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Mapping Mutual Fund Investor Characteristics and Modeling Switching Behavior

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Abstract

Securing a mutual fund that meets investment goals is an important reason why some investors exclusively stay with a particular mutual fund and others switch funds within their fund family. This paper empirically investigates investor attitudes toward mutual funds. Our model, based on investor responses, develops an investor's "risk profile" variable. Results indicate that regardless of whether the investors invest in nonemployer plans or in both employer and nonemployer plans, they consider their investment risk, fund performance, investment mix, and the capital base of the fund before switching funds. The model developed in this study can also assist in predicting investors' switching behavior.

JEL classification: D12; D31; G23; P34; P46

Keywords: Customer loyalty; Fund switching behavior; Decision models; Risk analysis

1. Introduction

Among the many developments in the financial sector, the growth in mutual fund investments is justifiably characterized as one of the most significant. Investments in these

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funds have increased from $62 billion in 1980 to $3.02 trillion in 2000 (Statistical Abstract, 2001). Mutual funds have become the primary vehicle of investments in capital markets for most individuals and households. It is estimated that nearly 47.4% of American households now own mutual funds, and most of these investors buy professionally managed mutual funds (Prial, 1999). However, evidence indicates that the average mutual fund underperforms a simple market index (Jensen, 1969; Malkiel, 1995). This may be because investors trade and switch funds frequently, which may lower their performance (Carhart, 1997).

The various providers of mutual funds are in a heavily competitive market today. Initial estimates show that nearly $55 billion flowed out of equity mutual funds in July 2002 (Mayer, 2002). The primary goal of this paper is to improve our understanding of why investors switch between funds or stay with a particular fund in a family of funds. To understand this behavior, we divide the sample into two groups: investors who own investments exclusively in nonemployer plans versus those who own investments in both nonemployer plans and employer plans [e.g., 401(k)]. It is hypothesized that investors investing exclusively in nonemployer plans differ on several behavioral dimensions from investors investing both in employer-sponsored and nonemployer plans. This study addresses the distinguishing features of these two types of investors by incorporating the logic functions of an Excel spreadsheet and a statistical model into a hybrid system to identify factors that cause each group of investors to switch funds within a fund family.

In addition, as competition between mutual fund companies intensifies and uncertainty regarding the credibility of financial statements increases in the wake of recent accounting scandals, an understanding of investor behavior becomes a critical source of competitive advantage to investment houses. From a funds manager's perspective, it is important to understand why some investors stay with a particular fund and why some switch to other funds within their fund family. This knowledge enables fund managers to accomplish two strategic goals in attracting and retaining new customers. Managers know that retaining customers in a fund family is a less costly and more efficient marketing strategy than finding new customers (Levin, 1993). For this reason, it is strategically important for fund managers to develop customer profiles that will help them answer questions about loyalty and fund-switching behavior of investors.

We divide the paper into six sections. In section 2, we review the literature. In section 3, we present the hypotheses and in section 4, we describe the logit model, the intelligent hybrid spreadsheet, and the research method. In section 5, we present the results. In section 6, we present our conclusions with reference to theoretical implications and suggestions for future research. Overall, the paper attempts to add to the growing body of behavioral research on investor behavior related to mutual fund investments by adopting an interdisciplinary approach to model building, by borrowing from the literature on economic psychology, and by adding an information systems component to the variables proposed by the behavioral finance literature. The findings of this paper will have strategic implications for investment houses marketing their products and services in today's highly competitive financial markets.

2. Literature review

A significant shift has occurred in the personal investment environment, affecting investors as well as investment firms. The shift is partly due to the Internet's role as a medium of communication and a channel of distribution. This democratization of information sources has changed the investment landscape (Baker and Nofsinger, 2002; Barber and Odean, 2001). Henderson (1999) notes that more and more investors are relying on information that they gather themselves in order to manage their investments. The changing technology and the consequent investor behavior demand that fund managers understand the changing customer profile.

Two important research streams in the finance literature focus on predicting fund performance and understanding investor behavior. The academic literature on mutual funds has mostly focused on fund performance and management style (e.g., Grinblatt and Titman, 1992; Brown and Goetzman, 1997; Lunde et al., 1999; Chevalier and Ellison, 1999; Kothari and Warner, 2001), although others have focused on the risk-return characteristics of bond mutual funds (Philpot et al., 2000; Blake et al., 1993). Some studies (Indro et al., 1999; Morey and Morey, 1999; Sirri and Tufano, 1998) have also investigated the different methods of predicting fund performance by using tools, such as neural networks or benchmarking. Recent literature, however, proposes the use of integrated or hybrid models for predicting fund performance. Tsaih et al. (1998), for example, develop a hybrid artificial intelligence technique to implement trading strategies in the S & P 500 stock index futures market. Their empirical results show that their system outperformed the passive buy-and-hold investment strategy during the six-year testing period. The authors suggest that the hybrid approach facilitates the development of more reliable intelligent systems than stand-alone expert systems models.

Hybrid systems also offer the organization a method to facilitate knowledge management. Knowledge management includes knowledge repositories, expert networks, best practices, and communities of practice (King et al., 2002). The repositories consist of databases from which members of the organization can retrieve specific technical knowledge. Knowledge management has been used to add external knowledge to Web sites (Ojala, 2002), provide knowledge discovery for destination management (Pyo et al., 2002), and deliver distance teaching (Hirschbuhl et al., 2002). These applications reflect the fact that one of the uses of knowledge management is to provide a strategic advantage (King et al., 2002).

