# MORNINGSTAR®

# Fund Managers by Gender
## Through the Performance Lens

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Madison Sargis
Senior Quantitative Analyst
+1 312-244-7352
madison.sargis@morningstar.com

Kathryn Wing
Associate Investment Analyst
+1 312-696-6767
kathryn.wing@morningstar.com

*The research for this paper was conducted on Morningstar Direct℠ . Learn more at:*
*https://www.morningstar.com/products/cloud/wealth-management*

## Executive Summary

This paper expands Morningstar's research on fund managers by gender. Our previous research established that female fund managers are outnumbered by men by a ratio of 9 to 1 in the United States. One possible explanation for the lack of women fund managers is performance. If women fund managers have delivered worse returns than men, their exclusion from the industry would be understandable.

This study considered the performance of actively managed U.S.-based equity and fixed-income funds, and the individuals managing them since 2003. Across three statistical tests, we find no significant performance difference between male and female fund managers, nor differences in fund performance for offerings run by mixed-gender teams. Therefore, we find that performance does not explain the lack of diversity in the fund industry.

## Key Takeaways

► Men and women deliver equally competitive fund performance, as do mixed-gender teams.
► These performance trends do not explain the lack of gender diversity in the fund industry.
► Men have benefited from the industry's growth, capturing nearly all net new fund-management roles.
► Women have entered the industry at the same rate they have exited it, so their representation has fallen as the industry has expanded.

**Introduction**

Morningstar began formally studying fund managers by gender in 2015 after observing anecdotally that women are underrepresented in the fund industry. We studied the rates of female managers and found that women are vastly outnumbered by men in fund-management ranks, not only in absolute terms but also relative to other professional industries, such as law and medicine.

In this latest look at fund managers by gender, we harnessed Morningstar's U.S. database of mutual funds and their managers to consider whether performance differences between managers is driven by differences in gender and thus rationally explains the lack of female representation in the fund-management industry.

We recognize studying fund manager performance by gender is a polarizing topic. Our goal is not to estimate a manager's performance potential based on an exogenous characteristic such as gender. Rather, we are examining whether the current industry trend of decreasing female participation is justified through the lens of performance. In effect, we intend to determine whether the industry would perform worse with more female fund managers.

We structured our study to answer two distinct questions. First, do funds benefit from diversity? On a peer-relative basis, do men and women exhibit different performance track records? To answer this, we constructed two datasets: one to track fund performance and the second to track manager performance. For both datasets, we applied three performance tests to measure the impact of gender diversity on investment performance.

To provide context for the performance results, we summarize portfolio manager gender diversity trends since 1990. Then, we discuss the results of the performance studies. We conclude the paper with general observations and suggestions for the industry. The Appendix details the data we used for the analysis, describing the specifics of the methodology we employed and our references. The paper concludes with the full data tables and supplementary charts.

**Fund Managers Through Time**

Today, the active equity and fixed-income mutual fund industry is a $9.98 trillion market. Since 1990, the number of active equity and fixed-income fund managers increased fivefold from 1,900 to 8,500. Exhibit 1 shows the number of male and female fund managers through time and the net number of entrants by gender. The chart shows that men have gained 85% to 90% of the net new portfolio-manager roles since 1990. Over the period, women have left and entered the industry in equal numbers, so they did not benefit as the number of portfolio manager jobs expanded. More recently, however, the number of men in the industry decreased as the number of portfolio-managers declined from 7,657 in 2015 to 7,400 in September 2017.

**Exhibit 1**  Net Number of Managers in U.S. Mutual Fund Industry
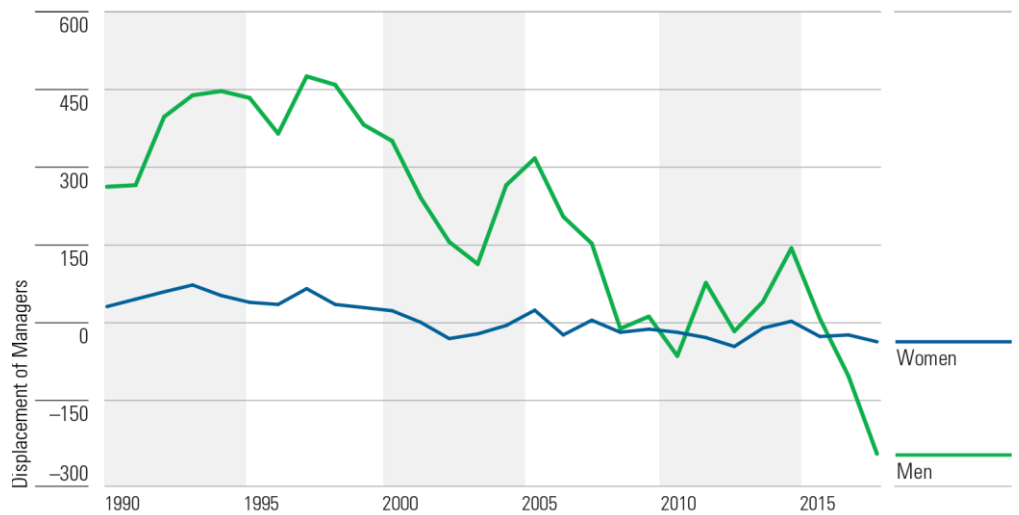


Source: Morningstar Direct. Data as of 09/30/2017.

**Exhibit 2**  Total Number of Managers in U.S. Mutual Fund Industry
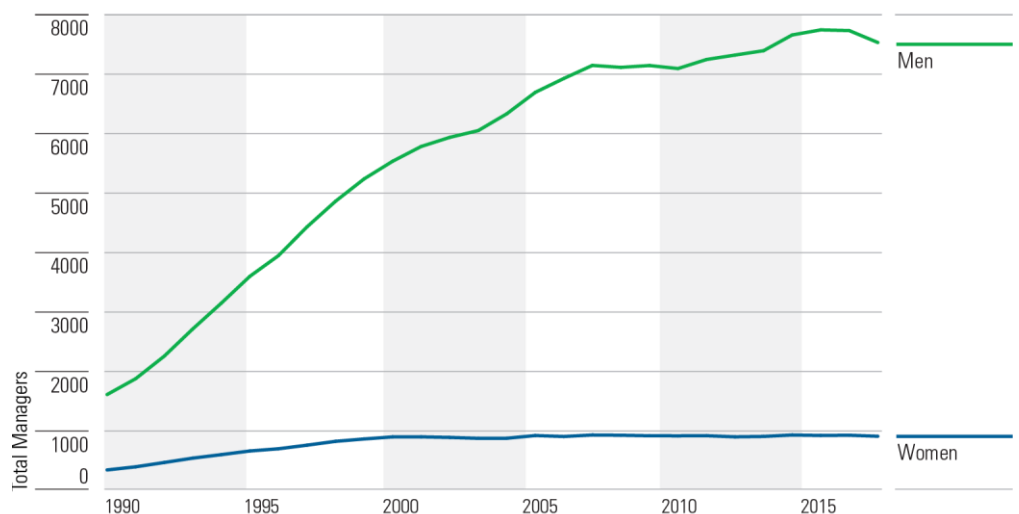


Source: Morningstar Direct. Data as of 09/30/2017.

