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Market states and mutual fund risk shifting

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## Abstract

**Purpose** – The purpose of this paper is to explore the motivation behind mutual funds' risk shifting behavior by examining its impact on fund performance, while jointly considering fund managers' compensation incentives and career concerns.

**Design/methodology/approach** – The study uses a sample of US actively managed equity funds over the period 1980-2010. A fund's risk shifting is estimated as the difference between the fund's intended portfolio risk in the second half of the year and the realized portfolio risk in the first half of the year. Using the state of the market to identify the dominating type of incentive that fund managers face, we examine the relationship between performance and risk shifting in a cross-sectional regression setting, using the Fama and MacBeth (1973) methodology.

**Findings** – The authors find that poorly performing (well performing) funds are likely to increase (decrease) their risk level in bull markets, while reducing (increasing) it during bear markets. Furthermore, we find that funds that increase risk underperform, while those that decrease their portfolio risk do not. In addition, we find that poorly performing funds that increase (or decrease) their risk underperform across bull and bear markets, while well performing funds that reduce risk during bull markets subsequently outperform.

**Originality/value** – The paper contributes to the literature on mutual fund risk shifting by providing evidence that the performance consequence of such behavior is dependent on the state of the market and on the funds' past performance. The results suggest that loser funds tend to be agency prone or be managed by managers with inferior investment skill, and that winner funds exhibit superior investment ability during bull markets. The authors argue that both the agency and investment ability hypotheses are driving fund managers' risk shifting behavior.

**Keywords** Mutual funds, Fund performance, Market states, Risk shifting

**Paper type** Research paper

## 1. Introduction

It has been well-documented that mutual fund managers change the risk exposure of their portfolios substantially over time (Brown *et al.*, 1996; Chevalier and Ellison, 1997; Koski and Pontiff, 1999; Goetzmann *et al.*, 2007; Massa and Patgiri, 2009; Kempf *et al.*, 2009; Huang *et al.*, 2011; Hu *et al.*, 2011). Previous studies attribute mutual fund managers' risk shifting behavior to two possible explanations – fund managers' incentives, and/or their superior investment ability. Specifically, managers' compensation incentives could lead them to increase their portfolio risk levels in the hope of boosting their performance and attracting money flow (Brown *et al.*, 1996; Chevalier and Ellison, 1997; Koski and Pontiff, 1999; Elton *et al.*, 2003). Nevertheless, Kempf *et al.* (2009) argue that fund manager's compensation incentives must be considered in conjunction with managers' career concerns (employment incentive), as their risk shifting behavior will depend on the relative strengths of these two types of incentives. In addition to the literature on incentive-driven risk shifting, several studies have argued that the changes in mutual fund managers' portfolio risk could also be the result of managers taking advantage of their superior investment abilities. Specifically, Kacperczyk *et al.* (2005) find that skilled fund managers choose to deviate from a well-diversified portfolio when they exploit their informational advantage, while Cremers and Petajisto (2009) provide evidence that funds that highly deviate from their benchmark index outperform. Furthermore, Wei *et al.* (2015) provide evidence that contrarian funds,

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namely those that frequently trade against the "herd," possess superior stock selection ability, while Popescu and Xu (2016a) find that funds that lead "the herd" in their buy decisions outperform, in part, because of their superior valuation ability.

In this study, we explore the motivation behind mutual funds' risk shifting behavior by examining its impact on fund performance, while jointly considering fund managers' compensation incentives and career concerns. Although fund managers' motivations cannot be directly observed, we gain further insight into their reasoning for risk shifting by examining their performance subsequent to the decision to increase (decrease) the portfolio risk level. Specifically, if fund managers' risk shifting behavior is driven by agency issues, the funds' performance will suffer since opportunistic risk shifting will increase trading cost. Furthermore, if these funds' managers also have inferior investment ability, we expect these funds to subsequently underperform. However, if risk shifting behavior is the result of skilled managers exploiting their investment acumen, even in response to certain incentives, we expect these funds to outperform. Prior studies have shown that fund managers' risk shifting behavior depends on their previous performance and the type of incentives they face. Specifically, Kempf *et al.* (2009) find that poorly performing funds tend to decrease risk when facing significant employment risk, and to increase risk when compensation incentives are strong. We employ a similar research design by using the state of the market to identify the dominating type of incentive that fund managers face. Specifically, we expect compensation incentives to dominate in bull markets while career concerns to be stronger in bear markets.