Some recent studies have begun to address the issue of understanding investor behavior (e.g., Zheng, 1999; Harliss and Peterson, 1998; Goetzmann and Peles, 1997; Alexander et al. 1997, 1998; Bogle, 1992). These studies have aroused scholarly interest in understanding how investors make investment decisions. A study by Alexander et al. (1998) examines responses of randomly selected mutual fund investors. Their findings show that employees investing in mutual funds through their employer-sponsored pension plans [e.g., 401(k)] are generally younger, more likely to own stock funds, and less likely to own certificate of deposits and money market accounts. In addition, individuals investing in mutual funds via nonemployer channels are significantly more experienced than individuals investing in employer-sponsored pension plans. Both types of mutual fund holders (those investing through employers and those investing in nonemployer plans) are well educated, with 55%

having at least a college degree, and do not consider the operating expenses of the mutual fund to be an important factor in their purchasing decision.

Overall, limited research has been performed to integrate these three streams of literature—financial, behavioral, and information technology (e.g., Nagy and Obenberger, 1994). This paper attempts to integrate these three streams of research to enhance our understanding of investors' fund-switching behavior and in improving prediction accuracy. Our study attempts to extend the literature on the investment behavior of mutual fund investors by focusing on the differences and similarities between individuals investing in employer versus nonemployer investment plans. This issue has not been investigated adequately in the literature.

3. Hypotheses development

Investments are made in a dynamic economic environment, where volatility and uncertainty greatly determine the expected returns. Miliken (1987) notes that perceived environmental uncertainty exists when it is difficult to understand environmental trends or when it is difficult to predict whether a particular event will occur. Switching between mutual funds in an uncertain and unpredictable environment, therefore, comes with a cost as well as the expectation of achieving the newly prioritized goals. The cost of switching funds to investors is both financial and psychological. Investors have to make the tradeoffs within bounded rationality and in an asymmetric environment. We present the alternate hypotheses dealing with the reasons for switching investments between funds in a mutual fund family. Existing research and input from some of the leading investment houses forms the basis for developing these hypotheses.

3.1. Asset allocation (AALL)

In general, employees invest their savings either in an employer-sponsored retirement plan or in an outside investment plan, or both. Frequently, employees choose stock or mutual funds offered by their companies (Benartzi, 1991). Investment opportunities outside the firm include individual stocks and bonds, mutual funds, money market funds, and so forth. Research on investment portfolio management suggests the importance of asset allocation for managing the investment environment (Braham, 1999; Cardona, 1998, Walker, 1998). Cardona (1998) describes asset allocation as a benefit of mutual fund investing. Braham (1999) provides evidence of better returns in the long run for financial planners and their clients who stick to their original asset allocation. We, therefore, propose the following:

H1: Investors switch funds within a fund family when they are not satisfied with the allocation of their existing investments.

3.2. Investment in stocks and bonds (INVP)

The existing literature indicates that mutual funds are used as a vehicle to participate in different stock and bond markets (Cardona, 1998). In addition to the benefits of diversifi-

cation, mutual funds also give investors the benefit of professional management, economies of scale, and flexibility (Cardona, 1998). However, over time investors may feel the need to change the composition of their investment with respect to stocks and bonds. Unless investors are risk prone, it is more likely that they will invest in a balanced portfolio. We, therefore, propose the following:

H2: Investors may switch investment in mutual funds in order to achieve a better mix of stocks and bonds in their investment portfolio.

3.3. Investment losses (INVU)

The selection of mutual funds is a nonroutine decision for investors, involving different types of uncertainties. These uncertainties stem from bounded rationality and an asymmetric environment. Given these two situations, investors motivated by fear of possible investment loss may switch funds. The hardest part of the investment selection process may stem from a lack of adequate information or difficulty comprehending information that is already available. Of course, in the end, investors wish to maximize returns by avoiding investment losses. We then propose the following:

H3: Investors switch funds within a fund family to minimize investment losses.

3.4. Investment strategy

Benartzi (2001) reports that approximately one third of the assets of large retirement savings plans have been invested in the stocks issued by the employing firm. Investors may decide to switch investments between funds or within a fund family as a result of the investment strategy they have chosen. Specifically, investors may switch funds to follow an investment strategy that reduces risk (RRED), locks-in capital gains (LGAINS), widens diversification (WDIV), obtains a better mix of equity versus bonds or U.S. versus foreign securities (IMIX), and makes better decisions based on self-analysis of existing information (SANA). Therefore, we propose the following:

H4: The investment strategy of the investors would influence the decision whether or not to switch funds among the funds in a fund family.

3.5. Age (AGE)

Age as a variable has been extensively used in the finance literature to explain investment behavior. Alexander et al. (1988) found in their survey that the median age of a mutual fund shareholder is 43 years and that younger investors are more likely to invest in mutual funds through their pension plans than older investors. Bodie et al. (1992) provide theoretical justification for investors to reduce investments in stocks as they grow older. Riley and Chow (1992) found that individual risk aversion decreases with age. In addition, the life-cycle argument suggests that people's needs change as they age. We, therefore, propose the following:

H5: As investors grow older, they are more likely to switch funds to achieve a desirable investment strategy.

