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Using Quantile Regression to Analyze Mutual Fund Risk and Investor Behavior of Variable Life Insurance

Nan-Yu Wang[1], Sen-Sung Chen[2], Chih-Jen Huang[3] & Cheng-Hsin Yen[2]

[1] Department of Business and Tourism Planning, Ta Hwa University of Science and Technology, Hsinchu, Taiwan

[2] Department of risk Management and Insurance, Feng-Chia University, Taichang, Taiwan

[3] Department of Finance, Providence University, Taiwan

Correspondence: Nan-Yu Wang, Department of Business and Tourism Planning, Ta Hwa University of Science and Technology, 1, Dahua Rd., Qionglin Shiang Hsinchu County, 30740 Taiwan. Tel: 866-3-592-7700 ext. 3102. E-mail: nanyu@tust.edu.tw

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Abstract

In this study, we identified the relationship between purchase and redemption behavior of flow-return and flow-fund characteristics within different group investors by using Quantile regression. Our results showed that, under different levels of fund risks, fund performance would affect purchase behavior in the ways of preferring higher fund turnover and lower fund expense ratio for insured investors. In addition, risk-averse investors would actively redeem funds with strong performance and funds with high risk.

Keywords: mutual funds, fund performance, fund risk, investment behavior, quantile regression

1. Introduction

Increasing numbers of financial instruments are emerging. Investment instruments are no longer limited to stocks, bonds, futures, options, and funds. To satisfy the varied needs of customers and to provide extensive financial services, investment-linked products have been introduced. Since 2000, Taiwanese interest rates have dropped from 4.470% to 1.355%. In response to this , investment insurance, which was introduced in the Netherlands in 1956, has received increasing attention in Taiwan recently. Investment insurance currently occupies a considerable share of all insurance product premiums.

The increasing complexity of investment instruments in the financial market has also increased investors' collection costs. Therefore, emerging investors hope for institutional investors to make choices for them, and investors hope that the timing ability of institutional investors will allow them to earn excess returns. Binay (2005) indicated that fund performance is not significant after controlling for risk. However, Binay found that institutional investors performed with excess returns over a 20-year research period. Insurance companies and investment consultancies had better-than-market returns in 15 out of 22 years. Because investment insurance can be linked to large numbers of funds, we analyzed a variety of scenarios with funds linked and not linked by life insurance companies.

Chen et al. (2007) compared and analyzed the performance of funds linked and not linked by insurance companies to determine whether they are low-risk with high returns. They also analyzed whether the expenses of cross-selling in different channels erode the performance of funds themselves. The results indicated that institutional investors must place their funds in investment targets with high liquidity and low returns because of their prudent investment principles. Thus, investment-linked insurance policies cannot earn excess returns. However, investors subscribe to these policies because they are risk averse. Previous studies were highly focused on the differences of funds linked by institutions and legal persons. Lee et al. (2010) divided funds into high-risk and low-risk funds and examined whether the key explanatory variables and effects on redemption rates differed. Therefore, in this study, we considered fund risk categories to provide a reference for purchasing and subscribing to investment-linked insurance for the policyholders of funds with investment-linked insurance policies.

Among studies on investment-linked insurance policies, few scholars have compared the differences in investment behavior among the policyholders of investment-linked insurance policies. The majority have focused on changes in interest rates, legal provisions, or pricing factors. Chen, Wu, and Wang (2008) addressed mutual funds with investment-linked insurance policies issued by life insurance companies. They analyzed the relationship between flows and fund returns in a variety of subscription and redemption channels. They used the Granger causality test to verify whether the purchase and redemption behavior of policyholders reacted asymmetrically when the policyholders observed that the linked funds had positive (negative) returns. The present study is the first in Taiwan to use quantile regression to analyze the investment behavior of fund inflows and outflows with and without links to life insurance companies.