Exhibits 1 and 2 may suggest that men outperformed and thus captured the vast majority of new manager roles over this period. We aimed to test whether there is a performance difference between men and women fund managers that can rationally explain the disparity in gender representation.

## Methodology

### Data

To test performance by manager gender, we constructed two different datasets—fund level and manager level. For both, we considered actively managed equity and fixed-income funds in the U.S. between January 2003 and September 2017. We used peer-relative metrics—namely ex-category average—to define return, so we used funds in Morningstar Categories where Morningstar Analyst Ratings (commonly known as the "star rating") are calculated each month. Such categories provide a meaningful peer group to evaluate fund and manager performance. The ex-category average measures the return relative to these categories' average returns.

To examine fund performance, we created a single record for each fund by combining the returns across its share classes. For funds that provided net asset information for each share class, we combined the share classes' returns on an asset-weighted basis. For those funds where complete asset information was not available, we equally weighted each fund's returns across its share classes. This approach best represents a manager's success at executing a single strategy. It also reduces the noise in an industry-wide study that would be caused by funds that offer multiple share classes. By asset-weighting the returns, we represent the typical fundholder's ownership experience in the fund.

For the study of managers' performance, we created a single record for each fund by combining returns across share classes, asset-weighting the results where possible. Some managers are assigned to multiple funds. In these cases, we combined the manager's performance across the funds, equal-weighting the record we created for each fund. We did not consider the relative value of assets run by men and women, in part because women run far fewer assets overall. In the end, we created a time series of returns for each manager where each fund's return is compared with the category norm, and managers running multiple funds have those records combined on an equal-weighted basis.

The results below show fund-level performance that has been equally weighted for managers running multiple funds. We also calculated asset-weighted results and do not prefer one method over the other. The equal-weighted results are displayed in the paper and we include the asset-weighted results in the Appendix.

In the subsequent sections of the paper, when we refer to "fund performance" we are using the fund dataset, while "manager performance" refers to the manager dataset. Finally, for both the funds and managers, we ran three tests: Fama-MacBeth regressions, portfolio-based tests, and event studies.

**Fama-MacBeth Regression Methodology**

We used a Fama-MacBeth cross-sectional regression procedure to test whether a fund manager's gender can explain the difference in future fund returns. We chose to control for four structural characteristics to better isolate the contribution to performance from gender. Specifically, we controlled for fees, fund of funds, fund age, and fund size, which explain the majority of cross-sectional differences in average returns. Furthermore, for equity funds we controlled for socially responsible funds since our 2016 study demonstrated that women are more likely to run such funds, and other research suggests that environmental, social, and governance investment objectives may cause a fund's returns to deviate from the category's norms.

For the fund study, the formula equation is as follows:

$$r_{i,t+1} = \beta_1 AllWomen + \beta_2 MixedGender + \beta_j Controls$$

where r represents the fund's ex-category average.

For the manager study, the formula equation is as follows:

$$\bar{r}_{i,t+1} = \beta_1 Men + \beta_j Controls$$

where $\bar{r}$ represents a manager's average ex-category average return across the portfolio of funds managed.

The regression's dependent variable is the return of fund or manager i over the next month (t+1). Independent variables are measured at the end of the current month (t) for each fund or manager. The gender variables—all women and mixed-gender—are categorical. These variables denote whether the fund was run exclusively by women or by a mixed-gender team. In general, the coefficient (which we also refer to as a "premium") for the individual gender variables can be interpreted as the average return of the funds or manager with the particular gender, relative to that of the funds or manager after controlling for the other factors.

<span style="color:red">**Performance Results**</span>

**Fama-MacBeth Regression**

This section showcases the results from a series of Fama-MacBeth regressions that test performance by fund manager gender. Exhibit 3 shows the average coefficients obtained from the Fama-MacBeth regression on the gender variables and controls for funds. The coefficients (hereafter referred to as premiums) and their t-statistics help determine whether the gender makeup of a fund's management team or a sole manager's gender can explain the out- or underperformance of a fund relative to its Morningstar category after controlling for other variables. Exhibits 4 and 5 show the cumulative month-by-month results for equity and fixed-income funds, respectively. Similarly, Exhibit 6 shows the average coefficients for the manager's performance in both asset classes.

**Exhibit 3**  Average Premiums for U.S. Actively Managed Equity and Fixed-Income Funds by Manager Gender, January 2003 to September 2017

|  | **Equity Teams** | | **Fixed Income Teams** | |
|---|---|---|---|---|
|  | Women | Mixed-Gender | Women | Mixed-Gender |
| Mean % | 0.00 | −0.02 | 0.02 | 0.01 |
| T-Statistic | −0.50 | −3.33 | 1.52 | 0.84 |

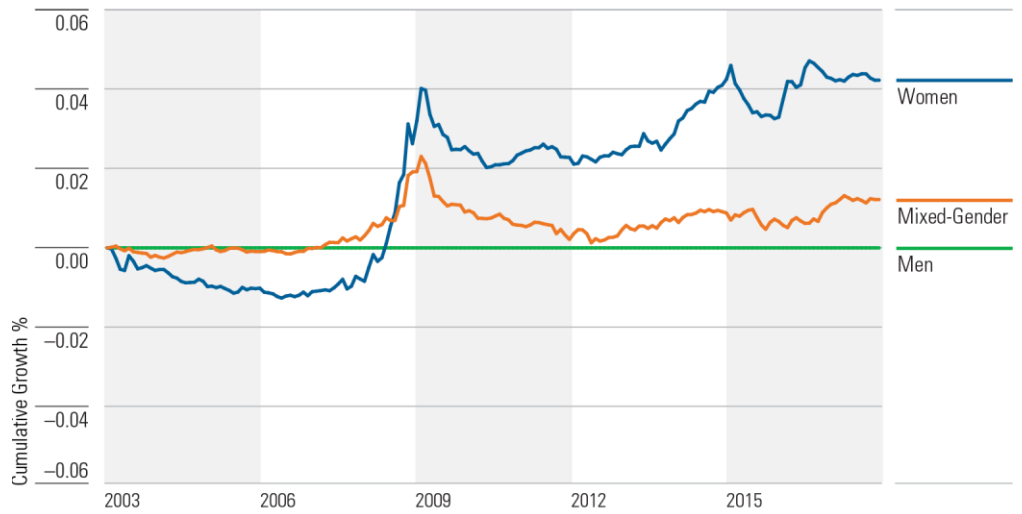Source: Morningstar Direct. Data as of 09/30/2017.

