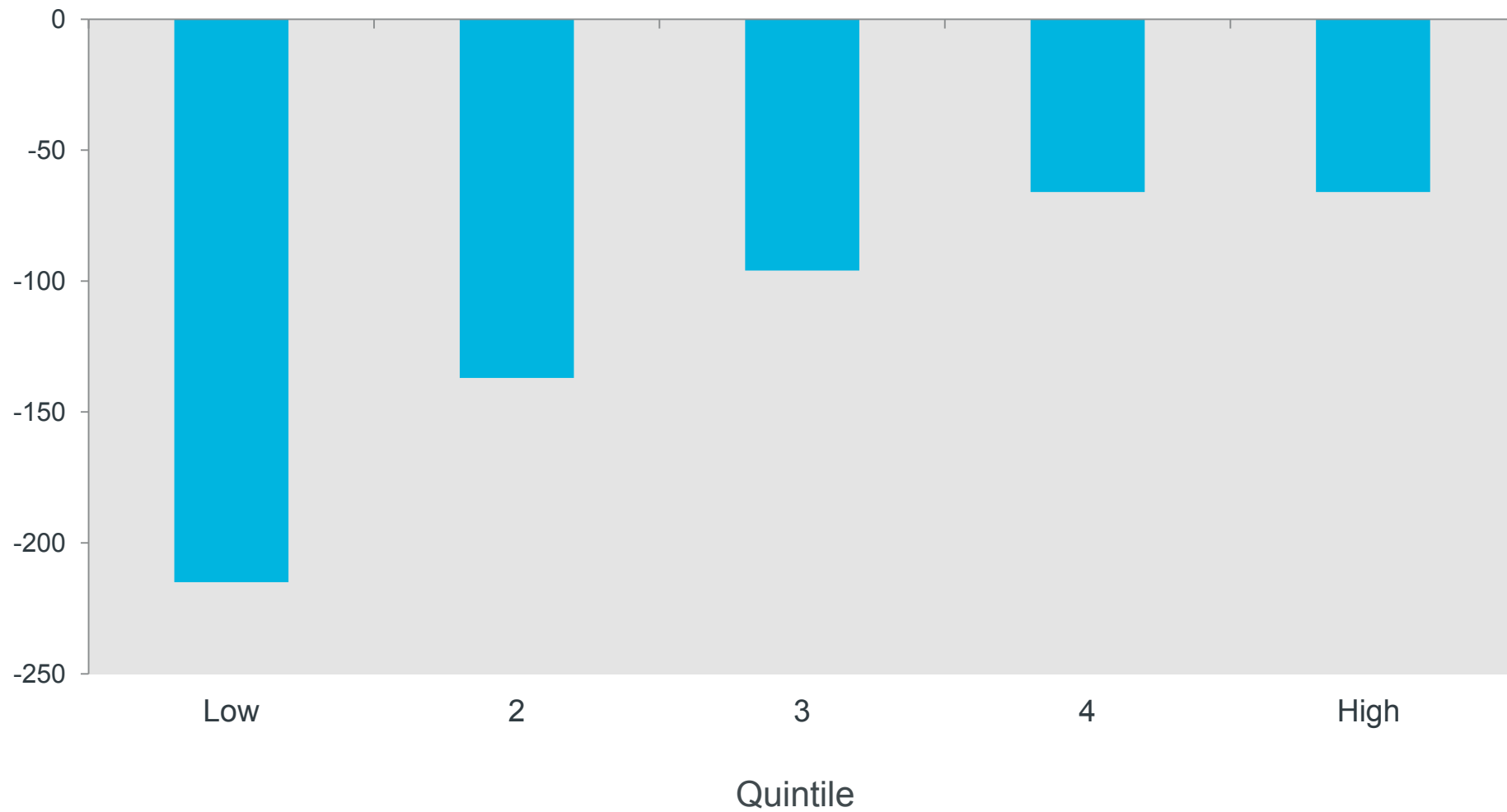
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Tracking Error



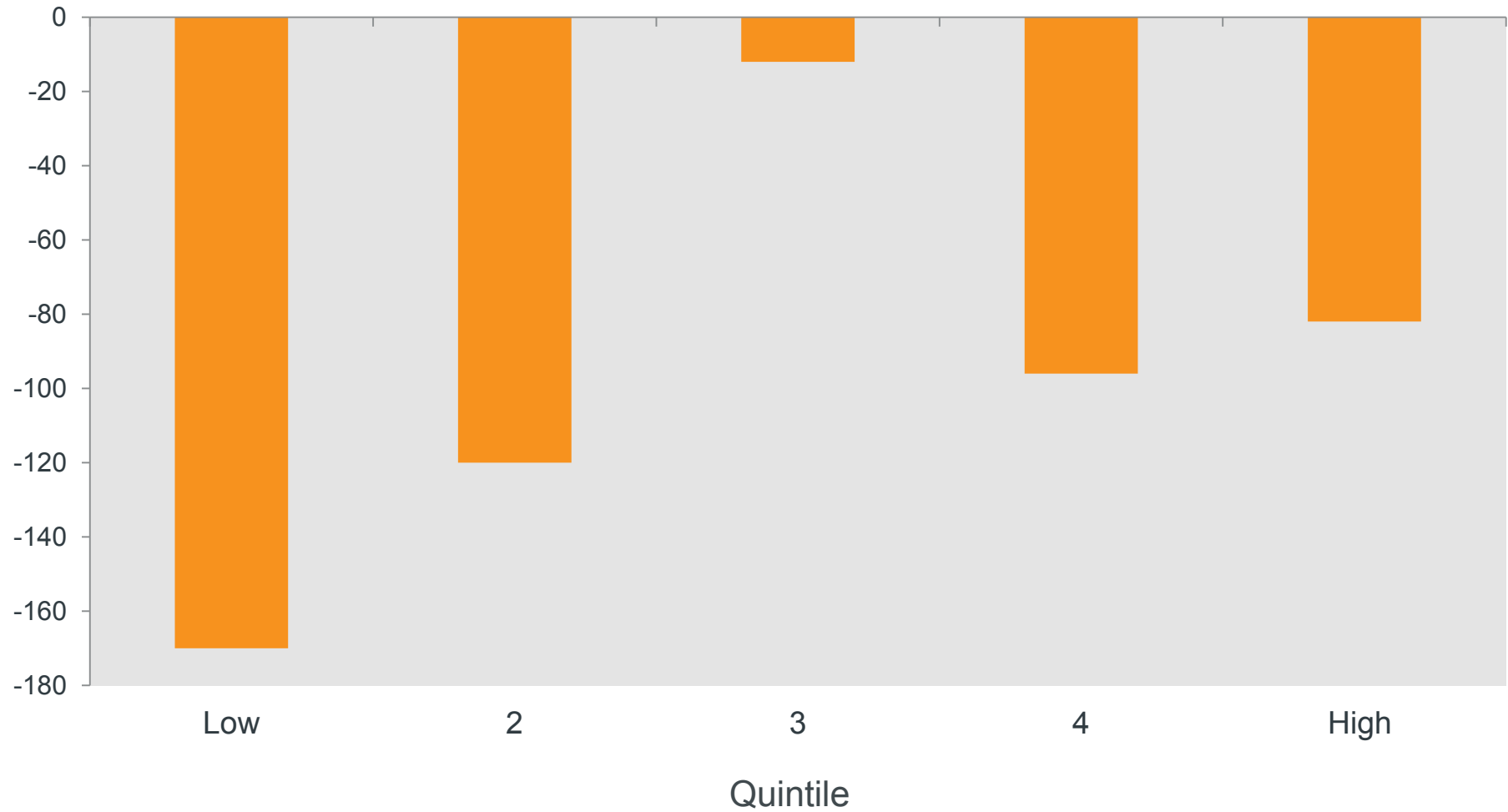
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Information Ratio