We used the TEJ monthly data to investigate whether the relationships between fund flows, returns, and characteristics varied with different levels of risk for the linked funds of different groups of domestic equity fund investors. We divided investors into overall domestic stock fund investors (Group A), insured investors (Group B), and noninsured investors (Group C). Because we were unable to segment the funds linked to life insurance companies entirely into insured investors and noninsured investors, the data source can only be used to attest that Group C comprised noninsured investors only.

This paper is divided into five sections. In addition to the Introduction Section, we introduce the variable definitions, the research sample, the research period and range, and the testing models adopted for statistical analysis. In Section 4, we explore the relationships between flows and returns in different groups of domestic equity fund investors and links. Subsequently, we test the response of fund returns in the domestic fund market toward investment behavior. Then, we examine the relationship between fund characteristics and investment behavior to analyze whether different levels of fund risk affected the investment behavior of insured investors differently. Finally, we present our conclusion and recommendations for subsequent research in Section 5.

2. Variable Definitions

Funds with various characteristics exhibit varying data that influence the willingness of investors to purchase or redeem funds. A fund's standard deviation of returns can be viewed as the periodic volatility of a fund, which influences fund flows (Berloowitz & Kotowitz, 2000; Chevalier & Ellison, 1997; Jank & Michael, 2013; Lee et al., 2010; Liu et al., 2003; O'Neal, 2004; Sirri & Tufano, 1998; Shu et al., 2002). Jank and Michael (2013) indicated that investors redeem funds when funds are high-risk. After adjusting for risk in performance, fund risk and fund inflows are positively correlated. This indicates that risk-averse investors redeem funds when fund risk increases. However, risk-loving investors replace them.

Sirri and Tufano (1998) held that although performance and risk influence fund flows, consumers are unable to measure risk or performance clearly. Thus, they used the standard deviations of deferred monthly returns as estimates of risk and found that fat-tail return distributions are more likely to occur when funds assume increasing amounts of risk. These results also indicate the tendency of consumers to avoid risk. Therefore, increasing standard deviations reduces fund flows, resulting in a negative association between performance and standard deviations.

Shu et al. (2002), O'Neal (2004), and Lee et al. (2010) viewed fund risk as an explanatory variable of redemption rate and observed the influence of fund risk on redemption rates. Their results indicated that investors prefer to redeem high-risk funds. Lakonishok and Smidt (1986) and Frazzini (2006) held that fund returns greatly fluctuate when fund risk is high, with a high probability of eroded book profits. By contrast, the probability of eroded book profit is low when fund risk is low. Therefore, investors redeem funds after earning profits to ensure book profits. Shu et al. (2002) used Taiwanese fund data to test the relationships between large-scale funds and small-scale funds and found that the standard deviations of large funds are lower than those of small funds, which indicates that large–fund investors are more risk averse than small funds are. Regarding to domestic scholars, Huang et al. (2007) used raw return rates to perform four-factor analysis on the responses of fund risk and fund flows. They found that fund risks and flows are negatively correlated under two kinds of performance effects. Lee et al. (2010) indicated that compared with winners with low fund risk, investors redeem winners with high fund risk more vigorously. Regarding the disposition effect, investors redeem losers vigorously when fund performance is inferior to that of the market; that is, a reverse disposition effect occurs. However, when fund performance loses substantially to the market, investors are less likely to redeem the losers. Therefore, fund risk is a crucial factor that influences whether investors redeem funds.

However, Fu et al. (2010) indicated that fund risk is not significant in explaining subscription rates and redemption rates. This indicates that investors do not thoroughly consider risk factors when purchasing and redeeming funds with advertisements because such advertisements alter the risk attitudes of investors. Investors tend to be risk averse toward funds without advertisements. Therefore, trading becomes inactive for funds with high risk, whereas trading clearly heats up for funds with low risk. However, investors are not concerned with the risk of advertised funds. Chiu (2011) found that, in contrast to expected results, fund risk and fund performance are significantly negatively correlated. During their research period, low volatility in fund returns was associated with strong fund performance.