If men outperformed women to justify the gender disparity we observe, we should expect that all of the study's coefficients would be negative and statistically significant. Moreover, all-women teams would have the lowest premiums since they, by definition, have relatively more women than the mixed-gender teams. For conclusive evidence, these trends would persist across equity and fixed-income.

In the data, we find the hypothesis that men outperform is not supported. The results from the equity all women, fixed-income all women, and fixed-income mixed-gender teams demonstrate that funds with female portfolio managers do just as well as funds run by men. This is evidenced by insignificant t-statistics. Only in equity mixed-gender teams do we see a divergence, where the two-basis-point underperformance is significant but hardly meaningful. Furthermore, passing one test but failing three others is not sufficient evidence to prove the hypothesis that men possess more investment skill. Thus, we see no overall persistent differences in fund performance if the fund is managed by a man, a woman, or a mixed-gender team.

We do note some interesting trends when we examine results by asset class over shorter periods. Since 2003, fixed-income funds run exclusively by women experienced a cumulative return that is 4.23%, or 0.32% annualized, higher than the average fund's return in the category. Most of these gains came during the financial crisis and in the past three years. Notably, the study's sample included 124 distinct fixed-income funds run by women. At the end of 2004, there was a high of 47 bond funds run by women but there has been a steady decline since then. Today, there are only 14 fixed-income funds run by
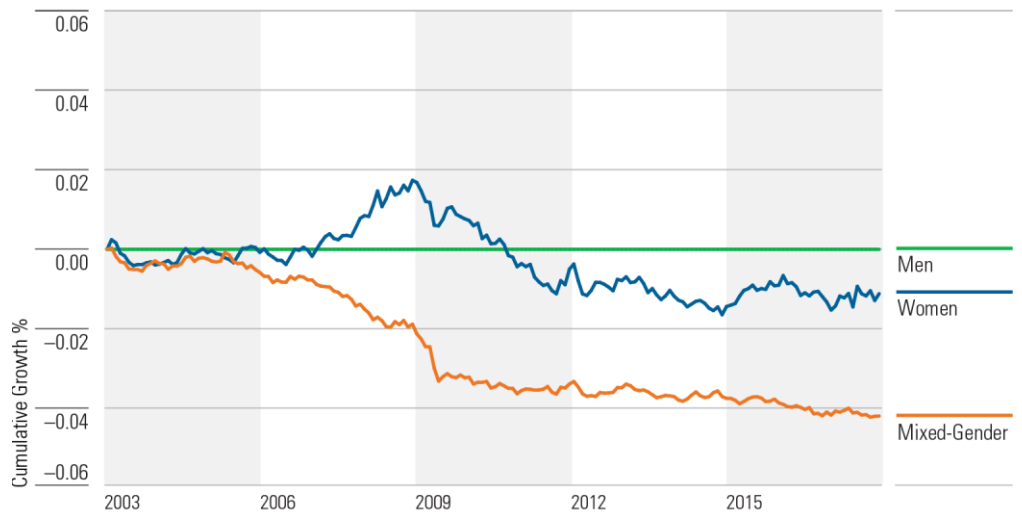
women. In the Appendix, we have provided supplementary data on this subset of fixed-income fund managers to provide more detail on the funds they run.

**Exhibit 4**  Fixed-Income Fund Premiums Through Time by Manager Gender



Source: Morningstar Direct. Data as of 09/30/2017.

**Exhibit 5**  Equity Fund Premiums Through Time by Manager Gender



Source: Morningstar, Inc, Data as of 09/30/2017.

Another way of looking at gender and performance is by looking at individual managers' track records. We ran the same style of Fama-MacBeth test on managers' track records to determine the statistical differences by gender relative to the ex-category average. Again, if men were better managers than

women, we would expect negative and statistically significant coefficients. We found no significant difference in performance between female and male managers.

**Exhibit 6**  Manager Performance Regression Results

|              | Equity | Fixed-Income |
|--------------|--------|--------------|
| Mean %       | −0.01  | 0.00         |
| T-Statistic  | −1.20  | −0.04        |

Source: Morningstar, Inc, Data as of 09/30/2017.

In summary, in seven of the eight regression-based tests, we found that relative to category, men and women produced statistically similar investment results. We found no evidence that men outperform women.

**Portfolio-Based Tests**

In this section, we discuss the results from our portfolio-based tests. While we view the Fama-MacBeth regression results as a more robust and fair approach to evaluating the efficacy of manager performance by gender, we recognize that regressions can be esoteric. Investors may find the portfolio-based tests more intuitive. In Exhibits 7 through 10, we show the performance of the portfolios of funds and manager performance. The fund portfolios are equal-weighted and updated at the beginning of each month based on the gender makeup of the team: all men, all women, and mixed-gender. The manager portfolios are equal-weighted based on the manager's equal-weighted portfolio of managed products.

Like the previous regressions, we are looking to see whether performance explains the under-representation of women in the fund industry. Following the hypothesis that men have outperformed, we would expect to find that funds run by men experience the highest category outperformance, followed by mixed-gender teams, and then by funds exclusively run by women.

In fixed-income, the reverse occurs. Since 2003, fixed-income funds run by women outperformed their respective category average returns by 0.35% annually, whereas mixed-gender bond fund management teams outperformed by 0.16% annually, followed by men at 0.08% annually. Among equity funds, funds run by men outperformed funds run by women by 0.24% annually, relative to the category average. Equity funds run by mixed-gender teams had the worst performance, trailing the category average by 0.09% annually over the period. Exhibits 7 and 8 show these annualized return effects on $1 for fixed-income and equity, respectively.

Looking across the six portfolios constructed among fixed-income and equity funds, only one portfolio's performance aligned with expected results from the hypothesis. In the other five, we found the reverse: Funds with higher concentrations of female managers did better. Like the Fama-MacBeth study, the portfolio-based approach suggests that we reject the notion that funds run exclusively by men produce superior performance.