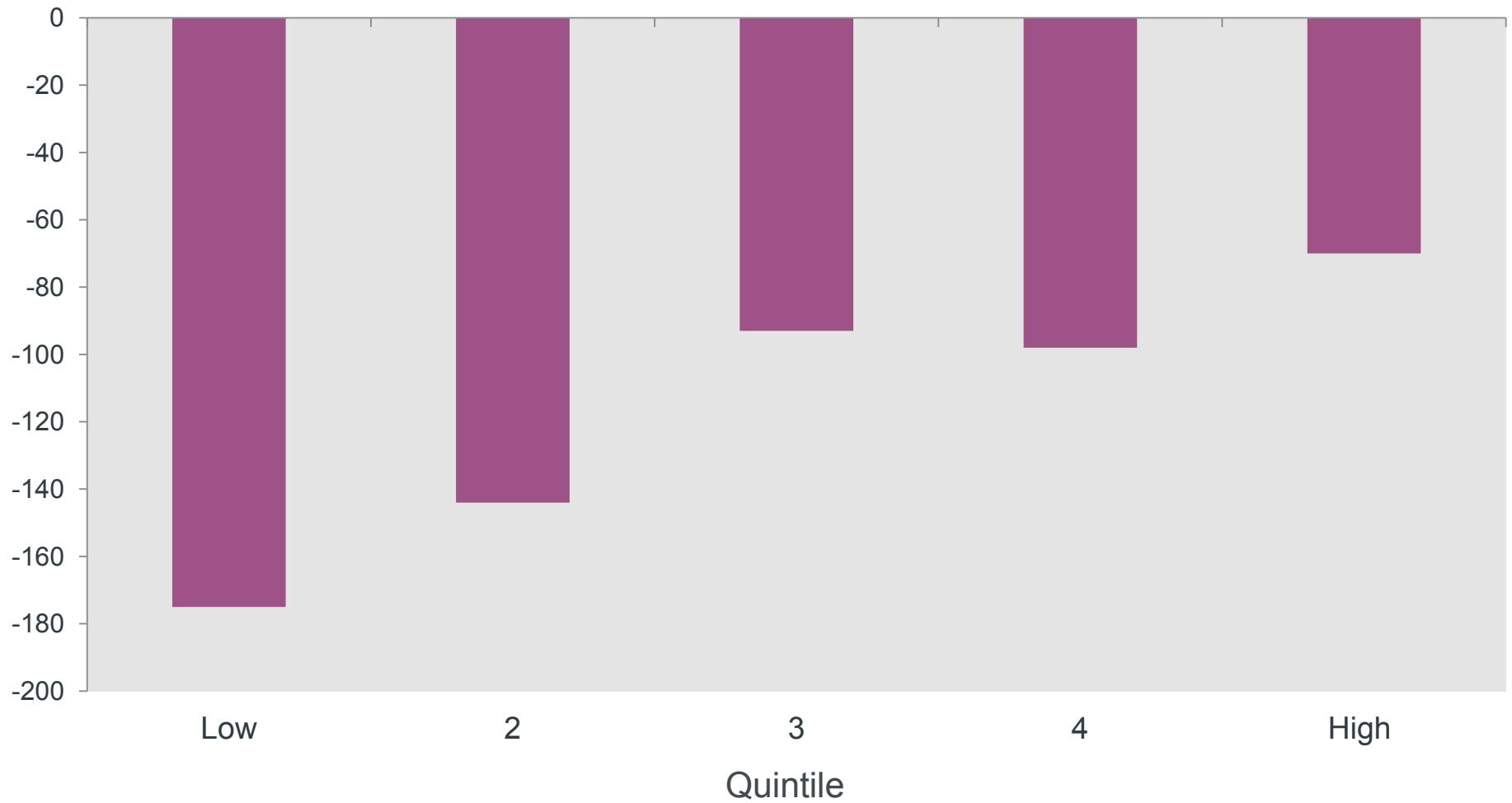
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FF Regression Intercept



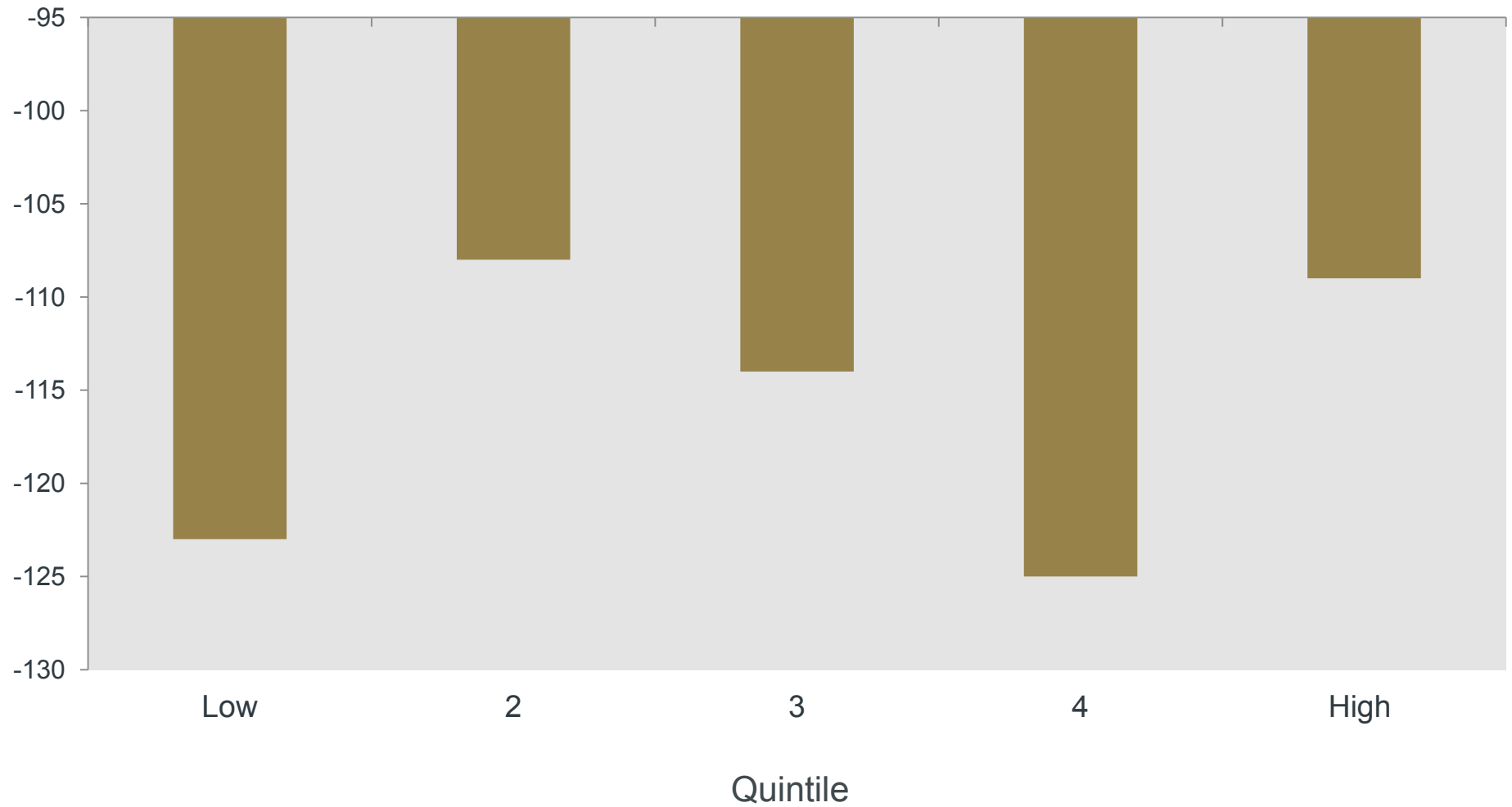
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FF Intercept T-Statistic



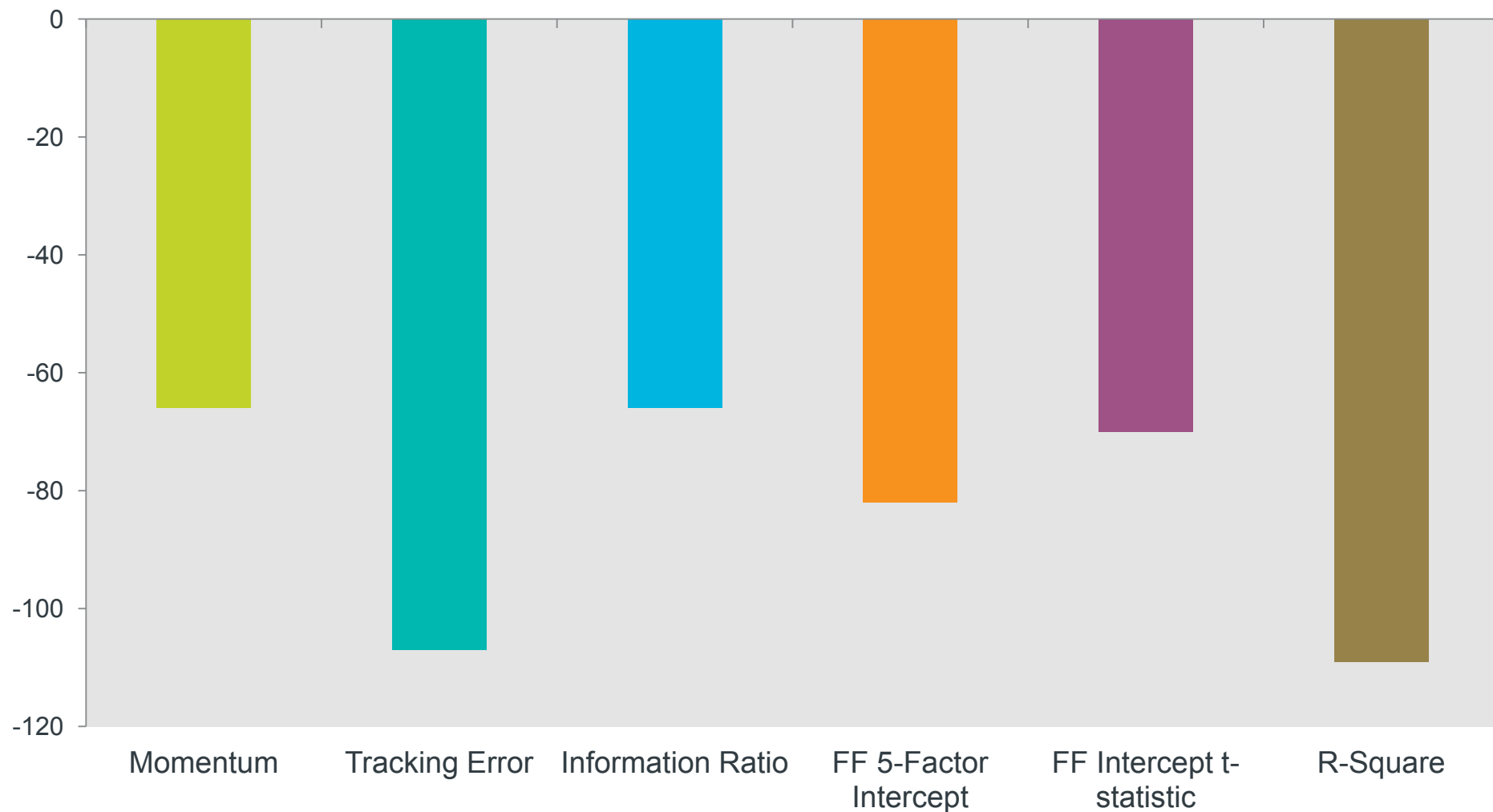
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FF Regression R-Square