In this study, we used the standard deviations of returns from the previous year and returns deferred by one period as an indicator for fund risk, and we analyzed the response of risk toward fund subscription and redemption. In addition, we investigated the relationships between fund flows, fund performance, and fund characteristics by dividing funds into high-risk and low-risk groups.

Edelen (1999) indicated that the fund flows generated by the subscription and redemption behavior of investors influence funds negatively. When a fund's performance is strong, investors may purchase the fund vigorously, generating substantial capital inflows for the fund. These inflows force fund managers to change their optimal investment portfolios, leading to subsequent drops in performance. Jank and Michael (2013) analyzed fund inflows and outflows to determine the subscription and redemption behavior of investors with varying levels of fund performance.

In this study, we used net inflows and net outflows as dependent variables. We took net inflows and outflows from subscription and redemption amounts, respectively, and from fund size during the previous period from the TEJ database. The equations we obtained are expressed as follows:

$$\text{Inflow}_{i,t}=\frac{Purchase_{i,t}}{Total\ Net\ Assets_{i,t-1}},\ \text{Outflow}_{i,t}=\frac{Redemption_{i,t}}{Total\ Net\ Assets_{i,t-1}},$$

where $\text{Inflow}_{i,t}$ is the inflow of fund *i* during month *t*; $\text{Outflow}_{i,t}$ is the outflow of fund *i* during month *t*; $Purchase_{i,t}$ is the subscription amount of fund *i* during month *t*; $Redemption_{i,t}$ is the redemption amount of fund *i* during month *t*; and $Total\ Net\ Assets_{i,t-1}$ is the fund assets of fund *i* during month *t*-1.

The metric for fund risk was an annualized standard deviation calculated from the monthly rates of return in preceding 12 months. We did not perform this calculation for funds that had been established for less than 12 years. This method can be used to examine the influence of fund risk on flows. The formula for annualized standard deviation is $\sigma_i * \sqrt{12}$. In this equation, σ_i is the standard deviation of monthly return on investment in preceding 12 months.

3. Methodology

3.1 Quantile Regression

Regression models are primarily used to examine the relationships between multiple variables, and the ordinary least squares (OLS) is the estimation method most commonly employed for multiple regression analysis. The main characteristic of OLS is that it considers the explained variable distribution a conditional mean function and emphasizes the central tendency of the explained variable distribution. Consequently, the estimated results do not include the sample data on both ends of the explained variable distribution. In other words, the results cannot be used to analyze the difference in the impact factors for the groups that practiced cold and hot redemption of fund flows. Therefore, quantile regression (QR) was used to overcome the disadvantages of OLS that result from excessively focusing on means. Developed by Koenker and Bassett (1978) based on median regression, QR is also known as percentile regression because it can be used to estimate the percentile of the independent variable *Y* based on the dependent variable *X*. Based on the given percentiles, the estimated parameter values of various groups can be obtained. Unlike OLS, which expresses mean values, QR yields nonparametric parameters without requiring any distributional assumptions. Instead, analysts can estimate regression curves with differing percentiles by adjusting the percentiles. Lee and Saltoglu (2001) considered the primary advantage of QR to be its ability to yield superior statistics using empirical quantiles. Koenker and Bassett (1982) concluded that QR possesses robustness because under given regression parameters, the signs of the residuals remain unchanged during estimation, suppressing the influence on estimated values when extrema occur in the samples. Consequently, various points have differing weights: A greater residual receives a smaller weight, and a smaller residual receives a greater weight.

OLS is a method that estimates regression coefficients by minimizing the squares of errors, whereas the goal of least absolute deviation (LAD) is to minimize the sum of the absolute errors. The concept of QR proposed by Koenker and Bassett (1978) was based on LAD. An increasing number of scholars have recently adopted QR models to analyze financial data; for example, Chen and Huang (2011) used QR to examine the relationship between fund governance and performance.