**Exhibit 7**  Fixed-Income Fund Portfolio's Ex-Category Performance by Manager Gender
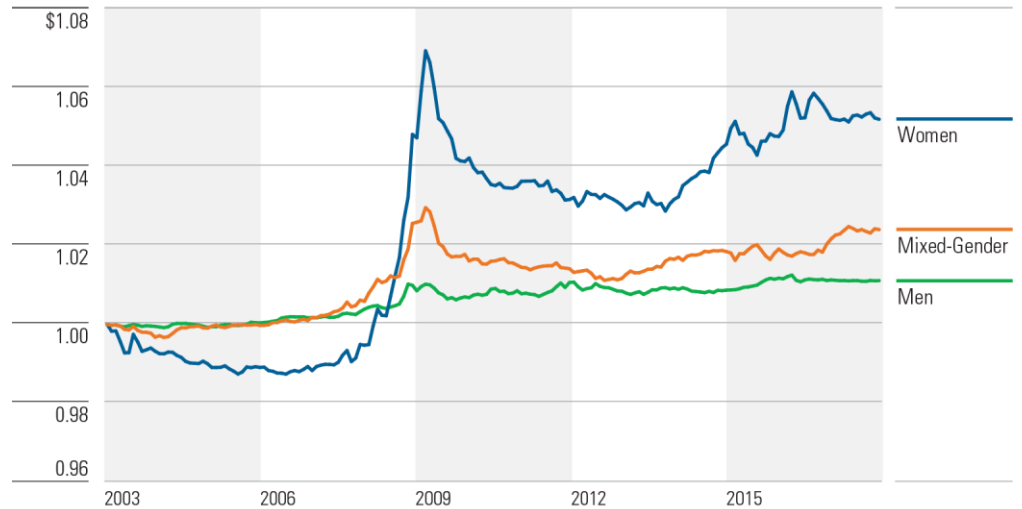


Source: Morningstar, Inc, Data as of 09/30/2017.

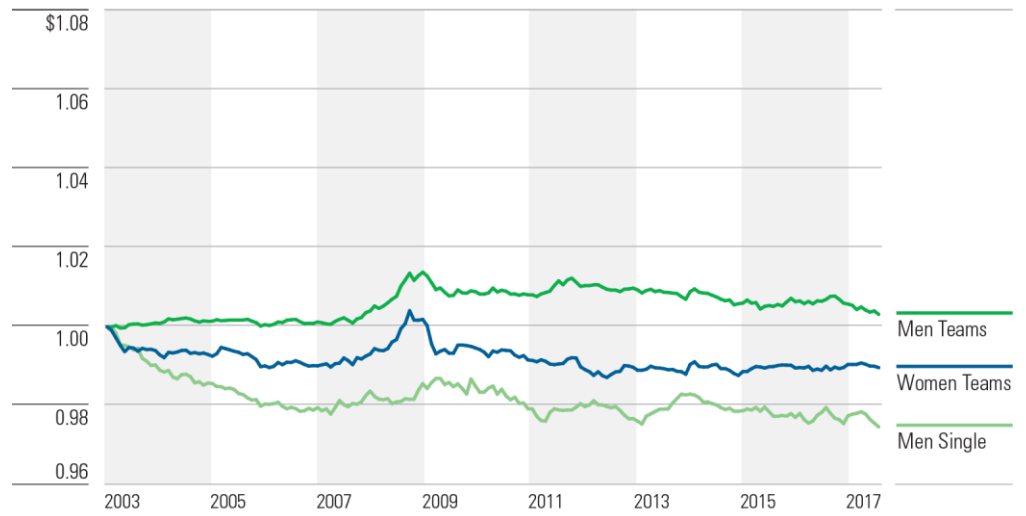**Exhibit 8**  Equity Fund Portfolio's Ex-Category Performance by Manager Gender
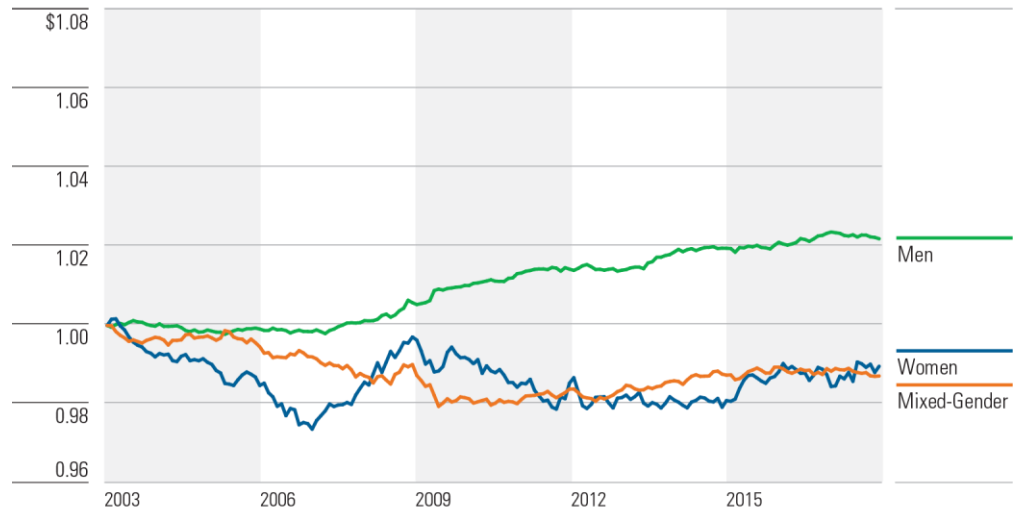


Source: Morningstar, Inc, Data as of 09/30/2017.

In addition to the fund portfolios, we ran the portfolio-based tests on managers' average track records. This test combines a manager's record across several funds. Managers are denoted as team managers if over half of their assets under management are in team-run funds. Similarly, single managers are denoted as such if less than half of their assets under management are in funds run by one manager. There are few women who have run funds solo over their careers, so we excluded the Women Single subset from the analysis.

In this approach, if the hypothesis that men produce superior outperformance is true, women-run teams would underperform men managing in teams or as solo managers. Again, this is not what we find. The results show that in equities, since 2003 a portfolio of men managing in teams outperforms women managing in teams, but the women managing in teams outperformed men singlehandedly running funds. The annualized return on a $1 are 0.02%, -0.07%, and -0.17%, respectively. Among fixed-income managers, there is minimal difference between teams of male and female managers, and both groups outperform men who run fixed-income funds solo with narrow margins between the groups. The annualized return on a $1 are 0.13%, 0.10%, and 0.01%, respectively.

**Exhibit 9**  Equity Manager Portfolio Study's Ex-Category Performance by Manager Gender



Source: Morningstar, Inc, Data as of 09/30/2017.