We begin our analysis by examining whether mutual fund managers exhibit different risk shifting behavior across bull and bear markets. Using a longer sample period (1980-2010) than Kempf *et al.* (2009), we confirm their findings. Specifically, we find that poorly performing funds are likely to increase their portfolio risk level in bull markets, while reducing it during bear markets. At the same time, well performing funds exhibit the opposite risk-shifting behavior, by reducing their portfolio risk level in bull markets, and increasing it during bear markets.

In order to investigate the motivation behind risk shifting behavior, and its impact on fund performance across market states, we focus on the following sets of tests. First, we examine the performance consequences of risk shifting behavior across market states. For the overall sample period, we find that funds that increase risk underperform, while funds that lower their portfolio risk do not. Our results are consistent with those in Huang *et al.* (2011), who find that funds that increase the level of risk underperform those that do not. Furthermore, we find that funds who shift risk up underperform in bull markets, while those that shift risk down outperform in bull markets and underperform in bear markets. We argue that the results suggest that both the agency and investment ability hypotheses are driving fund managers' risk shifting behavior.

Second, we examine the performance consequences of risk shifting behavior for well performing as well as for poorly performing funds, and across market states. Specifically, for the overall sample period, we find that loser funds that increase their risk underperform. Furthermore, loser funds' underperformance as a result of increasing portfolio risk occurs in bull markets, as well as in bear markets. In contrast, for the overall sample period, we find that winner funds' risk shifting behavior does not impact their performance. Additionally, we find that winner funds that reduce risk during bull markets subsequently outperform. We argue that the results suggest that loser funds tend to be agency prone or be managed by managers with inferior investment skill, and that winner funds exhibit superior investment ability during bull markets.

Our study is related to two strands of research. First, our paper contributes to the literature on mutual fund risk shifting behavior and its motivation. Most of the prior research focuses on just one of the agency related explanations, either compensation

incentive or employment incentive. Kempf *et al.* (2009) is the first study that examine the risk shifting behavior in response to both incentives. Our paper contributes to the literature by showing that not only agency incentives but also fund manager's investment ability drive risk shifting behavior. Second, our paper contributes to the literature on the performance consequences of risk-shifting behavior. The most prominent study in this area is Huang *et al.* (2011), who show that funds that increase risk underperform and conclude that risk shifting is the result of either inferior investment ability or agency issues. However, Huang *et al.* (2011) do not differentiate the incentives that winner and loser fund managers face in different market states. Our study contributes to this literature by showing that loser funds who shift risk either way underperform in both bull and bear markets and that winner funds who shift risk down outperform in bull market. Our results suggest that both the agency and investment ability hypotheses are driving fund managers' risk shifting behavior.

The remainder of the article is organized as follows. Section 2 describes the data and the methodology. Section 3 examines the risk shifting behavior across market states. Section 4 investigates the performance consequence of risk shifting behavior across market states. Section 5 further investigates the performance impact of risk shifting behavior for winner and loser funds across bull and bear markets, respectively. Section 6 concludes.

## 2. Data and methodology

### *2.1 Data and sample*

The data come from three sources: monthly fund characteristics from the CRSP Survivor-Bias Free US Mutual Fund database, daily stock returns and market index returns from the CRSP US Stock database, and quarterly fund holdings from the Thomson Financial Mutual Fund Holdings database. For the purpose of our analysis, we limit the sample to actively managed US equity funds[1]. For funds with multiple share classes, we compute the fund-level variables by taking the weighted average of these attributes at the share class level, where the weights are the lagged total net assets of each share class.

Sample summary statistics are reported in Table I. The number of funds increases substantially from 252 in 1980 to 1,451 in 2010. The average fund size increases from \$153 million to \$1,642 million and slightly drops to \$1,323 million. The growth in fund size is

| | Total net assets | | Equity holdings | | |
|---|---|---|---|---|---|
| Quarter | Mean | Median | Mean | Median | No. of Funds |
| June 1980 | 152.98 | 48.72 | 100.44 | 30.55 | 252 |
| June 1983 | 246.77 | 106.40 | 192.37 | 87.61 | 265 |
| June 1986 | 311.74 | 101.98 | 262.34 | 96.35 | 375 |
| June 1989 | 257.36 | 55.65 | 227.77 | 63.88 | 549 |
| June 1992 | 373.60 | 83.30 | 321.15 | 72.32 | 698 |
| June 1995 | 572.90 | 104.80 | 418.21 | 88.04 | 1,091 |
| June 1998 | 1,107.31 | 156.40 | 897.42 | 150.44 | 1,475 |
| June 2001 | 1,091.21 | 146.75 | 967.12 | 141.16 | 1,854 |
| June 2004 | 1,105.60 | 153.20 | 931.27 | 129.16 | 1,945 |
| June 2007 | 1,641.76 | 247.20 | 1,407.85 | 224.99 | 1,857 |
| June 2010 | 1,322.91 | 217.80 | 1,290.23 | 243.48 | 1,451 |
| Avg. of all quarters | 691.62 | 115.54 | 573.72 | 109.72 | 1,094 |