Referencing Kuan (2003), the explained variable was defined as y_t, which can include fund flow, inflow, outflow, and fund performance; x_t was defined as the vectors of the explanatory variables, and *t* was defined as the number of sample observations. In a linear model for a given weight of θ ($0 < \theta < 1$), the objective function of the θ^{th} quantile regression is estimated to be the weighted average absolute error.

$$V_T(\beta;\theta)=\frac{1}{T}\left[\sum_{t:y_t\geq x_t'\beta}\theta\left|y_t-x_t'\beta\right|+\left(1-\theta\right)\sum_{t:y_t<x_t'\beta}\left|y_t-x_t'\beta\right|\right] \quad (1)$$

When θ is smaller (greater) than 0.5, the weight of the positive error of the objective function is smaller (greater), whereas that of the negative error is comparatively greater (smaller). Therefore, this quantile is located in the left (right) portion of the distribution. When $\theta = 0.5$, the weights of the positive and negative errors are equal. Consequently, Equation (1) is essentially identical to the objective function of the least absolute error method, and the estimated regression model is a 0.5 quantile (i.e., median) regression. The first-order condition for minimizing Equation (1) is as follows:

$$\frac{1}{T}\sum_{t=1}^{T}X_t\left(\theta-I_{\{y_t-x_t'\beta<0\}}\right)=0 \quad (2)$$

where I_A is the indicator function for Incident A, and the optimal solution is the function of the θ^{th} quantile regression in the distribution under condition y_t. However, nuisance parameters exist in the covariance matrix estimated using quantile regression; thus, an estimator can be defined for these parameters. In this study, the bootstrap method, which calculates statistics by resampling data and performing random repeated sampling on finite samples, was employed to estimate the quantile regression model. This method can be used to rectify the heterogeneity and autocorrelation of data. Compared with the limit estimation, the approximate distribution yielded by this method is more accurate.

3.2 Sample Description

The sources of the research sample were the TEJ database and the database of a life insurance company in Taiwan. The research period was from January 1, 2001 to December 31, 2012, and all monthly data were used. The sample contained 143 months-worth of data. The samples from the TEJ database included the names, fund sizes, Jensen's alphas, fund turnover rates, fund risks, and fund expense ratios for all of the domestic equity funds in Taiwan.

4. Results

4.1 Descriptive Statistics

Table 1 shows fund risks. The 13-year average risk for Group B was 23.77%, and that for Group C was 24.32%, which was higher than that for Group B. This indicates that institutional legal persons had lower risk when purchasing funds. This result is similar to that obtained by Cheng, Elyasiani, and Jia (2011), who indicated that insurance companies must reduce investment risk to attract investors because of the prudent investor rule. Although Taiwan has no specifications for the prudent investor rule, the Financial Supervisory Commission has established relevant provisions for investment insurance to enable institutional legal persons to attract investors and reduce risk. In addition, common ground between the two is that risk has tended to drop since 2008. This indicates that regardless of whether equity funds are linked, fund risk is not as high as it was previously.

Table 1. Descriptive statistics for fund risk

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
A	1323.41	1432.28	1316.82	1466.73	1500.6	1607.94	2439	2377.38	2114.04	2139.56	2056.55	1886.14
B	1504.22	1548.52	1405.31	1480.94	1409.47	1485.93	2319.49	2253.63	1985.33	2003.02	1794.72	1619.77
C	460.01	639.24	655.39	1369.53	2335.04	4151.1	6091.45	5531.89	4143.24	4251.04	6206.27	6486.85

Note. We obtained our samples from the TEJ database. The sample data were from January 1, 2001 to December 31, 2012. Group A comprised overall domestic stock fund investors, Group B comprised insured investors, and Group C comprised noninsured investors. Variable definition: Fund risk is the annualized standard deviation calculated from the monthly rate of return over the most recent 12 years. The calculation formula is $\sigma_i * \sqrt{12}$.