3.6. Income (INC)

Alexander et al. (1998) provide information about the financial characteristics of investors who own mutual funds. Participants in their survey who purchased mutual funds through brokers, pension plans, and directly from a fund company reported higher median income than those purchasing through other channels. These purchasers were experienced investors with median income of $58,800. Hence, income influences investment behavior of individuals and, furthermore, individuals with higher income are more likely to switch funds to maximize their return on investment. We, therefore, propose the following:

H6: Individuals in higher income brackets are more likely to switch funds.

3.7. Fund performance

Siri and Tufano (1998), Patel et al. (1990), and Ippolito (1992) report that investors generally invest in positive performance funds and divest from poor performing funds. Benartzi (1991) found that employees' investment in their employer's company stock is correlated with past returns, but not with future performance. Existing literature also suggests that factors such as return and risk characteristics of financial assets affect investor decisions to invest in a fund family (Elton and Gruber, 1989; Markowitz, 1959). Harliss and Peterson (1998) found that when choosing funds, investors consider fund performance closely, regardless of the risk and expenses of the fund. Based on these studies, the following factors are considered as reasons for investors to select a particular fund family: better initial investment performance (IFPER), low fund expenses (LFEXP), fund diversification (FDIV), consolidation of funds in one family (FCON), and a large capital base (LCAPB). Hence, investors may switch funds because of any one or a combination of these factors. We propose the following hypothesis:

H7: Investors switch funds when the performance of the fund is below the original expectation factors: investment performance, fund expenses, fund diversification, consolidation of funds in one family, and a large capital base.

3.8. Investors' risk profile (RPROF)

Attitude towards risk is posited to affect risk-taking behavior of the investor. Prior studies suggest that large gains and losses affect investor risk behavior (see Baker and Nofsinger, 2002; Shefrin, 2000; Thaler and Johnson, 1990). After earning large gains, the investment behavior of investors tends to become riskier; after experiencing large losses, investors may become overly cautious or even reckless with their investment decisions. Hartman and Smith (1990) in a microlevel study found that the level of risk perceived by investors affected investment behavior. Harliss and Peterson (1998) found that investors do not consider investment risk on choosing a fund; instead, they tend to focus on fund performance. In this study, the investor's attitude toward risk is measured using a variable, RPROF, described in Appendix A. We propose the following hypothesis:

H8: Investors following an aggressive investment strategy are more likely to switch funds within a fund family than investors using a conservative investment strategy.

4. Research method

4.1. Sample

The data for this study was gathered in cooperation with leading brokerage houses. Several executives from investment banking firms reviewed and critiqued the questionnaire for possible ambiguity and misinterpretations in the choice of the words. Five thousand questionnaires were mailed. A total of 262 individuals responded to our survey, which represents a response rate of 6.55%. Admittedly, this is a low response rate, which makes it difficult to generalize the results of this study. However, we believe that the low response rate, common in financial surveys, is a result of the personal financial nature of information sought. Of the total of 262 responses, 143 individuals had mutual fund investments in employer-sponsored plans and also in nonemployer plans, and 119 individuals had investments only in nonemployer plans.

Each of our two datasets, representing those individuals who had investments only in nonemployer mutual funds and those who invested both in employer-sponsored and nonemployer plans, were randomly divided into training and testing datasets for the purpose of developing the hybrid system. The "nonemployer investments only" sample, starting with 119 observations, was divided into a training dataset totaling 59 observations—45 represented individuals who had not switched funds, and 14 represented individuals who had switched funds. The testing dataset included the remaining 60 items—46 individuals who had not switched funds, and 14 who had switched funds. The dataset for the individuals who had "both" kinds of investment plans—nonemployer plans and employer-sponsored plans—started with 143 observations. The training dataset consisted of 71 observations—46 of those had not switched funds and 25 had switched funds. The testing dataset contained the remaining 72 responses—46 individuals who had not switched funds, and 26 who had switched funds.

4.2. Variables

4.2.1. Dependent variable

The dependent variable measures the switching behavior of respondents (SF) and is coded 1 if the investor traded or switched investment between funds in a fund family and 0 otherwise.

4.2.2. Independent variables

1. AALL = asset allocation. It measures whether or not current asset allocation is appropriate.
2. INVP = investment in stocks and bonds. It measures how investors' asset allocation has changed over time, that is, towards owning more mutual funds than individual stocks or bonds.
3. INVU = investment uncertainty. It measures which of the following factors the

respondents found the hardest in making investment decisions: lack of information, need for more information, confusing information, and fear of losing money.

4. RRED = risk reduction. The reason for trading or switching investment between funds is for risk reduction.
5. LGAINS = lock-in-capital gains. The reason for trading or switching funds is that investors want to capture capital gains.
6. IMIX = changing portfolio mix. The reason for switching funds is to change the mix of equity versus bonds or U.S. versus foreign investments within a fund family.
7. SANA = investment analysis. It measures whether investors switch funds based on their private analysis of existing information.
8. AGE = ages of respondents. Age classifications groups are: under 25, 25 to 34, 35 to 44, 45 to 54, 55 to 66, and over 66. On average, as investors grow older, they are more likely to switch funds to short- or intermediate-term investment horizons.
9. INC = income. It measures annual income before taxes and is grouped as: less than $30,000; $30,000–49,999; $50,000–74,999; $75,000–99,999; $100,000–149,999; and over $150,000. Individuals with higher income are more likely to switch funds for higher returns.
10. IFPER = investment performance. It measures whether investors originally invested their monies in the mutual fund due to the investment performance. Investors are likely to switch funds to obtain a higher investment return.
11. LCAPB = fund size. It measures whether mutual fund investors originally selected the fund because of the larger size of the fund. The larger the fund size, the greater the amount of money the fund is able to attract.
12. RPROF = investor profile. Investors expecting high investment risk due to general economic conditions are likely to switch funds. The detail of how this variable is developed is given in Appendix A.