**Notes:** At the end of each quarter between March 1980 and June 2010, we calculate the number of equity funds in our sample, the mean and median asset size (in millions) as well as the mean and median equity holdings (in millions), respectively. The table reports these numbers for 11 particular quarters, as well as for the entire sample period

**Table I.**
Summary statistics

primarily driven by the increase of funds' equity holdings. The average equity holdings for our sample funds increase from $100 million in 1980 to a peak level of $1,408 million in 2007 and slide to $1,290 in 2010.

For our analysis, we use market states as proxies for the relative strength of two incentives, namely compensation incentives and career concerns. Using a quarterly rolling window, we calculate the six-month cumulative market return on the CRSP value-weighted index and define a market state as bull (bear) if the half-year market return is positive (negative)[2]. Compensation incentives are assumed to be stronger in bull markets and career concerns are assumed to be more important in bear markets. Using this procedure, we classify 85 bull markets and 34 bear markets.

### *2.2 Risk shifting measure*

We follow Kempf *et al.* (2009) and measure the risk shifting of mutual fund $i$ at time $t$ as the intended risk change $RAR_{i,t}$, which is calculated as the ratio of the intended risk in the second half of the year ($\sigma_{i,t}^{(2),\,\text{int}}$) and the realized risk in the first half of the year ($\sigma_{i,t}^{(1))}$:

$$\text{RAR}_{i,t} = \frac{\sigma_{i,t}^{(2),\,\text{int}}}{\sigma_{i,t}^{(1)}} \tag{1}$$

$\sigma_{i,t}^{(1)}$ is calculated using the actual portfolio holdings[3] in the first half of the year and the realized stock returns during the same period. Specifically, we calculate value-weighted fund returns each week and compute $\sigma_{i,t}^{(1)}$ as the standard deviation of the weekly portfolio returns in the first half-year; $\sigma_{i,t}^{(2),\,\text{int}}$ is computed similarly as $\sigma_{i,t}^{(1)}$, but using the actual portfolio holdings from the beginning of the second half of the year, and stock returns from the first half of the year. Specifically, we first calculate the weekly weights of a fund's stocks using the actual holdings data at the beginning of the second half of the year and their contemporary market values. We then calculate value-weighted fund returns each week based on the weekly weights and the matching stock returns from the corresponding week during the first half of the year. Finally, $\sigma_{i,t}^{(2),\,\text{int}}$ is computed as the standard deviation of the hypothetical weekly portfolio returns in the second half of the year. Using each fund's actual holdings from the second half of the year, and the stocks' returns from the first half of the year allows us to measure the fund manager's intended risk shifting behavior, while controlling for any changes in the stocks' risk profiles or market conditions. The intended risk change $\text{RAR}_{i,t}$ is calculated on a quarterly rolling basis. Therefore, in the computation of $\text{RAR}_{i,t}$, the first half of the year refers to the first two quarters, while the second half of the year refers to the following two quarters.

## 3. Risk-shifting behavior across market states

Previous literature has documented that mutual fund managers' investment decisions vary with the state of the market. Popescu and Xu (2016a, b) find that mutual funds herd, on average, more in down markets than up markets, and that it is mostly driven by poorly performing funds. Kempf *et al.* (2009) show that equity fund managers' risk taking behavior is influenced by their desire to keep their jobs (employment incentives) during bear markets, and earning a higher compensation (compensation incentives) during bull markets. Specifically, during bear markets, aggregate inflows into mutual funds are lower, and therefore, the likelihood of job loss increases for the average fund manager (Chevalier and Ellison, 1999). During bull markets, however, the situation is the opposite. Aggregate inflows into funds are higher, thus fund managers' decisions are mostly driven by bonus and compensation incentives.