4.2 Fund Risk Classification

To observe whether fund risk influences subscription and redemption volume, O'Neal (2004) divided the flows of an equity fund sample into subscription rate and redemption rate and indicated that subscription rate is a significant variable for flow and that fund risk influences redemption rate. In this study, we used a quantile regression model to analyze funds linked and not linked by life insurance companies. The majority of scholars have addressed the relationship between fund risk and fund flows without dividing funds into high-risk funds and low-rush funds or observing the relationship between flows and risk in different subscription and redemption channels. Lee et al. (2010) divided funds into high-risk funds and low-risk funds to analyze how investors handle funds with distinct risk levels. In this study, we used the standard deviation of returns over the preceding year as a metric for fund risk. We divided funds into high-risk funds and low-risk funds based on the average value of the standard deviations of returns. In addition, we addressed the effects of fund risk on subscription and redemption volumes in different sample groups.

4.2.1 The Relationship between Inflows and Fund Operating Characteristics in High-Risk Funds

Table 2 shows the quantile regression results for Group B. The inflows and performance of high-risk funds were significantly positively correlated at quantiles 0.1 to 0.9. This indicates that insured investors vigorously purchased funds with strong performance. The results for Group C reveal that the relationship between inflows and performance in high-risk funds was statistically significant only with weak fund inflows. The results for Group B indicate that the inflows and expense ratios of high-risk funds were significantly negatively correlated at quantiles 0.1 to 0.9. The insured investors vigorously purchased funds with low expense ratios. The results for Group C indicate that fund inflows and fund expense ratios were not statistically significant at any of the conditional quantiles. These results are different from those of Group B, indicating that insured investors considered fund expense ratios when subscribing to high-risk funds. The results for Group B indicate that the inflows and fund turnover of high-risk funds were significantly positively correlated in quantiles 0.1 to 0.9. The insured investors vigorously subscribed to funds with high turnover. The results for Group C indicate that only typical fund inflows were statistically significant. These results are different from those of Group B, indicating that when insured investors subscribed to high-risk funds, the strength of fund inflows and the sensitivity of fund turnover increased.

4.2.2 The Relationship between Inflows and Fund Operating Characteristics in Low-Risk Funds

Table 2 shows the quantile regression results for Group B. Fund inflows and fund performance were significant at a 1% level of significance at quantiles 0.1 to 0.9. This indicates that performance sensitivity increased when the insured investors subscribed vigorously. The quantile regression results of Group C are consistent with those of Group B. This indicates that regardless of whether the investors were insured, their fund flows and performance were similar. The results for Group B show that fund inflows and fund expense ratios were statistically significant when fund inflows were strong. This indicates that the insured investors preferred funds with low expense ratios when purchase quantities heated up. The results for Group C indicate that fund inflows and fund expense ratios were not statistically significant under any of the conditional quantiles. These results differed from those of Group B, which indicates that the insured investors were more concerned with fund expense ratios than the noninsured investors were. Finally, the results for both Group B and Group C show that fund inflows and fund turnover were not statistically significant under any of the conditional quantiles. This indicates that when a mutual fund was low-risk, the fund investors had no turnover preference when making purchases.

Table 2. Fund inflows and operating characteristics sensitivity of fund risk for group B and C

Inflows		High Group B		High Group C		Low Group B		Low Group C	
	Quantiles	estimated coefficients	T value	estimated coefficients	T value	estimated coefficients	T value	estimated coefficients	T value
Jensen	0.1	0.011***	3.56	0.007***	2.66	0.006**	2.26	0.004-	1.12
	0.2	0.014***	3.53	0.01**	2.44	0.008***	2.97	0.009***	3.15
	0.3	0.015***	4.87	0.004-	0.72	0.009***	3.19	0.011***	4.85
	0.4	0.015***	5.56	0.007-	1.48	0.009***	2.65	0.011***	5.25
	0.5	0.016***	3.66	0.009*	1.96	0.012***	4.00	0.012***	3.75
	0.6	0.022***	4.00	0.006-	0.95	0.014***	5.20	0.012**	2.48
	0.7	0.025***	4.59	0.01-	1.34	0.014***	4.30	0.017**	2.15
	0.8	0.031***	4.71	0.012-	1.14	0.014***	3.84	0.026***	2.92
	0.9	0.036***	4.10	0.019-	0.77	0.021***	5.03	0.036**	2.39
Exp.	0.1	-0.348**	-2.29	0.098-	0.75	-0.058-	-1.07	0.017-	0.44
	0.2	-0.546***	-2.85	0.188-	1.47	-0.029-	-0.44	0.018-	0.39
	0.3	-0.858***	-3.61	0.089-	0.62	-0.016-	-0.23	0.023-	0.46
	0.4	-1.027***	-4.31	0.166-	1.33	-0.071-	-0.95	0.025-	0.51
	0.5	-1.1***	-3.95	0.086-	0.60	-0.088-	-1.27	0.021-	0.43