The following variables address issues pertaining to investors holding investments in both employer-sponsored and nonemployer plans:

13. FDIV= diversification. It measures whether the investor selected the fund because of the funds' diversified portfolio. Investors are likely to select a diversified fund within the fund family.
14. FCON = consolidation. It measures whether the investor chose the fund to consolidate investment in a single fund family. If consolidation is the investment strategy, investors are more likely to move their monies into fewer funds within the fund family.
15. LFEXP = fund cost. It measures whether the investor selected the fund because of low fixed expenses. Investors are likely to switch funds to lower their fixed expenses.
16. WDIV = portfolio diversification. The reason for trading or switching funds within a fund family is the diversification of the investment portfolio.

4.2.3. The design of the spreadsheet-hybrid model

The development of the hybrid system was done after the collection of the survey data. The hybrid model, which is called IRisk, consists of an Excel spreadsheet, designed as a

questionnaire for the investor to answer, combined with the logistic regression model described below. Through its questioning procedure, IRisk accepts the responses to the variables described above. It also develops the value for the RPROF variable from the responses to questions listed in Appendix A. IRisk then calculates a probability as a prediction of whether an investor is likely to switch funds. This hybrid model can be viewed as an instructional system for the investor, as well as a method of providing expert support to the fund manager. The model, with its data bank of information derived from the survey questions, can provide a mechanism for "mining" the data, building an individual profile useful for a collaborative environment (Maybury et al., 2001).

The entry screen for the IRisk spreadsheet is shown in Fig. 1. This screen briefly explains the risk model, using the "Note" feature of Excel. The note appears as a red triangle in the corner of the title box as follows:

"This spreadsheet is a consultation that guides you, the user, through a process to determine whether you, an investor, may want to switch mutual funds. The questions to determine the investor risk profile are divided into three areas: Market reaction risk, Reinvestment risk, and Belief risk. Once you answer the questions on the screen, the spreadsheet will rank the risks as high or low. Then, you will be prompted to answer financial questions."

The spreadsheet then goes on and presents the questions that help formulate the RPROF variable (see Fig. 1). The user answers the first three questions given in Fig. 1, and the spreadsheet logic applies the scoring described in Appendix A. There is a scoring for "market reaction risk," "reinvestment risk," and "belief risk." Market reaction risk gauges the user's risk, based on the response to the question about how the user reacted when the stock market fell recently. The choices supplied are the same choices that were supplied on the research questionnaire. The reinvestment risk is based on the answer to the question about what the user will do when reinvesting. A choice that reflects a self-assured investor is viewed as a higher risk rating compared to the other choices, which represent fixed investments and a conservative strategy. The final question gauges belief risk as the response to the question about what the user believes will happen in the near future to the stock market and interest rates. The user responds with a "Y" or "N" on the appropriate line.

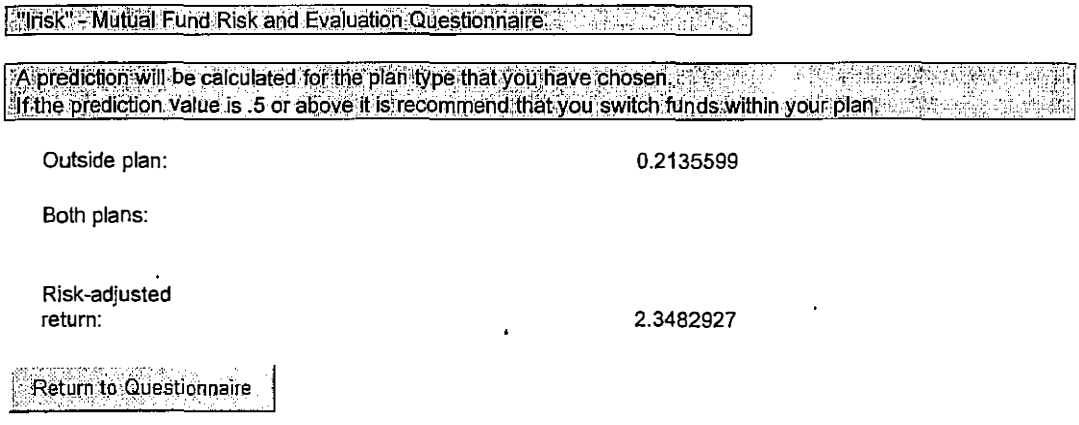
After the RPROF computation is performed, the spreadsheet continues with questions designed to collect responses for the remaining variables of the statistical model. The logistic regression equation is built into the IRisk spreadsheet, as shown in Fig. 2, and produces a "prediction" of whether the investor should or will switch funds. Because logistic regression computes a value between 0 and 1, the user can consider the prediction as a "probability" of switching.