We follow the contingency table approach designed by Kempf *et al.* (2009), and independently sort funds, every quarter, into two groups based on their raw returns and their risk shifting measure RAR within their investment styles[4]. Funds with above (below) median raw returns are defined as winner (loser) funds, while fund managers with above (below) median RAR are classified as high (low) RAR managers. High RAR managers are those who tend to increase their portfolio risk, while low RAR managers are those who tend to reduce their portfolio risk. Each quarter, we classify each observation into one of the four cells of the $2 \times 2$ contingency tables and calculate the sample frequency for each cell. We repeat this procedure every quarter, and compare the time series means of the sample frequencies for the whole sample period, and for bull and bear markets, respectively. The results are summarized in Table II.

We find that loser funds and winner funds do not exhibit different risk shifting behavior for the whole sample period. However, when we divide the sample period into bull markets and bear markets, we observe a pattern emerging in their risk shifting behavior. Specifically, we find that poorly performing funds are likely to increase their risk level in bull markets, while reducing it during bear markets. At the same time, well performing funds exhibit the opposite risk-shifting behavior, by reducing their risk level in bull markets, and increasing it during bear markets. These findings are consistent with those in Kempf *et al.* (2009), and suggest that loser funds are agency prone, while winner funds are not. Furthermore, they also show that our sample is comparable to theirs. In order to gain further insight into the motivation behind fund managers' risk shifting behavior, we focus on examining the performance consequence of risk shifting behavior across bull markets and bear markets, respectively.

## 4. Performance consequence of risk-shifting behavior across market states

Previous studies attribute mutual fund managers' risk shifting behavior to two possible explanations – fund managers' incentives, and/or their superior investment ability.

| | Sample frequency | | | |
|---|---|---|---|---|
| | Winner funds | Loser funds | $\chi^2$ | $p$-value |
| *All (bull and bear)* | | | | |
| High RS | 25.10 | 24.93 | 0.4179 | 0.5180 |
| Low RS | 24.97 | 25.00 | | |
| *Bull markets* | | | | |
| High RS | 24.04 | 25.99 | 118.3783*** | < 0.0001 |
| Low RS | 26.04 | 23.93 | | |
| *Bear markets* | | | | |
| High RS | 27.46 | 22.57 | 301.6102*** | < 0.0001 |
| Low RS | 22.62 | 27.36 | | |

**Notes:** This table reports the frequency of fund managers allocated to each of the four portfolios formed based on the funds' past performance and their risk shifting measures. Every quarter, we sort funds into two groups based on their raw returns within their investment styles. Funds with higher than median raw returns are defined as winner funds, while funds with lower than median raw returns are defined as loser funds. We independently sort funds into two groups based on their risk shifting measure RAR. Fund managers with above median RAR are classified as high RAR managers, while managers with below median RAR are classified as low RAR managers. We calculate the percentage of fund managers designated to each of the four portfolios and report the time series means for each portfolio. We conduct $\chi^2$ test of the null hypothesis that the percentage in each portfolio is 25 percent. The $p$ value is based on the standard $\chi^2$ test. We report the results for the whole sample period in the top panel, as well as for the bull markets and bear markets in the bottom panel. ***Significant at the 1 percent level

**Table II.**
Risk shifting measure across market states

Although fund managers' motivations cannot be directly observed, we gain further insight into their reasoning for risk shifting by examining their performance subsequent to the decision to increase (decrease) the portfolio risk level. Specifically, if fund managers' risk shifting behavior is driven by agency issues, we expect funds will subsequently underperform. However, if risk shifting behavior is the result of skilled managers exploiting their investment acumen, we expect funds will subsequently outperform.

Specifically, we examine the relationship between performance and risk shifting in a cross-sectional regression setting, using the Fama and MacBeth (1973) methodology. Consistent with Kempf *et al.* (2009), we use the difference between intended portfolio risk in the second half of the year and realized risk in the first half the year ($\sigma_{i,t}^{(2),\,\mathrm{int}} - \sigma_{i,t}^{(1)}$) as the risk shifting measure. We begin by estimating the following regression model where the dependent variable is the fund's raw return in the first quarter of the intended risk measurement period since this is the quarter right after a fund manager makes the risk shifting decision[5]:

$$\begin{aligned} \mathrm{RET}_{i,t} = {} & \alpha_{it} + \beta_1 \times \mathrm{RSP}_{i,t-1} + \beta_2 \times \mathrm{RSN}_{i,t-1} \\ & + \beta_3 \times \mathrm{RET}_{i,t-1} + \beta_4 \times \mathrm{LOGTNA}_{i,t-1} \\ & + \beta_5 \times \mathrm{FLOW}_{i,t-1} + \beta_6 \times \mathrm{EXP}_{i,t-1} \\ & + \beta_7 \times \mathrm{TURNOVER}_{i,t-1} + \beta_8 \times \mathrm{AGE}_{i,t-1} + \epsilon_{i,t} \end{aligned} \quad (2)$$