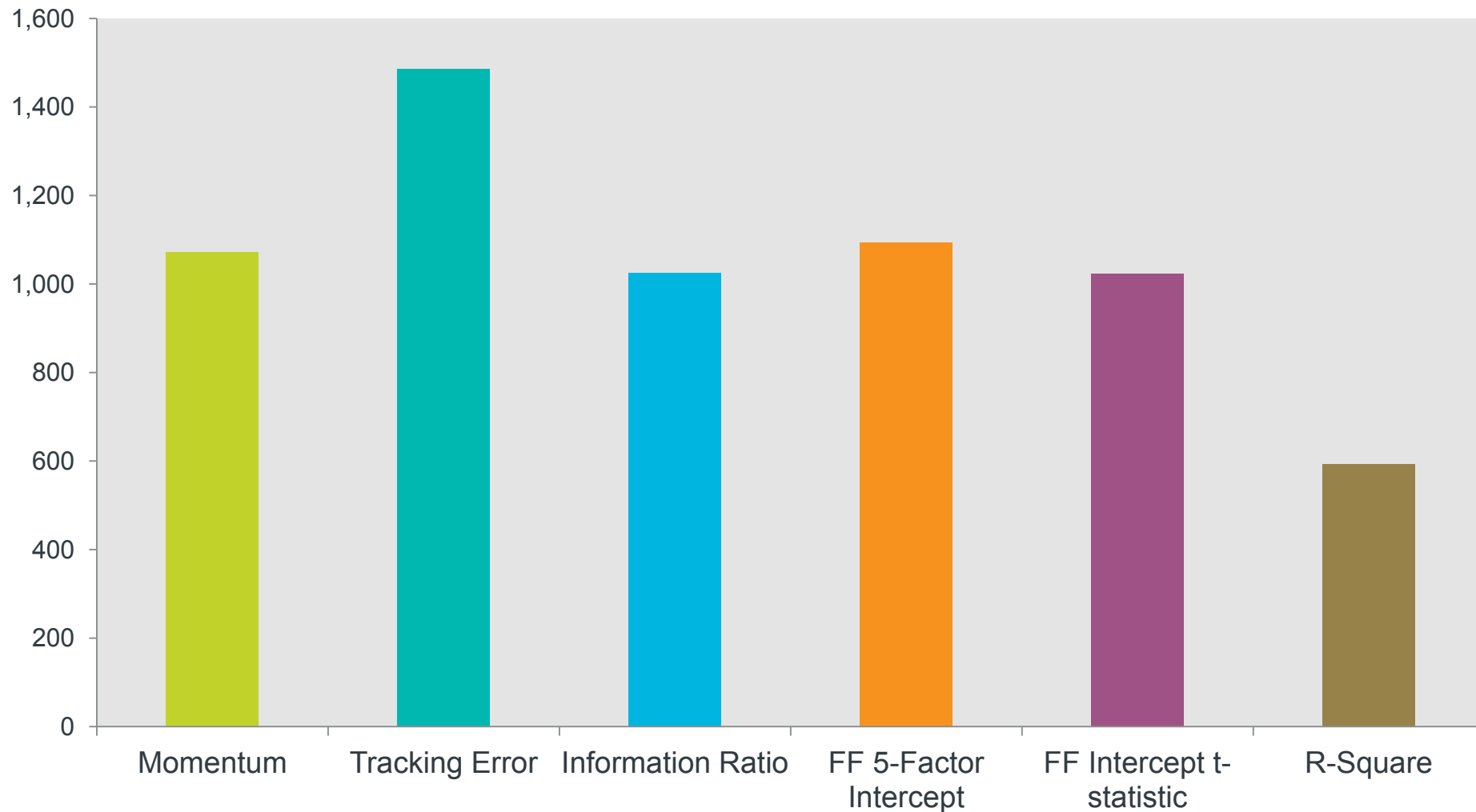
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Comparing Top Quintile Across Predictors



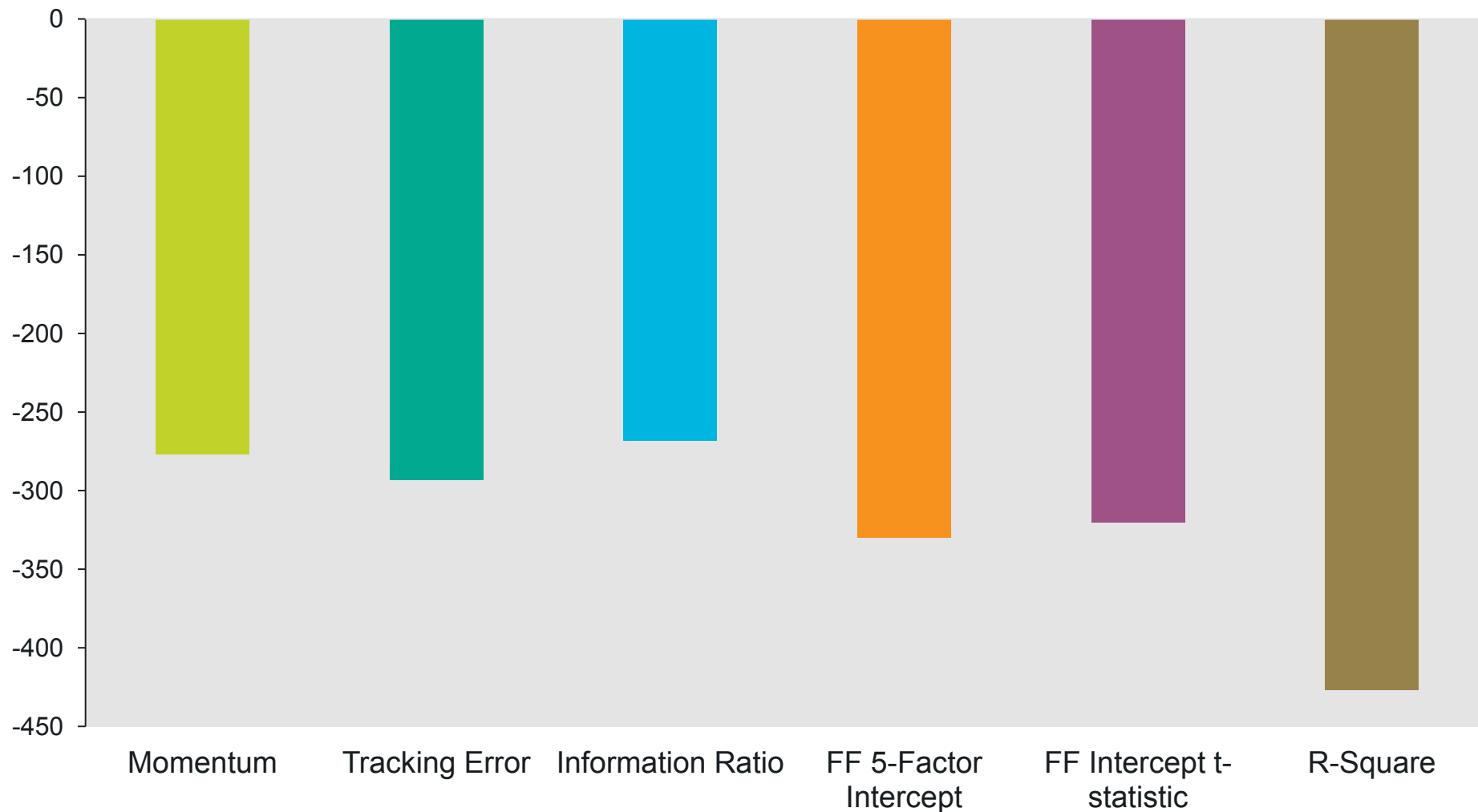
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Comparing Standard Deviation of Returns



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Comparing 3-Year Excess Return



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Observations with Active Share

Mean Annual Excess Return (BP) 1980-2013

Information Ratio

Active Share	Low	2	3	4	High	All
Low	-123	-102	-114	-130	38	-96
2	-170	-137	-117	-54	-119	-120
3	-112	-110	-101	-86	-132	-108
4	-163	-67	-33	-79	-72	-78
High	-172	57	-10	23	-25	-13
All	-144	-75	-74	-60	-65	-83

Source QMA, Antti Petajisto (2013 FAJ study), Joseph Mezrich (Nomura Securities), CRSP Survivorship Bias Free Mutual Fund Database.
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Observations with Active Share

Mean Annual Excess Return (BP) 2002-2013

Information Ratio

Active Share	Low	2	3	4	High	All
Low	-107	-72	-98	-111	47	-75
2	-119	-108	-79	-78	-109	-98
3	-108	-105	-107	-105	-115	-108
4	-116	-37	-97	-119	-56	-84
High	-56	-26	-85	-111	-58	-69
All	-104	-71	-93	-105	-61	-87

Source QMA, Antti Petajisto (2013 FAJ study), Joseph Mezrich (Nomura Securities), CRSP Survivorship Bias Free Mutual Fund Database.
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Observations with Active Share, Standard Deviation, Annual Return (BP) 2002-2013

Information Ratio

Active Share	Low	2	3	4	High	All
Low	366	389	416	381	619	432
2	509	477	495	577	481	510
3	615	548	556	568	602	576
4	826	704	705	703	673	720
High	1165	1013	789	831	757	896
All	682	657	610	642	647	648

Source QMA, Antti Petajisto (2013 FAJ study), Joseph Mezrich (Nomura Securities), CRSP Survivorship Bias Free Mutual Fund Database.
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Summary of Comparisons

Active share has been a good method to predict future fund performance, but has lost its power in recent years. In addition, it is:

- Not monotonic.
- Has a large standard deviation in future returns.