The hybrid model also provides information to investors regarding their fund's risk-adjusted performance (RAP), adapted from the model by Modigliani and Modigliani (1997). Previous research has shown that funds with higher ratings tend to have higher risk-adjusted performance, a greater degree of diversification, a larger asset base, managers with longer tenures, and lower front-load charges and expense ratios (Khorana and Nelling, 1998). It is important that the fund manager, broker, and investor have access to the risk-adjusted performance of the fund on a continuous basis. The equation for computing the RAP measure is as follows:

"Risk" - Mutual Fund Risk and Evaluation Questionnaire

	Enter in this column:	Risk
How did you react when the stock market fell recently?	"Y" or "N"	
Transferred assets to money market		
Did not change anything		
Changed from stock to bonds		
Redeemed for cash or sold company stock		
Sought professional help		
Made own decisions	N	0
What will you do when reinvesting?		
Return to original fund		
Return to original allocations in retirement plan		
Seek a safer mix		
Keep all investments in stable or money market		
Rely on professional advice	Y	
Trust my instincts		0
What do you believe will happen to the stock market/interest rates?		
Stock market will fall		
Stock market will move high	Y	
Interest rates will decline		
Interest rates will increase		1
Total risk score:		1
Type of investment plan?		
Outside plan only	Y	
Corp. and outside plan		
Does your fund family provide sufficient diversification?		0
How has your portfolio changed over time? (choose only one)		
Own more mutuals		
Own more stocks	Y	
Equal division		
No change		2
What was the hardest part of the selection process? (choose only one)		
Not enough info		
Needed more advice	Y	
Found info confusing		
Afraid to lose money		2
In which of the following situations would you switch funds? (choose all that apply)		
To reduce risk?		0
To lock in capital gains?	Y	1
To change equity mix?		0
To lower fund expenses?		0
To widen diversity?		0
Because you lost faith in future?		0
Because the manager changed?		0
Because your broker recommended?		0
Because of poor personal service?		0
Because of self-investment analysis?		0
What is your age? Less than 25		
25-34		
35-44		
45-54		
55-64	Y	
65 or older		5
What is your income? Less than 30000		
30000-49999		
50000-74999		
75000-99999		
100000-149999		
150000 or over		6
Why did you select your fund family? (choose all that apply)		
Good performance?	Y	1
Low risk		0
Low fund expenses		0
Diversification		0
Could consolidate		0
Variety	Results	0
Fund family had a large capital base		0
Enter your fund's return:		0.045

Fig. 1. Entry screen for the IRisk system.



The user links to this screen after answering the questions on the first page of the IRisk spreadsheet. This screen depicts the result for an investor who has only an outside plan.

Fig. 2. Prediction results and calculation of risk-adjusted performance (RAP).

$$RAP_i = (\sigma_m/\sigma_i)(r_i - r_f) + r_f \tag{1}$$

where RAP_i is the risk-adjusted return of portfolio i, σ_m is the standard deviation of market returns, and σ_i is the standard deviation of the investment's return. The return variable r_i is the average return of portfolio i. $(r_i - r_f)$ measures the risk premium for investment in a portfolio of securities. The variable r_f is the short-term risk-free interest rate; this term gives the minimum return one can earn by investing in a risk-free security, for example, U.S. Treasury bills. Investors expect to earn more than the RAP value, which will provide them a return higher than the return of the market portfolio. In this study, we use the T-bill rate for r_f. The return variable (r_i) is the annualized average returns published for mutual funds in a recent issue of the *Wall Street Journal*.

4.3. Logit regression models

Using the variables previously identified, we construct two logistic regression models to identify the variables, which explain why investors trade or switch funds within a fund family. Specifically, the models are expressed as follows (expected sign of each of the coefficients is positive):

Model 1 (Investors having nonemployer investment plans only)

$$\begin{aligned} SF = {} & \alpha_0 + \alpha_1 \text{AALL} + \alpha_2 \text{INVP} + \alpha_3 \text{INVU} + \alpha_4 \text{RRED} + \alpha_5 \text{LGAINS} \\ & + \alpha_6 \text{IMIX} + \alpha_7 \text{SANA} + \alpha_8 \text{AGE} + \alpha_9 \text{INC} + \alpha_{10} \text{IFPER} \\ & + \alpha_{11} \text{LCAPB} + \alpha_{12} \text{RPROF} + \delta \end{aligned} \tag{2}$$

Model 2 (Investors having both nonemployer and the employer investment plans)

$$SF = \alpha_0 + \alpha_1 AALL + \alpha_2 INVP + \alpha_3 INVU + \alpha_4 RRED + \alpha_5 LGAINS + \alpha_6 IMIX + \alpha_7 SANA + \alpha_8 AGE + \alpha_9 INC + \alpha_{10} IFPER + \alpha_{11} LCAPB + + \alpha_{12} RPROF + \alpha_{13} FDIV + \alpha_{14} FCON + \alpha_{15} LFEXP + \alpha_{16} WDIV + \delta \quad (3)$$

Model 1 estimates the likelihood of investors who own nonemployer investment plans switching funds within a fund family. These investors do not invest in employer- sponsored plans. On the other hand, Model 2 estimates the likelihood of switching funds within a fund family for investors who own investments not only in the employer-sponsored plans [e.g., 401 (k)], but also in nonemployer-owned mutual funds. Also, note that Model 1 uses 12 explanatory variables, whereas Model 2 is based on 16 variables. The additional four variables (LFEXP, FDIV, FCON, and WDIV) are included to address the question of whether investment behavior differs when investors hold part of their investment in their employer plans and also in nonemployer plans versus those who own investments exclusively in nonemployer mutual funds.