**Exhibit 10**  Fixed-Income Manager Portfolio Study's Ex-Category Performance by Manager Gender
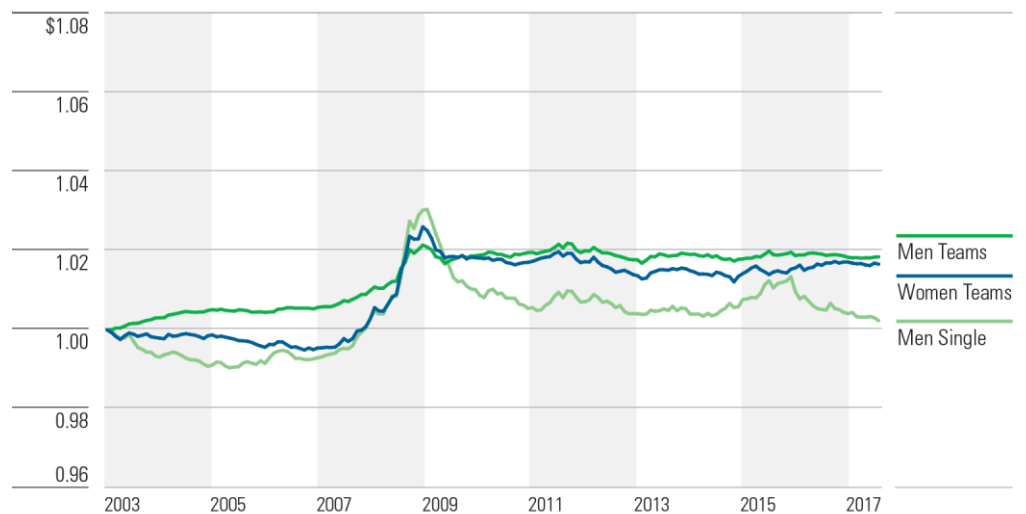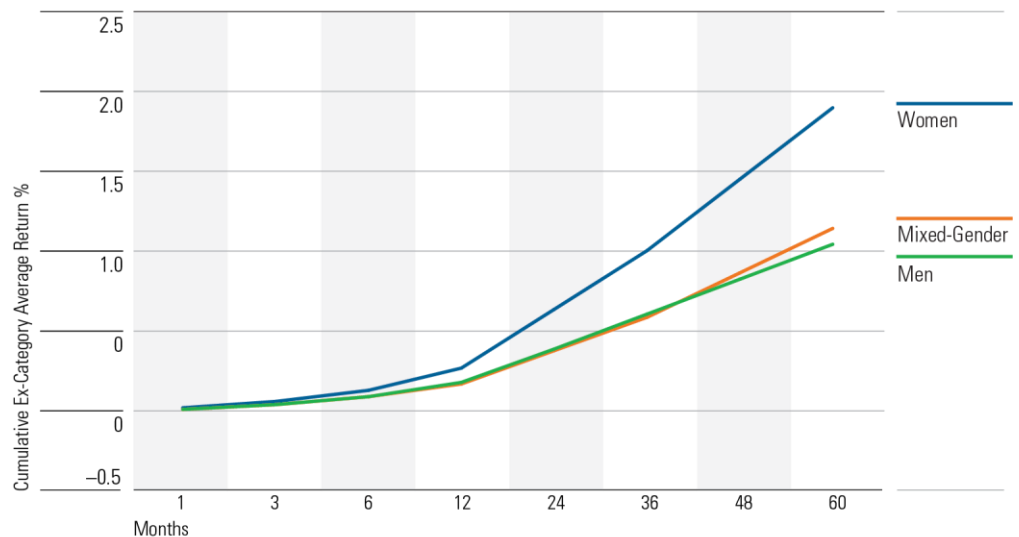


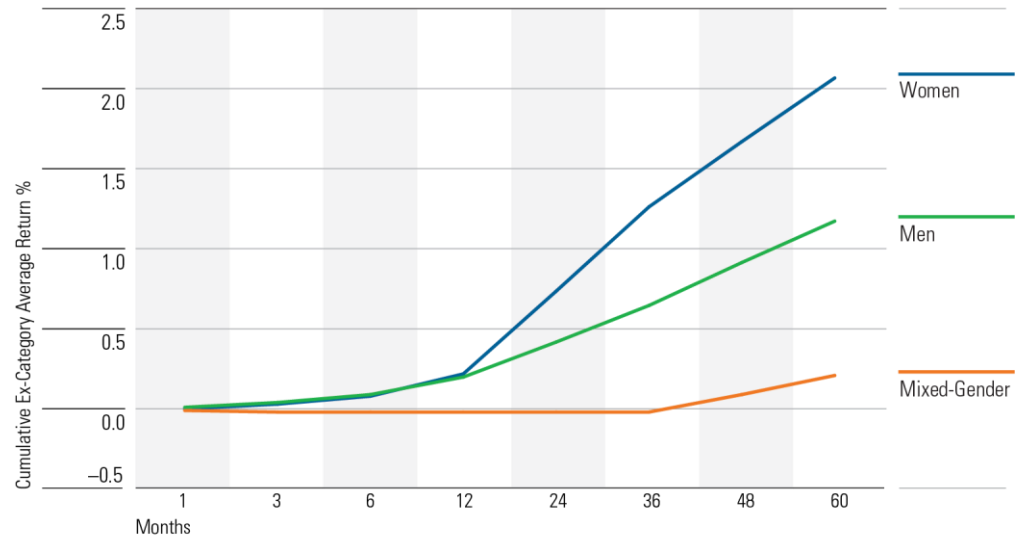Source: Morningstar, Inc, Data as of 09/30/2017.

### Event Study

To further analyze the relationship of manager gender and performance, we conducted an event study analysis on both the fund and manager datasets. The event study showcases the typical experience of an investor by the various team constructs for different holding periods. The study sorts U.S.-domiciled active equity and fixed-income funds by team structure—all men, all women, and mixed gender—and managers by gender—men, women—for each month. We then paired those groupings with their subsequent performance over several periods: one, three, six, 12, 36, and 60 months. We formed these pairings each month for the entire period of our sample, 2003 to 2017. We then looked at the funds' ex-category average returns over each period and manager gender. The analysis is designed to inform investor expectations. If fundholders invest according to a manager's gender on a given month, what subsequent performance at a typical fund or across the manager's funds can they expect over various holding periods?

The event study framework also tests the hypothesis that men have outperformed. If true, we would expect to find that funds exclusively run by men outperform funds run by mixed-gender teams and funds run by women would be the least successful. Similarly, male managers would produce stronger returns than female managers. However, in our third and final test, we can find clear evidence to reject the hypothesis. An investor who invested in women-run funds would have experienced the best relative performance in both equity and fixed-income, but the margins are small over the period. Over five years, the typical all-women team produced returns that were 0.41% and 0.38% annually above the category average, respectively. Interestingly, for both asset classes, the difference between the three fund-management types starts to separate at the 12-month mark and widens throughout the subsequent 60 months.