The information ratio.

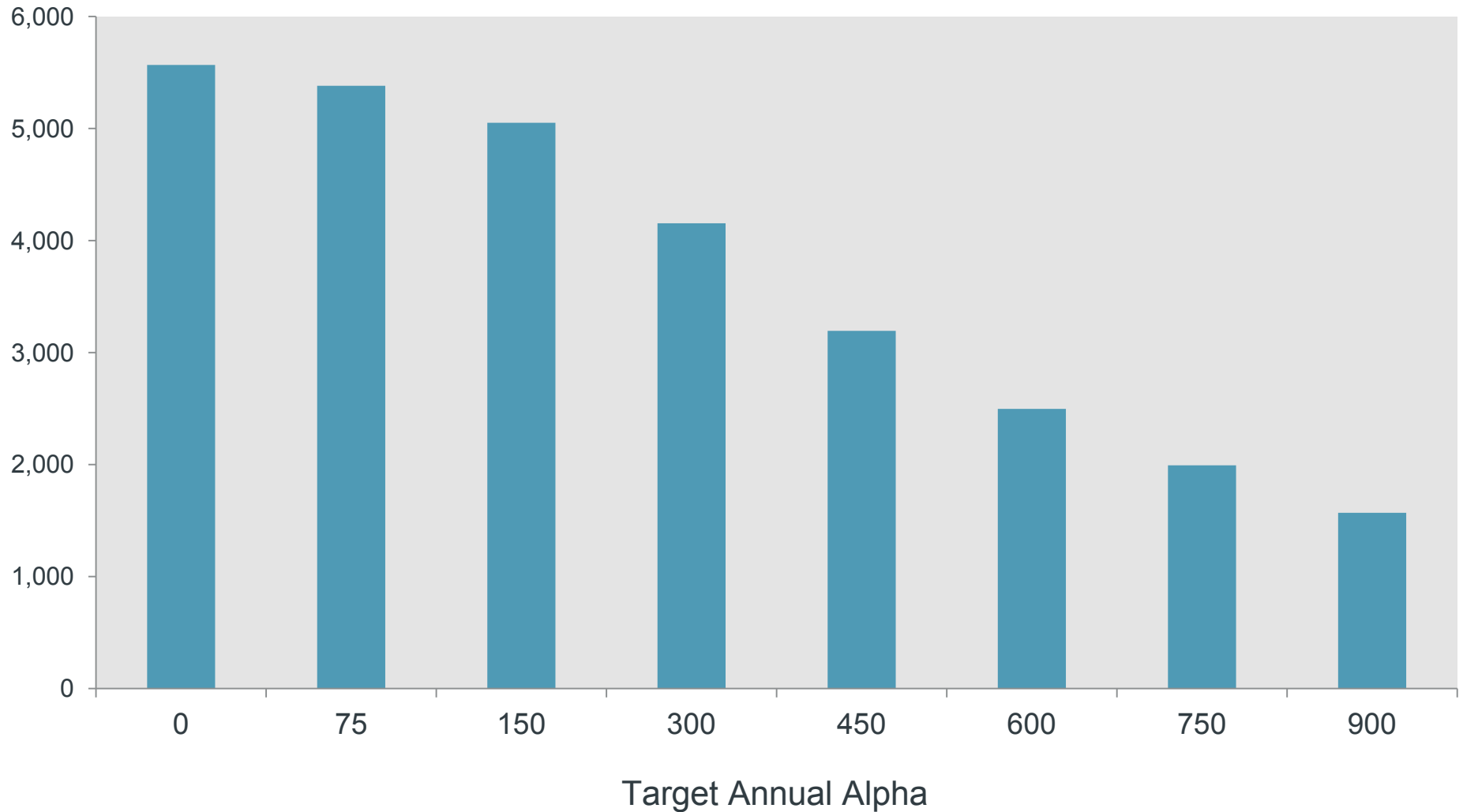
- Has consistently good predictive ability.
- Has the lowest standard deviation.
- Monotonic.

- We examined the performance of the modified IR measure, where an investor specifies a target Alpha (above benchmark).
- We used a target annual Alpha of 0, 75, 150, 300, 450, 600, 750 and 900.
- We examined those funds that were both in the top quintile of modified IR, **and** that exceeded their target alpha in the prior 36 months.

Number of Funds



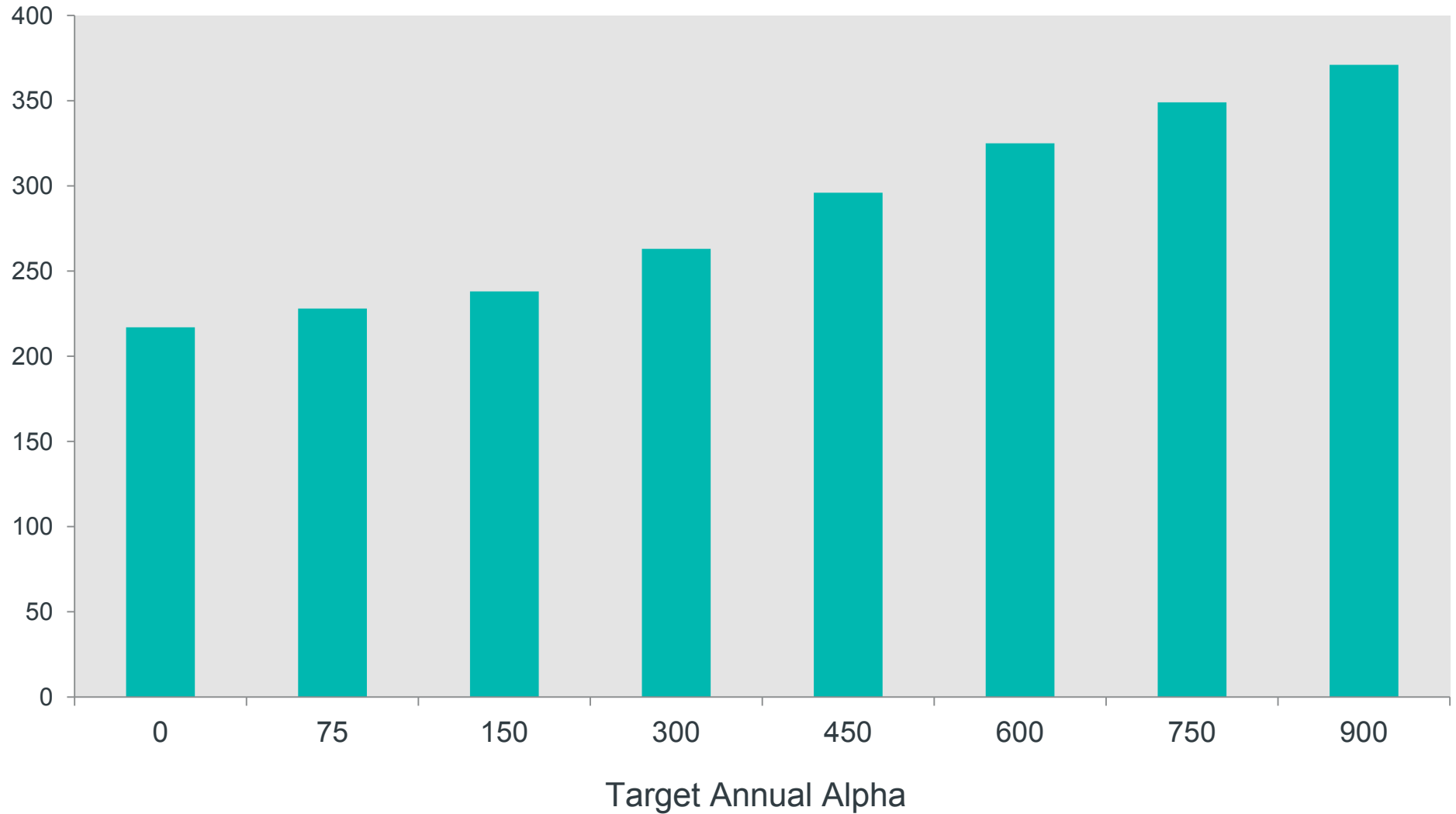
Number of Funds



As of 2014.
Source QMA, CRSP Survivorship Bias Free Mutual Fund Database.
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Tracking Error