5. Results

5.1. Logistic regression estimates

Table 1, Panel A shows the result for investors *who switched funds and have investment in nonemployer plans.* The variables for asset allocation (AALL), diversification (IMIX), age, investment performance (IFPER), large capital base (LCAPB), and risk profile (RPROF) are statistically significant and the coefficients of these variables are in the predicted direction, except for the AALL and IFPER variables. Overall, these results suggest that investors who have exclusively invested in nonemployer plans are likely to switch funds in a fund family: (1) when their current investment allocation is not satisfactory to them (AALL); (2) to obtain a better mix of equity versus bonds, U.S. versus foreign investments (IMIX); and (3) to invest in a fund with a large capital base (LCAPB). In addition, they also switch funds within a fund family as they grow older (AGE), follow an aggressive investment strategy and are willing to take greater economic risks (RPROF), or when the initial financial performance (IFPER) of the selected fund is attractive. In terms of prediction accuracy, when our prediction equation is used with the testing dataset, we have an overall prediction accuracy of 71.7%. We correctly predict those who did not switch funds with an accuracy of 78.3%, and we correctly predict those who switch funds with an accuracy of 50.0% (see Table 1, Panel B).

The logistic regression estimates in Table 2, Panel A show the likelihood of investors switching between funds in a fund family when investors own both employer-sponsored and nonemployer plans. The significant positive AALL variable suggests that investors switch

Table 1
Panel A. Results of logistic regression: investors having outside investment plans and who switched funds

Variable	Coefficient	Significance
Constant	−12.279	−1.54
AALL	−4.323	−1.67*
INVP	−1.122	−1.39
INVU	0.949	1.05
RRED	14.179	0.43
LGAINS	15.384	0.09
IMIX	11.425	2.04**
SANA	27.791	0.31
AGE	2.642	2.07**
INC	−1.997	−1.51
IFPER	−5.696	−1.85*
LCAPB	11.197	1.89*
RPROF	2.377	1.70*

**, *Significant at the 0.05 and 0.10 levels, respectively. The dependent variable is coded as 1 if the investor traded or switched investment between funds in a fund family and is coded 0 otherwise. AALL = current asset allocation provides sufficient diversification; INVP = change in investment of mutual funds vs. individual stocks/bonds and vice versa over time; INVU = investment uncertainty; RRED = risk reduction achieved by trading or switching investment between funds; LGAINS = switch funds to lock-in capital gains; IMIX = change in mix of equity vs. bonds or U.S. vs. foreign investments; SANA = investors use their own analysis to switch their investments among different funds; AGE = categories are: under 25, 25 to 34, 35 to 44, 45 to 54, 55 to 66, and over 66; INC = annual income before taxes grouped into following categories: less than $30,000; $30,000–49,999; $50,000–74,999; $75,000–99,999; $100,000–$149,999; and over $150,000; IFPER = initial investment performance; LCAPB = measures whether mutual fund investors originally selected the fund because of the size of the fund. The capital base is used as the proxy for size; and RPROF = measures investor profile. The expected sign of each coefficient is positive.

Panel B. Prediction accuracy of logistic regression model on test dataset: investors having outside investment plans and who switched funds

		Predicted			
		No	Yes	Total	Percent correct
Actual	No	36	10	46	78.3%
	Yes	7	7	14	50.0%
	Total	43	17	60	71.7%[a]

[a] (36 correctly predicted "No" + 7 correctly predicted "Yes")/60 total = 71.7%.

investments between funds for purposes of improving asset allocation. The variable measuring investment uncertainty (INVU) is negative and significant, suggesting that investment uncertainty is not a factor for investors to switch funds. Investment uncertainty was measured on a four-point scale: lack of information, need for additional information, confusing information, and fear of loosing money. The investment mix variable (IMIX) is, as expected, positively significant, which indicates that investors switch funds to obtain a better mix of stocks versus bonds. An additional significant variable is the WDIV variable, which has a positive coefficient. This implies that the decision to switch funds is for diversification. The RPROF variable and the variable for original selection of the fund based on good financial performance (IFPER) are also significantly positive variables, suggesting that the risk profile

Table 2
Panel A. Results of logistic regression: Investors having both outside investment plans and employer-sponsored plans who switched funds

Variable	Coefficient	T-Values
Constant	−5.695	−1.52
AALL	2.112	1.75*
INVP	0.151	0.34
INVU	−1.097	−1.71*
RRED	18.372	0.19
LGAINS	4.422	0.83
IMIX	5.304	2.67***
WDIV	2.139	1.66*
SANA	13.461	0.22
AGE	.388	1.22
INC	−.798	−1.32
RPROF	2.451	2.51***
IFPER	3.135	1.78*
LFEXP	−4.087	−2.22***
FDIV	−2.423	−1.68*
FCON	3.017	1.34
LCAPB	3.341	1.71*