	0.6	-1.266***	-4.60	0.051-	0.22	-0.121*	-1.79	0.049-	0.73
	0.7	-1.069***	-3.77	-0.193-	-0.55	-0.141*	-1.80	0.042-	0.37
	0.8	-1.135***	-3.69	-0.404-	-0.87	-0.2**	-2.27	0.036-	0.23
	0.9	-0.976**	-2.03	-0.832-	-0.98	-0.274**	-2.28	0.052-	0.19
Size	0.1	0.012***	2.81	0.002-	0.68	0.004**	2.21	0.000	0.15
	0.2	0.017***	3.22	0.000	0.15	0.004*	1.89	0.001-	0.45
	0.3	0.026***	3.90	0.002-	0.86	0.004*	1.84	0.001-	0.67
	0.4	0.03***	4.53	0.002-	0.71	0.006***	2.64	0.001-	0.86
	0.5	0.032***	4.16	0.005*	1.66	0.008***	3.43	0.002-	1.22
	0.6	0.036***	4.79	0.007*	1.81	0.009***	4.27	0.001-	0.62
	0.7	0.03***	3.96	0.013**	2.06	0.011***	4.57	0.003-	0.77
	0.8	0.033***	3.90	0.019**	2.19	0.015***	5.49	0.006-	1.19
	0.9	0.028**	2.09	0.037**	2.04	0.017***	4.78	0.008-	0.94
Turnover	0.1	0.000**	2.01	0.000	1.09	0.000	0.34	0.000	0.90
	0.2	0.001***	2.98	0.000	0.59	0.000	-0.30	0.000	0.44
	0.3	0.001**	2.32	0.001*	1.83	0.000	-0.22	0.000	0.79
	0.4	0.001***	3.01	0.001**	2.24	0.000	0.85	0.000	0.70
	0.5	0.001**	2.24	0.001**	2.04	0.000	0.61	0.000	0.26
	0.6	0.001***	2.76	0.001-	1.01	0.000	0.66	0.001-	0.99
	0.7	0.002***	4.30	0.001-	1.61	0.000	0.31	0.001-	0.47
	0.8	0.002***	4.73	0.001-	1.65	0.000	-0.16	0.001-	0.25
	0.9	0.002**	2.28	0.001-	0.84	0.001-	0.88	0.001-	0.33
R-square		0.264		0.037		0.122		0.087	

Note. We obtained our samples from the TEJ database. The sample data were from January 1, 2001 to December 31, 2012. Group A comprised overall domestic stock fund investors, Group B comprised insured investors, and Group C comprised noninsured investors. The variables include Jensen, Exp., Size, and Turnover. The significance levels of 10%, 5%, and 1% are signified by *, **, and ***.