$\mathrm{RSP}_{i,t-1}$ is a fund's risk shifting measure when it is positive, while $\mathrm{RSN}_{i,t-1}$ is when the risk shifting measure is negative, $\mathrm{RET}_{i,t-1}$ is the fund's previous quarter raw return, $\mathrm{LOGTNA}_{i,t-1}$ is the natural logarithm of the fund's assets under management, $\mathrm{FLOW}_{i,t-1}$ is the fund's flow over the previous quarter, $\mathrm{EXP}_{i,t-1}$ is the fund's expense ratio, $\mathrm{TURNOVER}_{i,t-1}$ is the fund's turnover ratio, and $\mathrm{AGE}_{i,t-1}$ is the fund's age. We split the risk shifting measure into the two components in order to capture the non-monotonic impact of risk shifting on performance[6].

The results in the second column in Table III show that for the overall sample period, the funds that increase their portfolio risk underperform, while funds that lower their portfolio risk do not. Specifically, we find that a 1 percent increase in portfolio risk results in a 2.75 percent drop in the fund's quarterly return. Our results are also consistent with Huang *et al.* (2011), who find that funds that increase the level of risk underperform those that do not.

In order to test whether the performance consequence of the risk shifting behavior varies across market states, we estimate the following regression model where the dependent variable is the fund's raw return in the first quarter of the intended risk measurement period:

$$\begin{aligned} \mathrm{RET}_{i,t} = {} & \alpha_{it} + \beta_1 \times \mathrm{RSP}_{i,t-1} \times UP + \beta_2 \times \mathrm{RSN}_{i,t-1} \\ & \times UP + \beta_3 \times \mathrm{RSP}_{i,t-1} \times \mathrm{DOWN} \\ & + \beta_4 \times \mathrm{RSN}_{i,t-1} \times \mathrm{DOWN} + \beta_5 \times \mathrm{RET}_{i,t-1} + \beta_6 \\ & \times \mathrm{LOGTNA}_{i,t-1} + \beta_7 \times \mathrm{FLOW}_{i,t-1} \\ & + \beta_8 \times \mathrm{EXP}_{i,t-1} + \beta_9 \times \mathrm{TURNOVER}_{i,t-1} + \beta_{10} \times \mathrm{AGE}_{i,t-1} + \epsilon_{i,t} \end{aligned} \quad (3)$$

where all variables are as previously defined, and UP and DOWN are dummy variables for the bull markets and bear markets, respectively. Specifically, dummy variable UP (DOWN) equals 1, if the market return for the first half of the year is positive (negative).

The results in the third column in Table IV are consistent with our earlier results. Specifically, during bull markets, we find that a 1 percent increase in portfolio risk results in a 1.36 percent drop in the fund's quarterly return, while a 1 percent decrease in the level of risk leads to a 0.12 percent increase in the fund's quarterly return. Furthermore, during bear markets, we find that a 1 percent decrease in the level of risk reduces the fund's return by 0.04 percent on a quarterly basis.

| | Raw return$_t$ | Raw return$_t$ |
|---|---|---|
| Intercept | 0.0251*** (3.25) | 0.0251*** (3.25) |
| $RSP_{t-1}$ | −2.7517*** (−2.09) | |
| $RSN_{t-1}$ | −0.0783 (−1.15) | |
| $RSP_{t-1} \times Up$ | | −1.3631*** (−2.50) |
| $RSN_{t-1} \times Up$ | | −0.1155* (−1.84) |
| $RSP_{t-1} \times Down$ | | −1.3887 (−1.49) |
| $RSN_{t-1} \times Down$ | | 0.0372** (2.06) |
| Raw return$_{t-1}$ | 0.0680*** (3.32) | 0.0680*** (3.32) |
| $Log(TNA)_{t-1}$ | −0.0003* (−1.71) | −0.0003* (−1.71) |
| $Flow_{t-1}$ | 0.0038 (1.13) | 0.0038 (1.13) |
| Expense ratio$_{t-1}$ | −0.1630* (−1.78) | −0.1630* (−1.78) |
| Turnover ratio$_{t-1}$ | 0.0014* (1.81) | 0.0014* (1.81) |
| $Age_{t-1}$ | −0.0001* (−1.86) | −0.0001* (−1.86) |