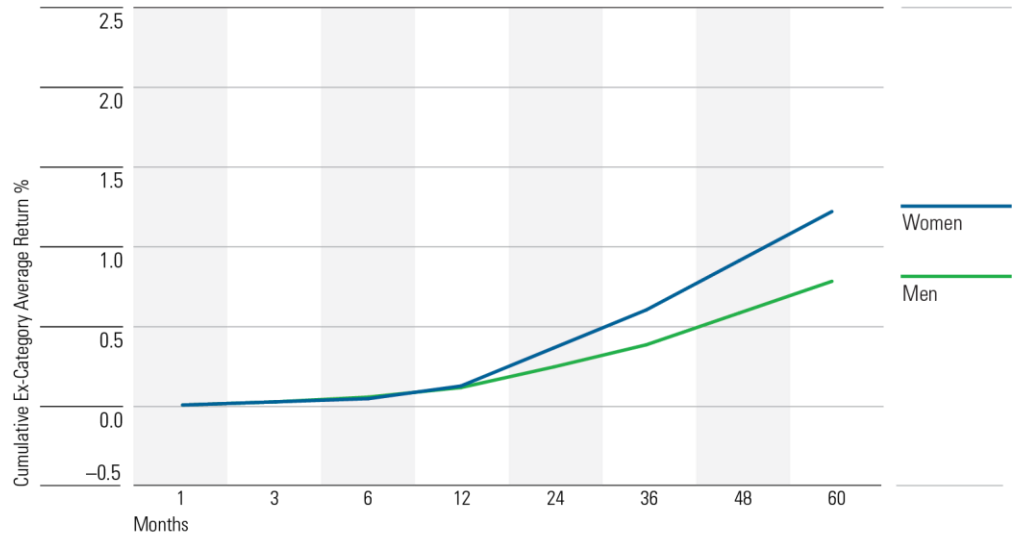**Exhibit 11**  Fixed-Income Fund Event Study (2003-2017)



Source: Morningstar, Inc, Data as of 09/30/2017.

**Exhibit 12**  Equity Fund Event Study (2003-2017)
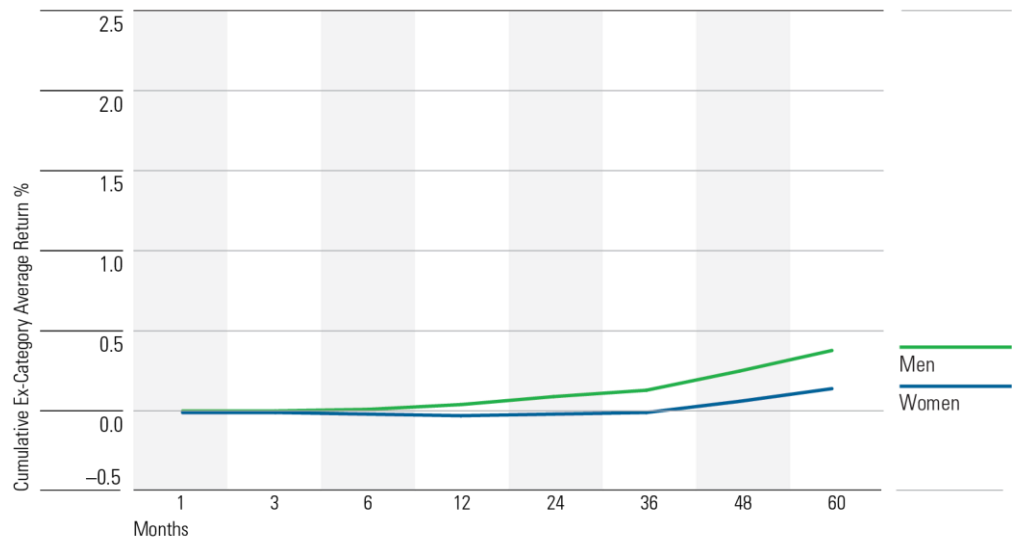


Source: Morningstar, Inc, Data as of 09/30/2017.

In our study of managers, our findings support previous tests' results. Among fixed-income managers, women outperformed, producing returns that were on average 0.09% higher annually than those produced by men. Women who run equity funds underperformed men on average by a 0.05% margin annually. As we saw in the fund event study, the difference in track records becomes apparent after 12 months and expands thereafter, but the differences are relatively small on an annualized basis.

**Exhibit 13**  Manager Fixed-Income Event Study (2003-2017)



Source: Morningstar, Inc, Data as of 09/30/2017.

**Exhibit 14**  Manager Equity Event Study (2003-2017)



Source: Morningstar, Inc, Data as of 09/30/2017.

### Conclusion

In this paper, we explored portfolio managers' performance by gender to determine if the results explain why there are so few women as named portfolio managers. Our results indicate that the low participation rate of women in the industry is not justified by performance. If men and women deliver similar performance, diversity comes with no downside for fund investors.

We intend to further explore the topic of fund management diversity; that research will likely focus on how these cohorts may be different by characteristics such as managers' educational backgrounds, including advanced degree types or professional certifications. A second avenue of research will likely focus on the composition of management teams through time and will consider correlation between fund performance and fund flows. We hope our conclusions will be used to further the conversation of diversity within the fund industry. M

## Appendix

### Data

Our study relied on Morningstar fund data sources and the R package: Predict Gender from Names Using Historical Data. Morningstar collects fund manager data from funds' regulatory filings with the Securities and Exchange Commission and assigns a numeric identifier to each individual manager. This allows us to track when an individual is first named a portfolio manager and when that person leaves all fund-management posts. Thus, we are able to follow the managers' careers, measure relative experience, and compare that data by gender.

The sample period began in January 2003 and ended in September 2017, including only funds domiciled in the U.S. in Morningstar-rated categories. Over the entirety of the sample, 13,063 unique managers were included, spanning over 11,272 unique funds. Monthly manager and monthly fund counts ranged from 3,843 to 3,849, and 3,651 to 6,426, respectively, depending on the period, with recent periods having higher counts for both. Our sample included managers in equity and fixed-income asset classes — equity 2,916 to 4294, and fixed-income 927 to 1,572. In September 2017, our sample spanned a total of 5,312 managers. The corresponding fund counts were equity 2,755 to 4,844, and fixed-income 896 to 1595. In September 2017, our sample spanned a total of 6,426 funds.

We constructed our analysis to look at both fund performance and manager performance. Therefore, we constructed two datasets, one looking at fund-level characteristics and performance, and another looking at manager-level characteristics and performance. For fund characteristics, we rolled up share-class data to the fund level. For funds providing complete asset information for all share classes, we calculated the asset-weighted variables. For those funds where complete asset information was not available, we computed equally weighted variables. For manager characteristics, we rolled up the fund-level characteristics for the securities managed. We constructed both equal-weighted and asset-weighted characteristics and performance variables to ensure our results were robust and not influenced by the overwhelming proportion of male to female managers.

Finally, our sample of funds did not suffer from survivorship bias. Morningstar's global fund databases return a full history of dead funds, and these funds are included in our sample where applicable. Moreover, our evaluation technique dynamically incorporated monthly changes in fund-universe composition, providing a more holistic and realistic picture of historical performance. Each monthly snapshot captured any funds that were subsequently merged or liquidated away.