4.3 The Relationships

4.3.1 The Relationship between Fund Outflows and Fund Operating Characteristics in High-Risk Funds

Table 3 shows the quantile regression results for Group B. The fund outflows and fund expense ratios of high-risk funds were significantly positively correlated at quantiles 0.1 to 0.9. This indicates that the fund investors vigorously redeemed funds when performance was strong. This result is consistent with those of Kahneman and Tversky (1979) and Farrzini (2006). According to prospect theory, which was presented by Kahneman and Tversky, insured investors are risk averse when performance is strong. Compared with low-risk funds, investors more vigorously redeem high-risk funds. Farrzini (2006) combined the disposition effect with prospect theory and mental accounting. When funds are profitable, investors are risk averse and prefer making profits. When funds are unprofitable, investors become risk lovers and prefer to continue holding losing subjects. The quantile regression results for Group C were consistent with those of Group B. This indicates that both insured and noninsured investors exhibited behaviors that were consistent with the conclusion of Kahneman and Tversky (1979) and Farrzini (2006). The results for Group B show that fund outflows and fund turnover were significantly positively correlated at quantiles 0.1 to 0.9, which indicates that insured investors preferred to redeem funds with high turnover. The results for Group C show that fund outflows and fund turnover in high-risk funds were not statistically significant under any of the conditional quantiles. This indicates that the redemption behavior of noninsured investors did not influence fund turnover.

4.3.2 The Relationship between Fund Outflows and Fund Operating Characteristics in Low-Risk Funds

Table 3 shows that the fund outflows and fund performance of Group B were significantly positively correlated under all of the conditional quantiles. This indicates that the insured investors preferred to redeem funds when fund performance was strong. However, fund outflows did not respond much to fund performance; that is, the insured investors did not vigorously redeem funds with strong performance. These results are consistent with those of Kahneman and Tversky (1979). Kahneman and Tversky introduced prospect theory, which indicates that investors are risk averse when performance is strong. Insured investors prefer to redeem vigorously high-risk funds rather than low-risk funds. The fund outflows and fund performance of Group C were not statistically significant under any of the conditional quantiles. These results differ from those of Group B. This indicates that the noninsured investors did not consider fund performance when redeeming funds. The results for both Group B and Group C show that the fund outflows and fund expense ratios of the low-risk funds were not statistically significant under any of the conditional quantiles. This indicates that the redemption situations and expense ratios of high-risk funds had no influence on both the insured and noninsured investors.

Table 3. Fund outflows and operating characteristics sensitivity of fund risk for Group B and C

Outflows		High Group B		High Group C		Low Group B		Low Group C	
	Quantiles	estimated coefficients	T value	estimated coefficients	T value	estimated coefficients	T value	estimated coefficients	T value
Jensen	0.1	0.011*	1.95	0.003-	0.46	0.014***	5.93	0.002-	0.37
	0.2	0.014***	3.33	0.014**	2.38	0.013***	4.95	0.004-	0.88
	0.3	0.014***	4.29	0.014**	2.25	0.015***	5.20	0.006-	1.15
	0.4	0.015***	4.62	0.016**	2.00	0.015***	5.25	0.008-	1.34
	0.5	0.02***	4.20	0.021**	2.23	0.015***	5.60	0.005-	0.55
	0.6	0.024***	4.07	0.029***	2.76	0.016***	6.00	0.004-	0.34
	0.7	0.03***	5.24	0.027**	2.12	0.014***	4.10	-0.011-	-0.78
	0.8	0.034***	7.65	0.038***	3.22	0.017***	4.64	-0.008-	-0.44
	0.9	0.042***	3.98	0.043***	3.45	0.013**	2.06	-0.031-	-0.82
Exp.	0.1	-0.835***	-4.35	0.085-	0.32	-0.014-	-0.17	0.032-	0.18
	0.2	-1.065***	-6.59	-0.046-	-0.18	-0.021-	-0.21	0.028-	0.14
	0.3	-0.944***	-4.08	0.096-	0.40	-0.033-	-0.35	0.049-	0.24
	0.4	-1.205***	-4.27	0.251-	0.96	-0.048-	-0.52	0.039-	0.21
	0.5	-1.124***	-3.16	0.373-	1.42	-0.083-	-0.79	0.037-	0.18
	0.6	-1.039***	-2.69	0.556*	1.96	0.003-	0.02	0.047-	0.19
	0.7	-0.714***	-1.69	0.376-	1.13	-0.018-	-0.10	0.079-	0.24
	0.8	-0.52***	-1.00	0.329-	0.78	-0.07-	-0.37	0.093-	0.22
	0.9	-0.63***	-1.37	0.198-	0.37	-0.118-	-0.57	0.132-	0.26
Risk	0.1	0.027***	4.88	0.001-	0.18	0.006**	2.35	0.001-	0.31
	0.2	0.034***	7.59	0.005-	1.04	0.007**	2.52	0.003-	0.50
	0.3	0.03***	4.67	0.004-	0.91	0.009***	3.31	0.003-	0.55
	0.4	0.038***	4.83	0.002-	0.52	0.01***	4.12	0.005-	0.94
	0.5	0.035***	3.53	0.002-	0.50	0.012***	4.36	0.006-	1.06
	0.6	0.032***	3.12	0.000	0.01	0.01***	2.64	0.007-	1.03
	0.7	0.023***	2.10	0.004-	0.72	0.012**	2.27	0.009-	1.04
	0.8	0.02***	1.45	0.007-	0.91	0.014***	2.74	0.011-	1.02
	0.9	0.027***	2.10	0.012-	1.31	0.018***	2.97	0.016-	1.02
Turnover	0.1	0.000***	-0.13	0.000	0.90	0.000	-1.56	0.001-	1.64
	0.2	0.000***	-0.41	0.001-	1.47	0.000**	-2.12	0.000	0.95
	0.3	0.000***	0.43	0.001-	1.64	-0.001**	-2.06	0.001*	1.74
	0.4	0.000***	0.02	0.000	1.07	-0.001**	-2.02	0.001-	1.29
	0.5	0.001***	1.52	0.000	0.11	-0.001*	-1.75	0.001-	1.07
	0.6	0.001***	2.17	0.000	-0.11	-0.001-	-1.48	0.001-	1.17
	0.7	0.001***	3.03	0.000	0.60	0.000	-0.64	0.002**	1.99
	0.8	0.001***	2.47	0.001-	0.90	0.000	0.11	0.003*	1.90
	0.9	0.001***	1.52	0.001-	1.30	0.000	0.06	0.005**	2.38
R-square		0.221		0.483		0.17		0.003	