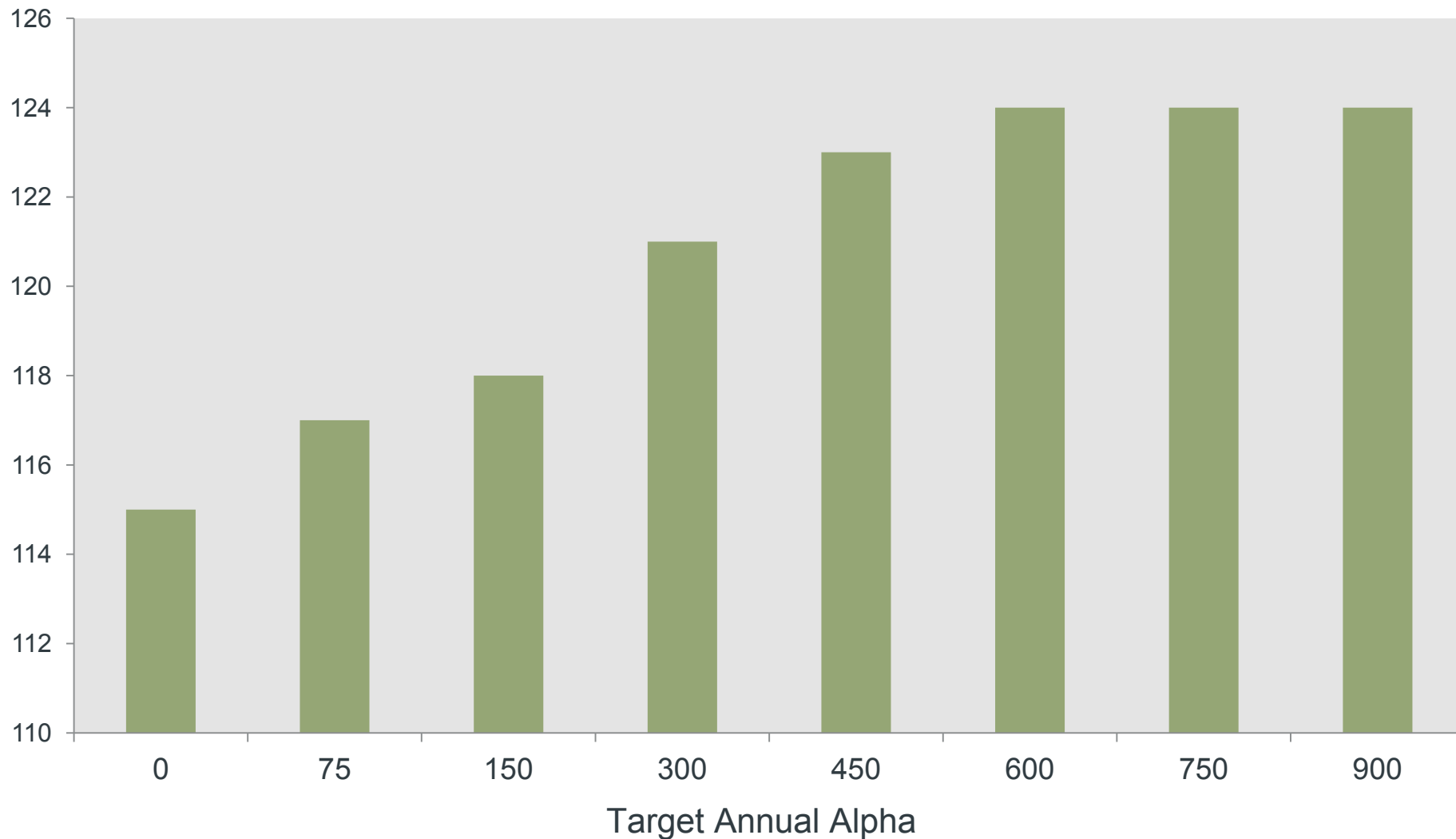
Tracking Error (BP/year)



As of 2014.
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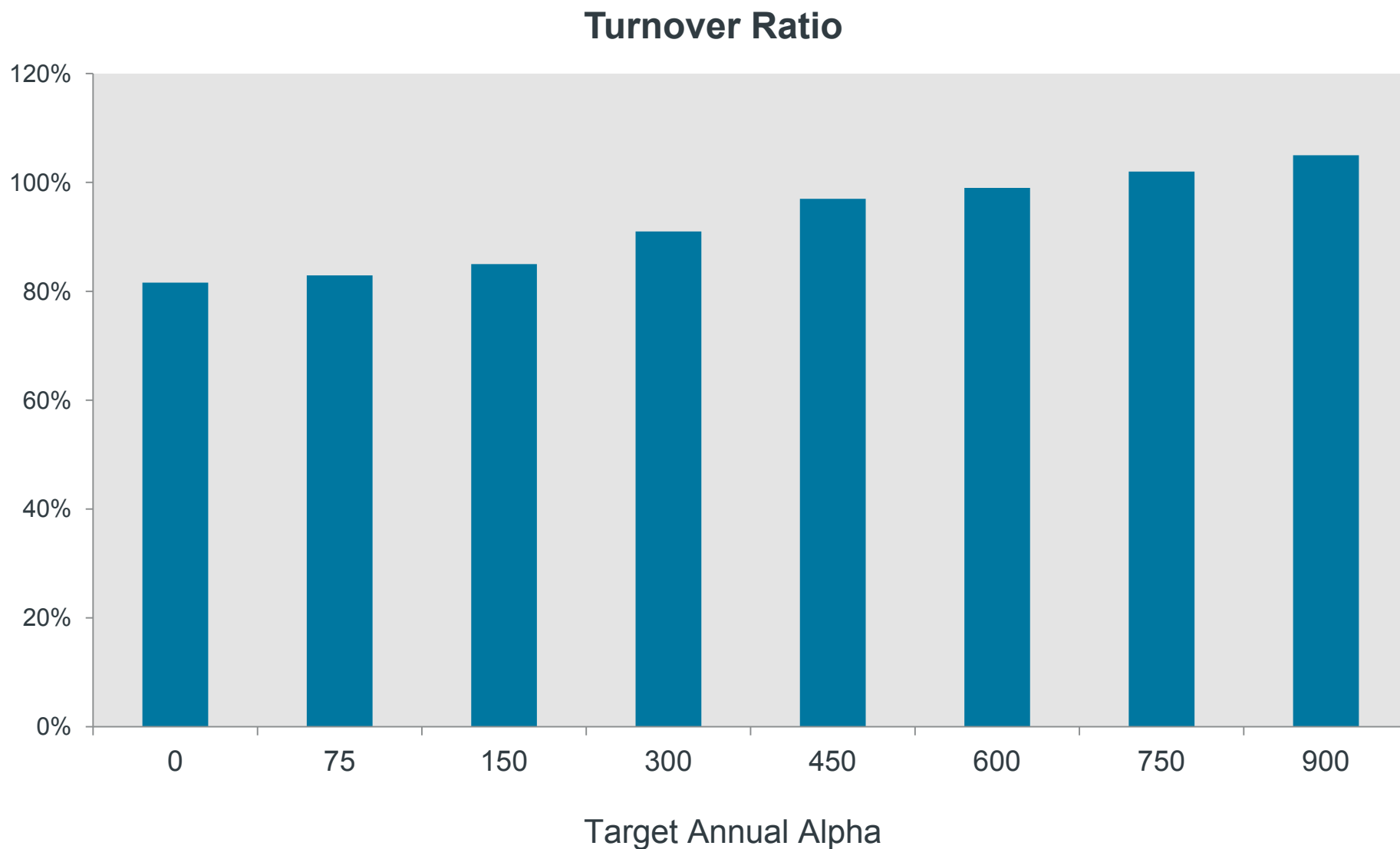
Expense Ratio

Expense Ratio (BP)