**Notes:** The table reports the Fama-MacBeth time series averages of the cross-sectional coefficients from regressions of a fund's raw return on the fund's risk shifting and control variables. Specifically, Column 2 reports the coefficients from the following regression:

$$RET_{i,t} = \alpha_{it} + \beta_1 \times RSP_{i,t-1} + \beta_2 \times RSN_{i,t-1} + \beta_3 \times RET_{i,t-1} + \beta_4 \times LOGTNA_{i,t-1} + \beta_5 \times FLOW_{i,t-1} + \beta_6 \times EXP_{i,t-1} + \beta_7 \times TURNOVER_{i,t-1} + \beta_8 \times AGE_{i,t-1} + \epsilon_{it}$$

Column 3 reports the coefficients from the following regression:

$$RET_{i,t} = \alpha_{it} + \beta_1 \times RSP_{i,t-1} \times UP + \beta_2 \times RSN_{i,t-1} \times UP + \beta_3 \times RSP_{i,t-1} \times DOWN + \beta_4 \times RSN_{i,t-1} \times DOWN + \beta_5 \times RET_{i,t-1} + \beta_6 \times LOGTNA_{i,t-1} + \beta_7 \times FLOW_{i,t-1} + \beta_8 \times EXP_{i,t-1} + \beta_9 \times TURNOVER_{i,t-1} + \beta_{10} \times AGE_{i,t-1} + \epsilon_{it}$$

$RSP_{i,t-1}$ is a fund's risk shifting measure when it is positive, while $RSN_{i,t-1}$ is when the risk shifting measure is negative; $RET_{i,t-1}$ is a fund's raw return for the previous quarter, $LOGTNA_{i,t-1}$ is the natural logarithm of a fund's assets under management, $FLOW_{i,t-1}$ is a fund's flow over the previous quarter, $EXP_{i,t-1}$ is a fund's expense ratio, $TURNOVER_{i,t-1}$ is a fund's turnover ratio, and $AGE_{i,t-1}$ is fund's age. UP and DOWN are the dummy variables for bull markets and bear markets, respectively. Specifically, UP (DOWN) equals 1, if the market return for the first half of the year is positive (negative). *,**,***Significant at the 10, 5, 10 percent levels, respectively

**Table III.**
Performance consequence of risk shifting by market states – cross-sectional regression approach

In conclusion, after controlling for fund characteristics, we find that funds who shift risk up underperform in bull markets, while those that shift risk down outperform in bull markets and underperform in bear markets. Our results suggest that both the agency and investment ability hypotheses are driving fund managers' risk shifting behavior. Specifically, during bull markets, when compensation incentives are greater, agency-prone funds and/or those funds managed by managers with inferior investment abilities increase their portfolio risk, and subsequently underperform. On the other hand, funds that reduce their portfolio risk in bull markets subsequently outperform, suggesting that these fund managers possess superior investment ability. Furthermore, during bear markets, when career concerns are greater, agency-prone funds and/or those funds managed by managers with inferior investment abilities reduce their portfolio risk and subsequently underperform.

## 5. Performance consequence of risk-shifting behavior by winner and loser funds across market states

Our earlier results show that winner and loser funds exhibit opposite risk shifting behavior across market states. Kempf *et al.* (2009) argue that this pattern is due to the different incentives that winner and loser fund managers face in bull markets vs bear markets.

| | Loser funds | | Winner funds | |
|---|---|---|---|---|
| | Raw return$_t$ | Raw return$_t$ | Raw return$_t$ | Raw return$_t$ |
| Intercept | 0.0252*** (3.18) | 0.0252*** (3.18) | 0.0241*** (3.19) | 0.0241*** (3.19) |
| RSP$_{t-1}$ | −4.1387*** (−2.55) | | −0.7530 (−1.06) | |
| RSN$_{t-1}$ | 0.0070 (0.17) | | −0.1524 (−1.35) | |
| RSP$_{t-1}$ × Up | | −1.9518*** (−2.70) | | −0.1578 (−0.25) |
| RSN$_{t-1}$ × Up | | −0.0539 (−1.19) | | −0.1733** (−1.98) |
| RSP$_{t-1}$ × Down | | −2.1868* (−1.77) | | −0.5952 (−1.13) |
| RSN$_{t-1}$ × Down | | 0.0608*** (4.15) | | 0.0208 (0.58) |
| Raw return$_{t-1}$ | 0.0737*** (5.29) | 0.0737*** (5.29) | 0.0697*** (2.83) | 0.0697*** (2.83) |
| Log (TNA)$_{t-1}$ | −0.0004 (−1.27) | −0.0004 (−1.27) | −0.0001 (−0.76) | −0.0001 (−0.76) |
| Flow$_{t-1}$ | 0.0006 (0.23) | 0.0006 (0.23) | 0.0064 (1.59) | 0.0064 (1.59) |
| Expense ratio$_{t-1}$ | −0.1021 (−1.60) | −0.1021 (−1.60) | −0.0427 (−0.43) | −0.0427 (−0.43) |
| Turnover ratio$_{t-1}$ | 0.0016 (1.61) | 0.0016 (1.61) | 0.0016** (2.22) | 0.0016 (2.22) |
| Age$_{t-1}$ | −0.0000 (−0.96) | −0.0000 (−0.96) | −0.0000 (−0.08) | −0.0000 (−0.08) |