### Regression Coefficients

The control and dependent variables in our regressions are important to understand. Many continuous explanatory variables are standardized into z-scores across all funds cross-sectionally by date and their asset class. Imputation by category was performed on all missing data for continuous explanatory variables. We imputed each category's median for each date.

**Dependent Variable**
*Gender*
Morningstar did not collect the gender of portfolio managers globally for all managers. Of the 26,340 fund managers in our study, we collected gender information on 15,996 managers. However, we did collect the first names of the fund managers. To identify gender for the remaining managers, their first names were run through an algorithm that assigned the probability of being female based on census data. Probabilities higher than 50% were assigned as female.

To audit the results, we manually verified any manager where Morningstar's gender data did not match up with the algorithm, any gender-neutral name, or names in regions where we felt the naming conventions would not be suitable for the algorithm. For example, *Patrice* in France is more heavily associated with men, while *Patrice* in the U.S. is often associated with women. The gender data underwent extensive cleaning. Manual verification was completed by identifying gender using professional photos, bio descriptions, or titles and pronouns such as *Mr., Mrs., Ms., he, she, his,* or *her*.

Finally, while a person's gender may not necessarily fall into the male-female binary, because of the nature of our data, we implemented the binary structure. We recognize that we were misclassifying and not considering fund managers who do not fit into this system.

**Independent Variables**
*Assets Under Management*
Assets under management is measured as the fund's total market value of investments in U.S. dollars. The variable is placed into z-scores by date and asset class. Because the z-scores are left-skewed, it is necessary to square-transform it.

*Fund of Funds*
This is a categorical, dummy variable that indicates whether a fund is structured as a fund of funds — a fund that specializes in buying shares in other mutual funds rather than in individual securities. Quite often this type of fund is not discernible from its name alone but rather through prospectus wording.

*Firm AUM*
Firm AUM is measured as the firm's total market value of investments in U.S. dollars for funds in the study. The variable is placed into z-scores by date and asset class.

*Net Expense Ratio*
In the U.S., net expense ratio is the most commonly used data point that encompasses all fees levied on the investor over the past year, including performance-based fees. For funds of funds, we also included acquired fund expenses.

*Socially Responsible Fund*
This is a categorical, dummy variable that indicates whether a fund has identified itself as socially conscious. This data point indicates if the fund invests selectively based on certain noneconomic

principles. Such funds may make investments based on such issues as environmental responsibility, human rights, or religious views. A socially conscious fund may take a proactive stance by selectively investing in, for example, environmentally friendly companies or firms with good employee relations. This group also includes funds that avoid investing in companies involved in promoting alcohol, tobacco, gambling, or in the defense industry.

*All Women*

This is a categorical, dummy variable that indicates a fund is managed by only women.

*All Men*

This is a categorical, dummy variable that indicates a fund is managed by only men.

*Mixed gender*

This is a categorical, dummy variable that indicates a fund is managed by both women and men.

**Study Results**

As mentioned above, we ran the manager study twice. First, we equal-weighted the manager's portfolio of funds, and second we asset-weighted the manager's portfolio of funds. The equal-weighted results are provided earlier in the paper. The asset-weighting results are provided below.

**Exhibit 15**  Manager Performance Asset-Weighted Premiums

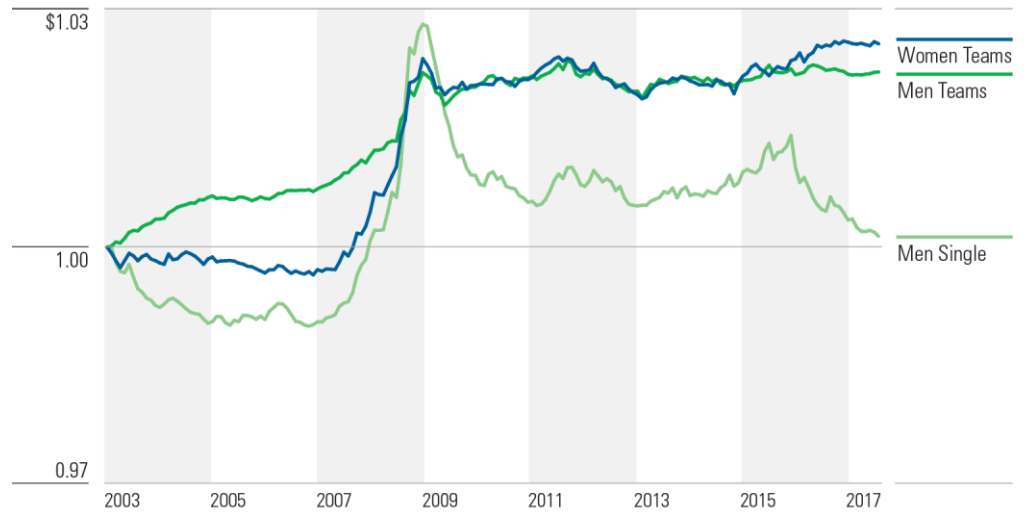|  | Equity | Fixed-Income |
| --- | --- | --- |
| Mean % | 0.01 | 0.00 |
| T-Statistic | 1.18 | −0.03 |

Source: Morningstar, Inc, Data as of 09/30/2017.