As of 2014.
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Turnover Ratio



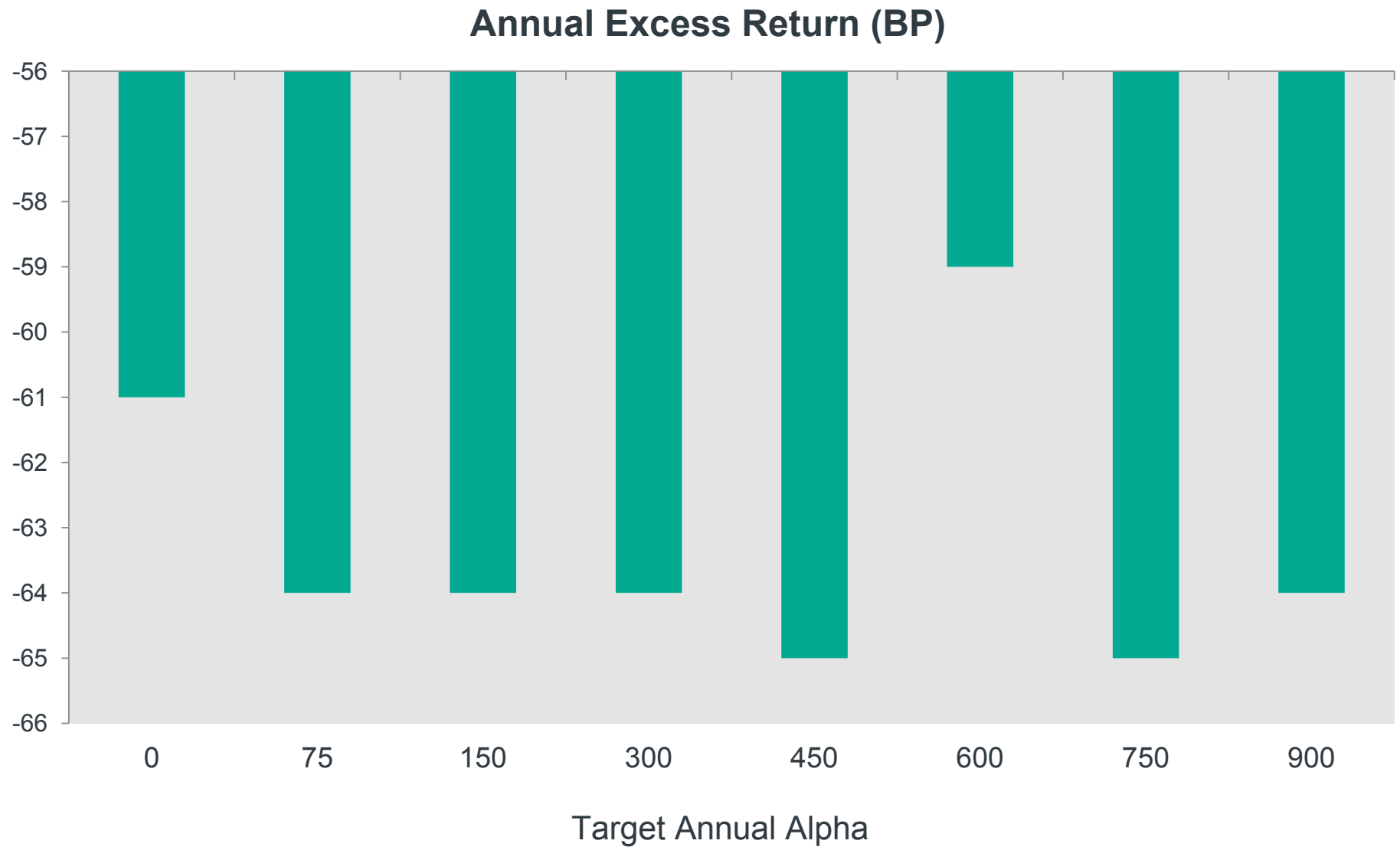
As of 2014.
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Number of Holdings In The Fund



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But, Actual Subsequent Return

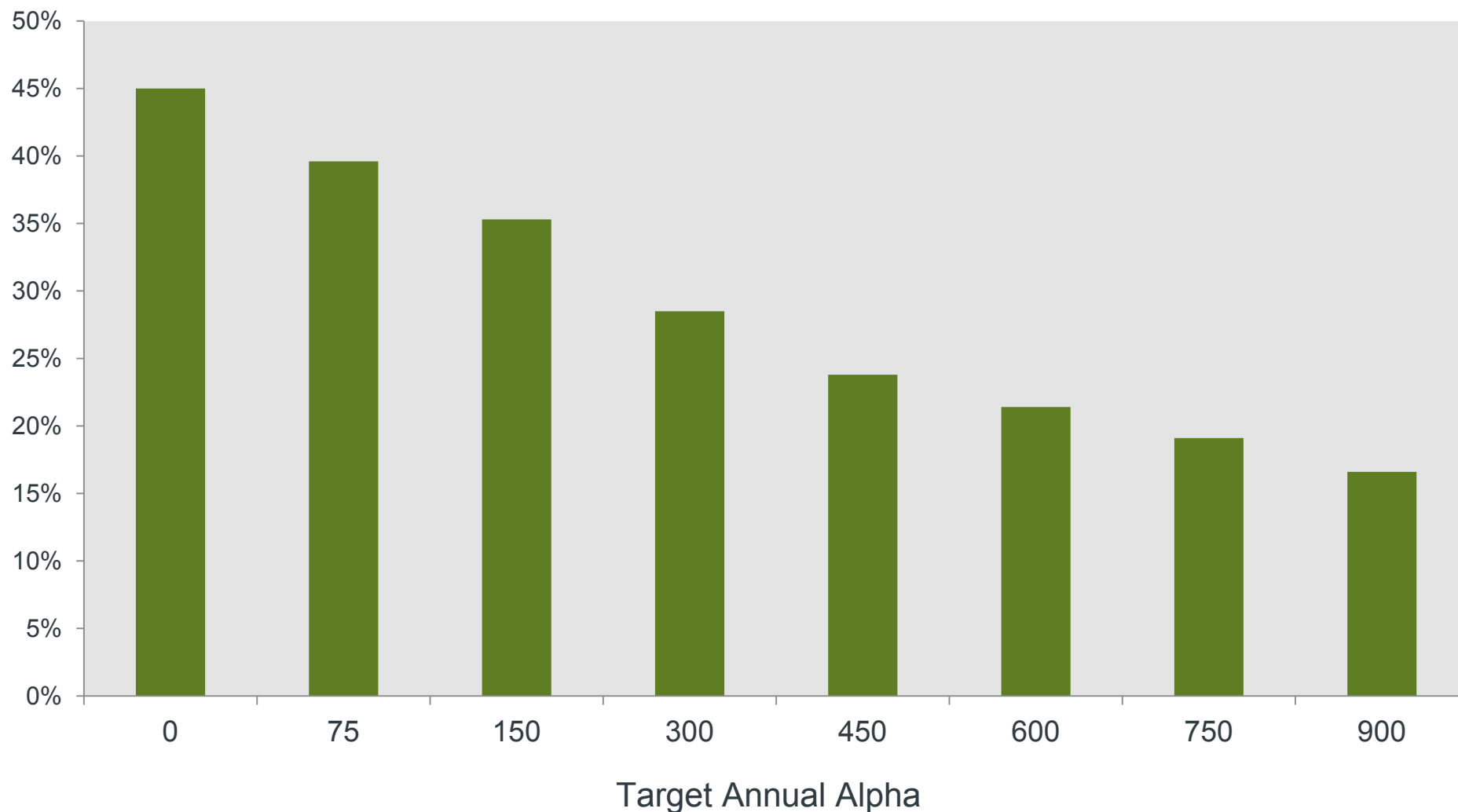


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Percentage of Funds Exceeding Target Alpha – Subsequent Year



% Beating Target



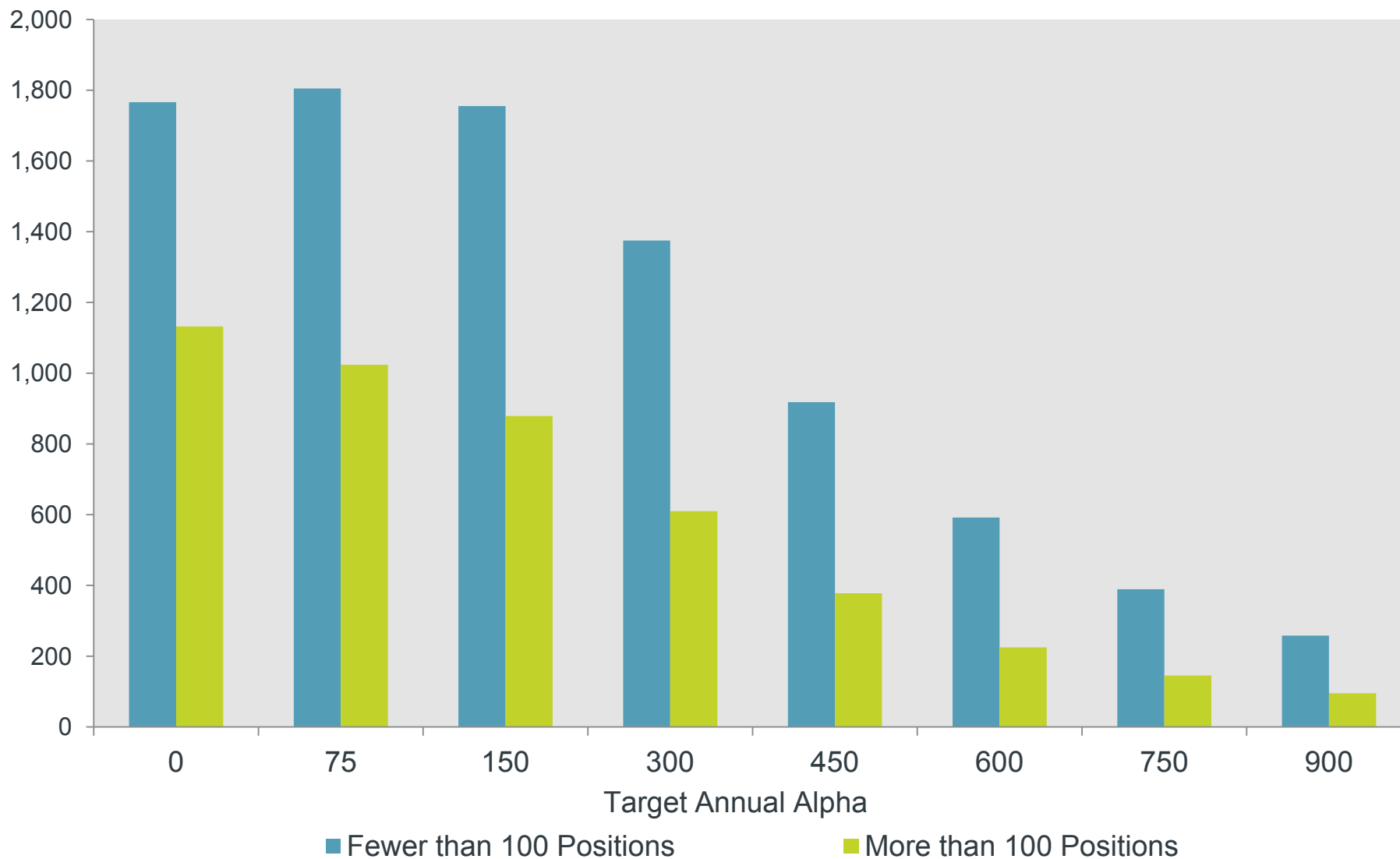
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- Selecting a target Alpha has implications for the type of funds that will be selected based on their past performance, and more important for their future performance.
- With higher target Alpha levels, top funds tend to be more concentrated, have higher tracking error, incur higher expenses, and have higher turnover.
- However, actual future performance is not necessarily better with higher target Alpha.