**Notes:** The table reports the Fama-MacBeth time series averages of the cross-sectional coefficients from regressions of winner (loser) fund's raw return on the fund's risk shifting and control variables. Funds with above (below) the median raw returns of all funds in the same segment are defined as winner (loser) funds. Columns 2 and 4 report the coefficients from the following regression:

$$\mathrm{RET}_{i,t} = \alpha_{it} + \beta_1 \times \mathrm{RSP}_{i,t-1} + \beta_2 \times \mathrm{RSN}_{i,t-1} + \beta_3 \times \mathrm{RET}_{i,t-1} + \beta_4 \times \mathrm{LOGTNA}_{i,t-1} + \beta_5 \times \mathrm{FLOW}_{i,t-1} + \beta_6 \times \mathrm{EXP}_{i,t-1} + \beta_7 \times \mathrm{TURNOVER}_{i,t-1} + \beta_8 \times \mathrm{AGE}_{i,t-1} + \epsilon_{it}$$

Columns 3 and 5 report the coefficients from the following regression:

$$\mathrm{RET}_{i,t} = \alpha_{it} + \beta_1 \times \mathrm{RSP}_{i,t-1} \times \mathrm{UP} + \beta_2 \times \mathrm{RSN}_{i,t-1} \times \mathrm{UP} + \beta_3 \times \mathrm{RSP}_{i,t-1} \times \mathrm{DOWN} + \beta_4 \times \mathrm{RSN}_{i,t-1} \times \mathrm{DOWN} + \beta_5 \times \mathrm{RET}_{i,t-1} + \beta_6 \times \mathrm{LOGTNA}_{i,t-1} + \beta_7 \times \mathrm{FLOW}_{i,t-1} + \beta_8 \times \mathrm{EXP}_{i,t-1} + \beta_9 \times \mathrm{TURNOVER}_{i,t-1} + \beta_{10} \times \mathrm{AGE}_{i,t-1} + \epsilon_{it}$$

RSP$_{i,t-1}$ is a fund's risk shifting measure when it is positive, while RSN$_{i,t-1}$ is when the risk shifting measure is negative; RET$_{i,t-1}$ is a fund's raw return for the previous quarter, LOGTNA$_{i,t-1}$ is the natural logarithm of a fund's assets under management, FLOW$_{i,t-1}$ is a fund's flow over the previous quarter, EXP$_{i,t-1}$ is a fund's expense ratio, TURNOVER$_{i,t-1}$ is a fund's turnover ratio, and AGE$_{i,t-1}$ is fund's age. UP and DOWN are the dummy variables for bull markets and bear markets, respectively. Specifically, UP (DOWN) equals 1, if the market return for the first half of the year is positive (negative). *,**,***Significant at the 10, 5, 1 percent levels, respectively

**Table IV.** Performance consequence of risk shifting by fund types and across market states – cross-sectional regression approach

Specifically, in bull markets, when compensation incentives dominate, loser funds have a strong incentive to increase their portfolio risk in order to catch up with winner funds, and thus increase their share of fund flows and assets under management; whereas winner funds tend to keep their portfolio risk constant and lock in their leading position. During bear markets, when career concerns dominate, loser funds are more likely to decrease their portfolio risk, and thus decrease the probability of losing their jobs; whereas winner funds are less concerned about their careers, and thus less likely to adjust their portfolio risk level. In addition to this agency theory argument, loser and winner funds could also alter their portfolio risk level if managers are skilled and taking advantage of their superior investment abilities.