**Exhibit 16**  Fixed-Income Manager Portfolio Study — Asset-Weighted
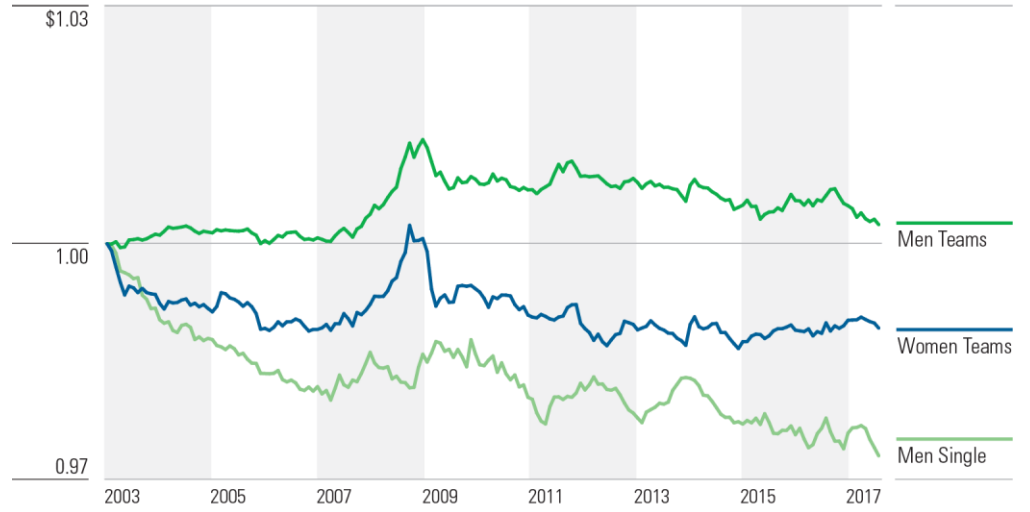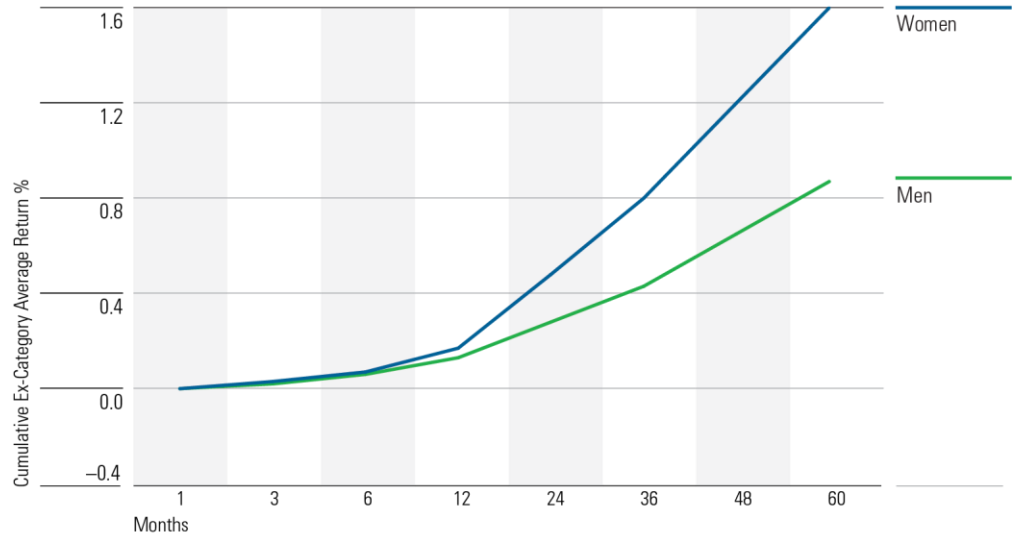


Source: Morningstar, Inc, Data as of 09/30/2017.

**Exhibit 17**  Equity Manager Portfolio Study — Asset-Weighted
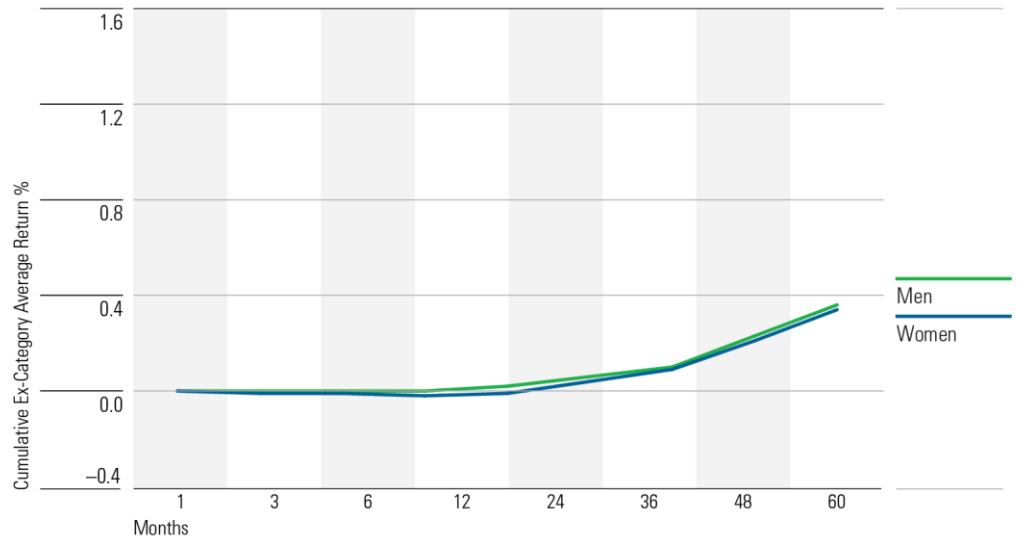


Source: Morningstar, Inc, Data as of 09/30/2017.

**Exhibit 18**  Manager Fixed-Income Event Study — Asset-Weighted (2003-2017)



Source: Morningstar, Inc, Data as of 09/30/2017

**Exhibit 19**  Manager Equity Event Study — Asset-Weighted (2003-2017)



Source: Morningstar, Inc, Data as of 09/30/2017.

**Supplementary Charts**

In this section, we provide a number of charts highlighting data we looked at throughout the course of the study. They provide further context into the composition of fund-management teams and may be of interest to the reader.

Below is the list of the fixed-income funds run exclusively by women as of September 2017.

**Exhibit 20**  Fixed-Income Funds Run Exclusively by Women as of Sept. 30, 2017

| Fund | Name | Manager Start Date | Category |
|---|---|---|---|
| PIMCO Senior Floating Rate Fund | Elizabeth MacLean | 4/29/11 | Bank Loan |
| GMO Emerging Country Debt Fund | Tina Vandersteel | 10/1/15 | Emerging Markets Bond |
| Wells Fargo High Yield Bond Fund | Margaret Patel | 8/31/12 | High Yield Bond |
| Vanguard Inflation-Protected Secs Fund | Gemma Wright-Casparius | 8/19/11 | Inflation-Protected Bond |
| Vanguard Interm-Term Treasury Fund | Gemma Wright-Casparius | 1/2/15 | Intermediate Government |
| AMG GW&K Core Bond Fund | Mary Kane | 2/26/15 | Intermediate-Term Bond |
| AMG GW&K Enhanced Core Bond Fund | Mary Kane | 11/14/12 | Intermediate-Term Bond |
| Parnassus Fixed Income Fund | Samantha Palm | 5/1/13 | Intermediate-Term Bond |
| Steward Select Bond Fund | Victoria Fernandez | 1/1/14 | Intermediate-Term Bond |
| Vanguard Long Term Treasury Fund | Gemma Wright-Casparius | 1/2/15 | Long Government |
| Vanguard Short Term Treasury Fund | Gemma Wright-Casparius | 1/2/15 | Short Government |
| Ivy Limited-Term Bond Fund | Susan Regan | 8/4/14 | Short-Term Bond |
| Ivy VIP Limited-Term Bond | Susan Regan | 8/4/14 | Short-Term Bond |
| Dunham International Opportunity Bond Fund | Malie Conway | 11/1/13 | World Bond |

Source: Morningstar, Inc,

**References**

Our methodology uses the regression approach pioneered in Fama and MacBeth (1973) to easily calculate standard errors that correct for correlation across assets. Furthermore, using the approach found in Fama and MacBeth (1973), we are able to easily build models in which the independent variables change over time.

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