Examination of Top Funds Given a Target Alpha Level

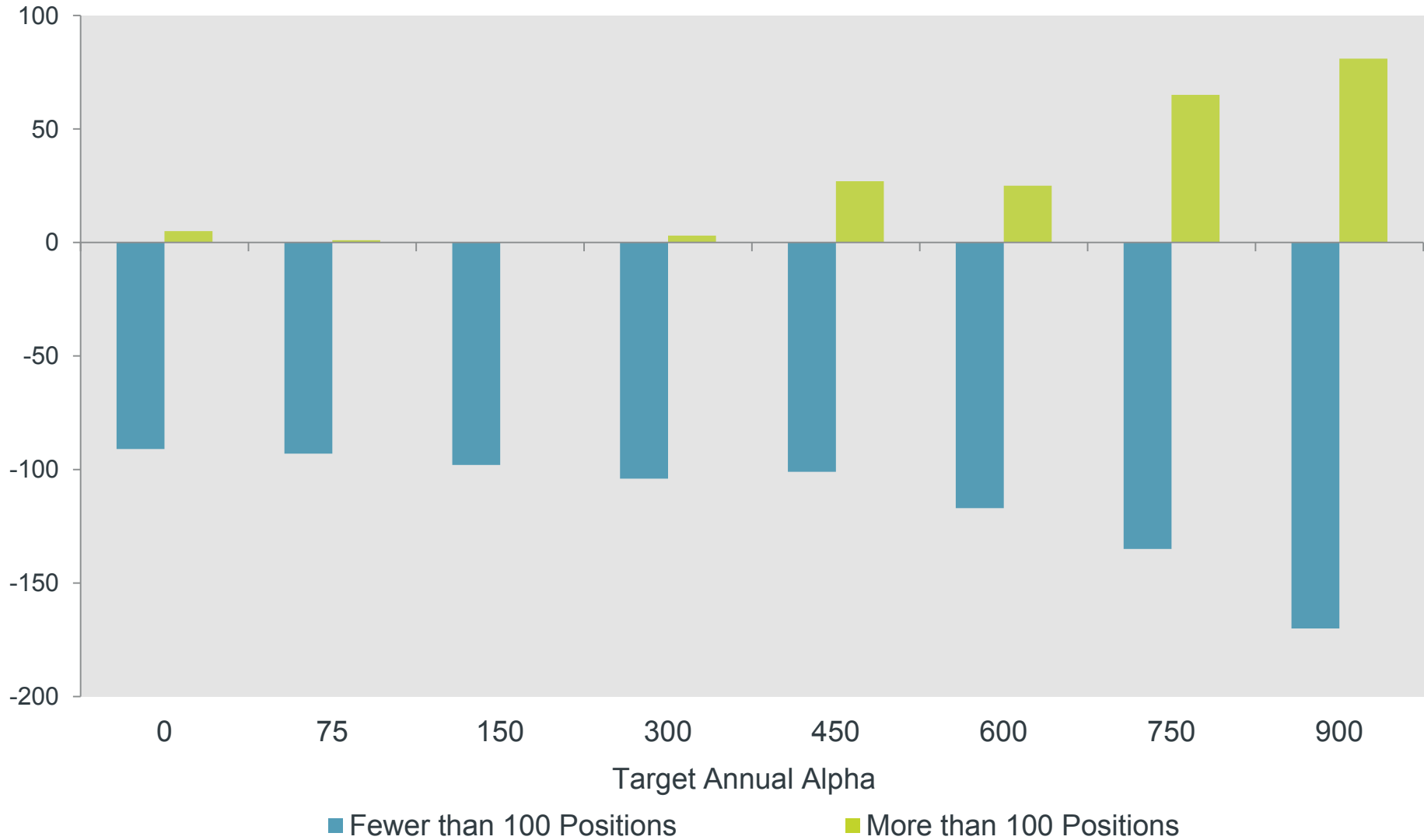
- In the following analyses, we again require both top quintile of modified IR and exceeding the target alpha in the prior 36 months.
- We then classify the funds according to their concentration (number of positions).
- We examine the future performance of diversified and concentrated funds.
- Data for 2002-2013.

Number of “Best” Funds



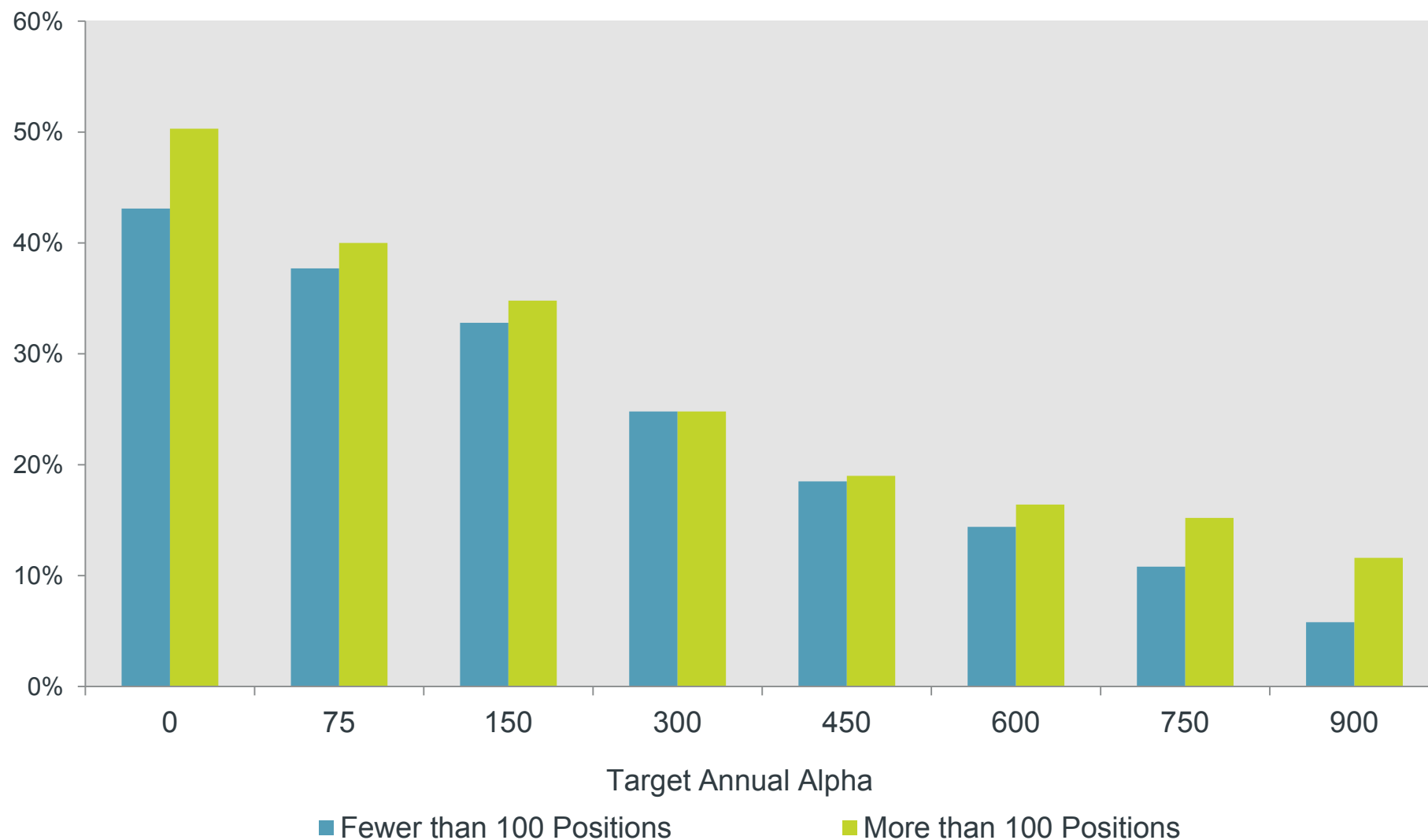
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Actual Subsequent Annual Returns