***, **, *Significant at 0.01, 0.05, and 0.10 variables, respectively. The dependent variable is coded as 1 if the investor traded or switched investment between funds in a fund family and is coded 0 otherwise. AALL = current asset allocation provides sufficient diversification; INVP = change in investment of mutual funds vs. individual stocks/bonds and vice versa over time, INVU = investment uncertainty; RRED = risk reduction achieved by trading or switching investment between funds, LGAINS = switch funds to lock-in capital gains; IMIX = change in mix of equity versus bonds or U.S. vs. foreign investments; WDIV = reason to switch funds is to diversify the investment portfolio; SANA = investors use their own analysis to switch their investments among different funds; AGE = categories are: under 25, 25 to 34, 35 to 44, 45 to 54, 55 to 66, and over 66; INC = annual income before taxes grouped into following categories: less than $30,000; $30,000–49,999; $50,000–74,999; $75,000–99,999; $100,000 $149,999; and over $150,000; IFPER = initial investment performance; LFEXP = investor selected the fund because of low fixed expenses; FDIV = investor selected the fund because of the fund's portfolio diversification; FCON = investor chose the fund to consolidate investment in a single fund family; LCAPB = measures whether mutual fund investors originally selected the fund because of the size of the fund. The capital base is used as the proxy for size, and RPROF = measures investor profile. The expected sign of each coefficient is positive.

Panel B. Prediction accuracy of logistic regression model on test dataset: investors having both outside investment plans and employer-sponsored plans who switched funds

		Predicted			
		No	Yes	Total	Percent correct
Actual	No	31	15	46	67.4%
	Yes	5	21	26	80.8%
	Total	36	36	72	72.2%[a]

[a](31 correctly predicted "No" + 21 correctly predicted "Yes")/72 total = 72.2%.

and the fund family performance affect the investor decision to switch funds. The large significant coefficient of the RPROF variable indicates that the individuals switch funds when they are aggressive investors. Additional significant variables are low fund expenses

Table 3
Summary of the test of hypotheses

Hypothesis	Model 1 Outside plans only	Model 2 Both plans
H1: Switch funds to improve asset allocation (AALL)	Significant*	Supported
H2: Switch to a more diversified mutual fund (INVP)		
H3: Switch to minimize investment losses (INVU)		Significant*
H4: Investment strategy		
RRED		
LGAINS		
WDIV		Supported
IMIX	Supported	Supported
SANA		
H5: Older individuals more likely to switch (AGE)	Supported	
H6: Individuals with higher income more likely to switch (INC)		
H7: Decision to switch if the following were original reasons to select a fund family:		
IFPER	Significant*	Supported
LFEXP		Significant*
FDIV		Significant*
FCON		
LCAPB	Supported	Supported
H8: Investor with a higher level of self-assurance would switch (RPROF)	Supported	Supported

*The coefficient is significant but is not in the anticipated direction.

(LFEXP), fund diversification (FDIV), and larger capital base of the fund (LCAPB). The significant coefficient of the LFEXP is negative, suggesting that transaction costs are not a deterrent for investors in a decision to switch funds in the same fund family. The negative significant coefficient of FDIV indicates that investors are not particular about fund family diversification when they select a fund. Finally, the positive significant coefficient of the LCAPB variable suggests that investors switch investments to a fund with a larger capital base.

Overall, the results in Table 2, Panel A show that investors switch funds within a fund family when: (1) their current asset allocation does not provide sufficient diversification; (2) there is investment uncertainty; (3) they wish to achieve a better investment mix; (4) they are an aggressive investor group; (5) the fund's financial and investment performance is relatively poor; (6) the fund's fees are relatively low; and (7) they wish to invest in a fund that is well diversified and has a large capital base. Prediction accuracy for this group, when our prediction equation is used with the testing dataset, results in an overall prediction accuracy of 72.2%. We correctly predict those who did not switch funds with an accuracy of 67.4%, and we correctly predict those who switch funds with an accuracy of 80.8% (see Table 2, Panel B).

Table 3 presents a summary of the test of hypotheses for Models 1 and 2. The table shows that for both types of investors (Models 1 and 2), three variables are significant and support our hypotheses—IMIX, LCAPB, and RPROF. In other words, the results in Tables 1 and 2 demonstrate that, regardless of the investment strategy used by the

investor, the investment mix of the fund, the large capital base, and the aggressive investment strategy causes investors to switch monies between funds. In addition, with respect to individual investment strategy, investors in nonemployer plans switch mutual funds as they grow older (see Table 3, Model 1). This may be because as they age, their investment horizon shifts from long- to intermediate- or short-term. On the other hand, investors with investments in both employer-sponsored and nonemployer mutual finds also consider the asset allocation (AALL), financial performance (IFPER), fund expenses (LFEXP), and the diversification of the plan (WDIV) in making investment decision to switch their investment between funds.

5.2. *Sensitivity analysis*

For our preliminary evaluation, we used a cutoff of 0.5 (50%) for the logistic regression model, indicating that an investor will switch funds. However, we also evaluate our model given the possibility that an investor will not switch funds unless there is a 60%, 70%, or 80% probability of switching funds.

For investors who have only nonemployer investments, there is no change in our prediction accuracies for any of the conditions of 60%, 70%, or 80% probability of switching funds. However, for those individuals owning investments in both nonemployee plans and employer plans, there is a difference among these alternatives. Using the test dataset, our findings indicate that if the cutoff is 60%, the prediction accuracy of our model declines slightly, with the prediction score for those who switch funds decreasing to 76.9%. The accuracy of the model for those who do not switch funds remains unchanged at 67.4%, and the overall accuracy is 70.8% (see Table 4). If we consider that the cutoff probability is 70%, then the prediction accuracy of the model for those who do not switch funds increases to 71.7%, whereas the prediction numbers for those who switch funds declines to 69.2%. The overall prediction accuracy is still 70.8%.