In order to reveal the economic motivation behind funds' risk shifting behavior, we empirically examine the performance consequence of such behavior for both winner and loser funds, across market states. Specifically, we examine the relationship between performance and risk shifting in a cross-sectional regression setting, using the Fama and MacBeth (1973) methodology. We begin by sorting funds, every quarter, into quintiles based on their raw returns. Funds placed in the top (bottom) quintile are identified as winner (loser) funds.

We then estimate the regression models specified in Equations (2) and (3), for both winner and loser funds, respectively.

Table IV reports the results for the regressions, and they are consistent with those in Table III. Specifically, for the overall sample period, we find that for every 1 percent increase in portfolio risk, loser funds underperform by 4.14 percent on a quarterly basis. Furthermore, loser funds' underperformance as a result of increasing portfolio risk occurs in bull markets, as well as in bear markets. Specifically, loser funds that increase their portfolio risk by 1 percent subsequently underperform by 1.95 percent on a quarterly basis in bull markets, and by 2.19 percent on a quarterly basis in bear markets. Furthermore, loser funds that decrease their portfolio risk by 1 percent underperform by 0.07 percent on a quarterly basis.

In contrast, the overall sample period evidence for winner funds shows that their risk shifting behavior does not impact their performance. However, during bull markets, winner funds that reduce risk by 1 percent subsequently outperform by 0.17 percent on a quarterly basis.

The evidence in Table IV suggests that loser funds who increase their portfolio risk in either market state, or who decrease the level of risk in bear markets are agency prone or likely to be managed by managers with inferior investment skill. At the same time, the evidence suggests that winner funds exhibit superior investment ability during bull markets.

## 6. Conclusion

Mutual fund managers change their risk levels significantly over time and this risk shifting behavior can have different impact on fund performance based on whether it is the result of fund managers' response to the incentives they face, and/or their superior investment ability. Our paper sheds light on this issue by examining whether the performance consequence of such behavior is dependent on the state of the market and on the funds' past performance.

We first document that mutual fund managers exhibit different risk shifting behavior across bull and bear markets. Specifically, we find that poorly performing funds are likely to increase their portfolio risk level in bull markets, while reducing it during bear markets. The evidence is consistent with the argument that loser funds increase their portfolio risk to improve their performance when compensation incentives are stronger, during bull markets, and to play it safe and secure their jobs when career concerns dominate, during bear markets. These findings confirm the results in Kempf *et al.* (2009), and further show that our sample is comparable to theirs.

In order to gain further insight into the economic motivation behind risk shifting behavior, we focus our analysis on its impact on subsequent fund performance across market states. When pooling all funds together, we find a negative relationship between increasing (or decreasing) risk and performance in bull markets and a positive relationship between decreasing risk and performance in bear markets. When separating funds by their past performance, we find that poorly performing funds that increase (or decrease) their risk underperform across bull and bear markets, while well performing funds that reduce risk during bull markets subsequently outperform. Our results suggest that loser funds tend to be agency prone or be managed by managers with inferior skill and that winner funds exhibit superior investment ability during bull markets.

Our study has important practical implications for both mutual fund investors and fund management companies, as it improves our understanding of the consequences following fund managers' risk shifting behavior. Individual investors are better off avoiding mutual funds that shift their risk levels due to compensation (employment) incentives, as the additional trading costs will hurt the funds' performance. Furthermore, they should particularly avoid funds that increase their risk level in up markets, or decrease their risk level during bear markets, as these funds underperform on a risk-adjusted basis. At the same time, fund management companies should also discourage and limit agency-prone risk-shifting behavior, as it can hurt fund family performance, as well as its asset allocation efficiency.

## Notes

1. We follow the filters used in Kacperczyk *et al.* (2008) and eliminate other types of funds such as bond funds, sector funds, international funds, balanced funds and index funds.
2. Defining market states is consistent with Cooper *et al.* (2004) and Kempf *et al.* (2009).
3. The fund holdings data is available quarterly. We assume that fund managers change their holdings at the beginning of each quarter and that fund managers keep the same holdings for the remaining of the quarter.
4. We follow the methodology in Pastor and Stambaugh (2002) and assign funds into five styles, using the information that the CRSP database provides about classifications by Wiesenberger, ICDI and Strategic Insight.
5. This measure is the one used in the regression analyses by Kempf *et al.* (2009), and it is also similar to the measure used by Huang *et al.* (2011).
6. This specification is similar to the one used by Huang *et al.* (2011).



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