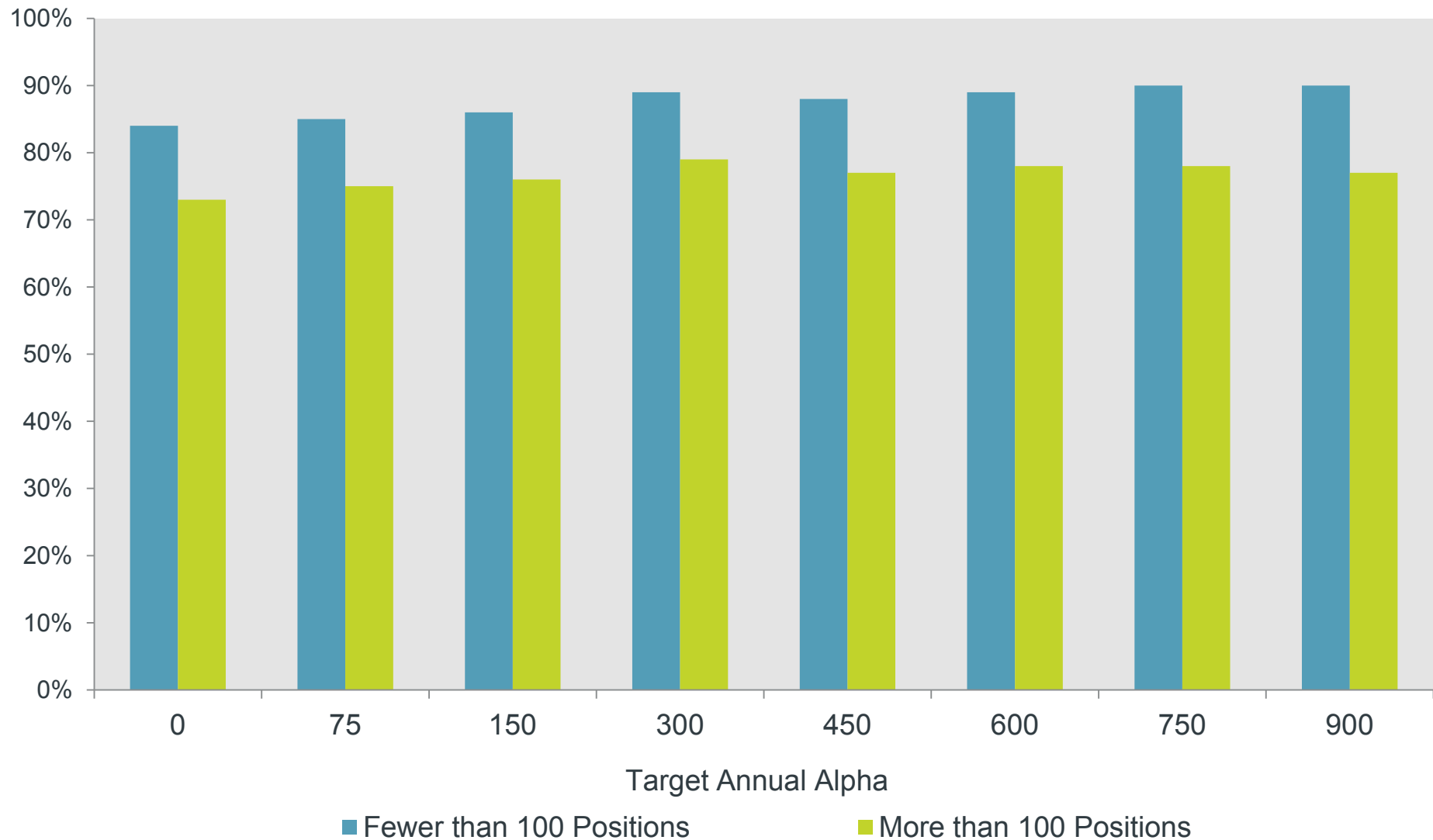
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Percentage of Funds Actually Exceeding Target Alpha Next Year



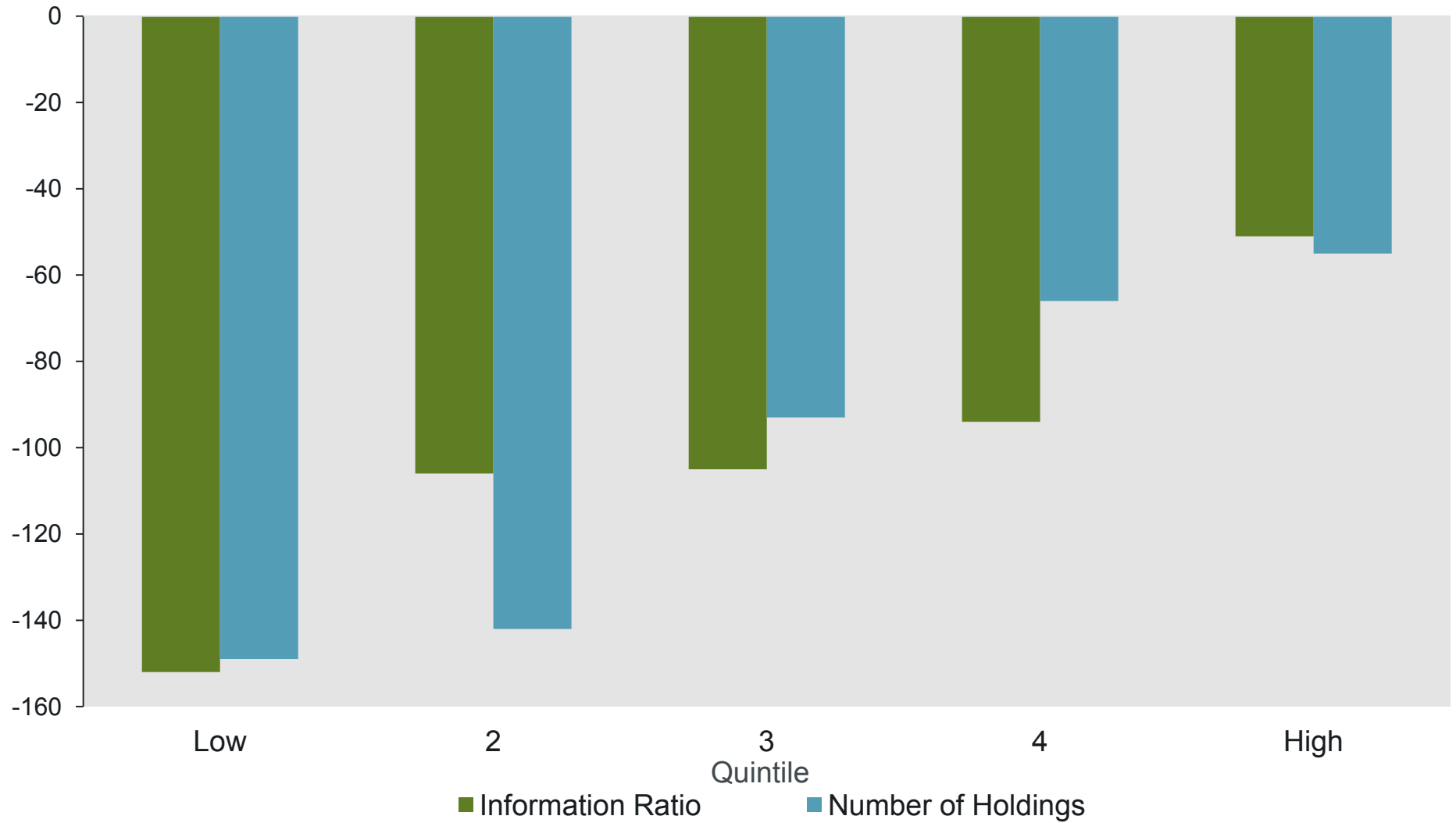
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Active Share



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Comparison of IR & Number of Holdings for All Funds



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Various Classification “Winner” Funds

Target Alpha	Number of Positions		Active Share		Size (TNA)	
	Fewer*	More^	Low*	High^	Small*	Large^
0	-94	-21	-43	-63	-67	-46
75	-88	-36	-46	-70	-82	-46
150	-95	-32	-39	-78	-89	-47
300	-91	-39	-20	-87	-74	-62
450	-97	-28	61	-106	-34	-90
600	-105	-29	188	-140	-27	-104
750	-163	27	333	-173	-50	-109
900	-199	419	470	-196	-57	-131

*Below median.

^Above median.

As of 2014.

Source QMA, CRSP Survivorship Bias Free Mutual Fund Database.

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Simulation 1

- We simulate random selection of 5 funds from at least 10 funds each year 2002-2013.
- Funds have to be top quintile of IR and also with return in excess of target alpha in the prior 36 months.
- Selection is separately performed for funds with fewer and more than 100 positions.
- Simulation is repeated 1,000 times every year.

Simulation 1 Results

- Top diversified (over 100 positions) funds had higher mean and median subsequent annual returns than top concentrated (fewer than 100 positions) funds for **all** target alpha levels.
- The above differences are statistically significant.
- Standard deviations of subsequent returns are significantly higher for concentrated funds, except for target alpha of 450BP.
- The percentage of funds exceeding the target alpha is significantly higher for diversified funds.

Simulation 2

- We select the five least correlated funds from the funds that were in the top modified IR quintile and exceeded the benchmark in the prior 36 months.
- This selection was done separately for diversified and concentrated funds each year 2002-2013.

Simulation 2 Results

Mean Subsequent Annual Return



As of 2014.

*Based on fewer than 12 years.

Source QMA, CRSP Survivorship Bias Free Mutual Fund Database.

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Replication with eVestment Data

- Similar results were obtained using the eVestment data during 1996 - 2013.
- IR is a good predictor of future excess returns.
- Top quintile of Modified IR funds that exceeded their target alpha in the prior 36 months had similar characteristics to those observed for the CRSP database.
- Diversified “winner” funds typically did better than concentrated “winner” funds.

Conclusions

- Having specified a target alpha, select funds with past modified IR that exceeded the target alpha.
- The best funds among top past performers are not necessarily those with high active share or the most concentrated.
- Diversified funds (with many positions) typically have better future performance than concentrated funds.

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