We finally consider the situation where the probability is 80% before an investor will switch funds. Prediction accuracy for those who do not switch improves to 78.3%, whereas prediction accuracy for those who will switch funds is 65.4% and overall accuracy increases to 73.6%. Therefore, our model predicts with reasonable accuracy if we consider the fact that investors may not switch funds if there is only a 50% chance that they should do so.

6. Conclusions and implications

Though our model is moderately successful in predicting the behavior of investors when they choose to switch funds, we have made some important discoveries regarding an investor's risk profile. The results for nonemployer plans show that the current asset allocation, investment mix, the age of the investor, initial fund performance, large capital base of the fund family, and the attitude towards risk are the factors that cause investors to switch funds within their fund family. With respect to respondents with investment both in nonemployer and employer-sponsored plans, our results indicate that their current asset allocation, investment losses, investment mix, fund and portfolio diversification, initial

Table 4
Panel A. Prediction accuracy of logistic regression model: investors having both outside investment plans and employer-sponsored plans who switched funds (Cutoff 60%)

		Predicted			
		No	Yes	Total	Percent correct
Actual	No	31	15	46	67.4%
	Yes	6	20	26	76.9%
	Total	37	35	72	70.8%[a]

[a] (31 correctly predicted "No" + 20 correctly predicted "Yes")/72 total = 70.8%.

Panel B. Prediction accuracy of logistic regression model: investors having both outside investment plans and employer-sponsored plans who switched funds Cutoff 70%

		Predicted			
		No	Yes	Total	Percent correct
Actual	No	33	13	46	71.7%
	Yes	8	18	26	69.2%
	Total	41	31	72	70.8%[a]

[a] (33 correctly predicted "No" + 18 correctly predicted "Yes")/72 total = 70.8%.

Panel C. Prediction accuracy of logistic regression model: Investors having both outside investment plans and employer-sponsored plans who switched funds Cutoff 80%

		Predicted			
		No	Yes	Total	Percent correct
Actual	No	36	10	46	78.3%
	Yes	9	17	26	65.4%
	Total	45	27	72	73.6%[a]

[a] (36 correctly predicted "No" + 17 correctly predicted "Yes")/72 total = 73.6%.

financial performance of the fund, fund charges, capital base of the fund, and the investor's attitude towards risk are variables influencing the decision to switch funds within a fund family.

Also in our study, we develop a hybrid system that accepts input and analyzes an investor's attitude towards risk as well as provides an indication of whether investors should switch funds. Our model provides more information to the investor about the financial performance of the fund in comparison to other funds, which is another variable that affects investors' decision-making process (Samant and Edwards, 2000).

Foremost, we recognize that our sample response rate has been unusually low. However, we take comfort in the fact that the nature of the data we sought from our respondents was of personal financial nature, responses to which are difficult to elicit. The second weakness of our study is that we have used self-reported data, which may suffer from reporting bias. In order to overcome these weaknesses, we pretested the research instrument. A number of executives from investment banking firms reviewed and critiqued the questionnaire for possible ambiguity and misinterpretations in the choice of the words.

We believe that the hybrid model will be useful to a mutual fund manager or

investment advisor, and to the individual investor as a tool of knowledge management to assist in evaluating the investment choices. Further study is needed to determine if our model continues to identify investors who will switch funds. It may also be useful to have the user enter the model at various stages—at the beginning for the full profile evaluation, at the point of the prediction model once the user's risk profile is known, or at the point where the risk-adjusted return is calculated. With more investors having access to various sources of information through the Internet and published sources, this trend of modeling the individual's risk profile may be more likely to continue.

Appendix A

Development of the risk profile variable (RPROF)

We developed the "risk profile" of investors based on their responses to a specific set of questions on the questionnaire. Individuals are identified either as "conservative" or "aggressive" based on their responses to the questions listed below. The response of "low" is considered as conservative and "high" as aggressive investor.

1. How did you react when the stock market fell recently?

The 6 responses to this question are listed below (we code high response as 1 and the low response as 0. Then we add all the responses to the question to derive a score on the question):

Transferred assets to money market (low)
Did not change anything (low)
Changed from stock to bonds (low)
Redeemed for cash or sold company stock (low)
Sought professional help (low)
Made own decisions (high)

2. What will you do when reinvesting?

There are 6 responses to this question (the scoring of this question is the same as in question 1 above):

Return to original fund (low)
Return to original allocations in retirement plan (low)
Seek a safer mix (low)
Keep all investments in stable or money market (low)
Rely on professional advice (low)
Trust my instincts (high)

3. What do you believe will happen to the stock market/interest rates?

There are 4 responses to this question (the scoring of this question is same as in question 1 above):

Stock market will fall (low)
Stock market will move high (high)
Interest rates will decline (high)
Interest rates will increase (low)

Our RPROF variable, then, represents the total risk "score" as the sum of the "high" variable from question 1, the "high" variable from question 2, and a maximum score of "1" from either of the two "high" variables from question 3. The highest score for RPROF is 3.0 for the most aggressive investor and the lowest score is 0 for the most conservative investor. Question 1 proxies for market reaction risk, question 2 for reinvestment risk, and question 3 for belief risk.

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