Note. We obtained our samples from the TEJ database. The sample data were from January 1, 2001 to December 31, 2012. Group A comprised overall domestic stock fund investors, Group B comprised insured investors, and Group C comprised noninsured investors. The variables include Jensen, Exp., Size, and Turnover. The significance levels of 10%, 5%, and 1% are signified by *, **, and ***.

5. Conclusion

In this study, we explored the behavioral differences between insured investors purchasing funds through investment-linked insurance policies and noninsured investors purchasing funds in Taiwan. In contrast to earlier studies, we used a quantile regression model to analyze the fund outflows and inflows of investment insurance. We also verified investors' behavioral responses toward different levels of fund risk.

Insured investors and noninsured investors had similar relationships with fund risk. Their attitudes toward fund risk did not change when fund inflows and outflows increase. We infer that because the majority of investment-linked insurance policies are sold through substantial amounts of channel marketing since investors may not be deeply concerned with risk. This point is consistent with the conclusion of Fu et al. (2010). However, noninsured investors were positively associated with fund risk. This indicates that with risk-adjusted performance and returns, although risk-averse investors redeem funds when fund risk increases, risk-loving investors replace them.

In the full sample, fund risk did not significantly affect the investment decisions of investors. Therefore, we cut the sample into various levels of risk to understand the influence of fund flows on the relationship between fund returns and fund characteristics. Few foreign or domestic studies have analyzed the investment decisions of investors when facing funds with various risk statuses. The empirical results of this study indicate that when insured investors purchased high-risk funds, fund inflows influenced fund performance. As performance and fund inflows grew stronger, fund turnover increased and investors avoided purchasing funds with high expense ratios.

Insured and noninsured investors do not subscribe to funds only when fund performance is strong, and they also redeem funds vigorously when profits appear. Thus, investors are risk averse when performance is strong. In contrast to low-risk funds, investors redeem high-risk funds relatively vigorously (Kahneman & Tversky, 1979).

We divided investors into three groups: overall domestic equity fund investors, insured investors, and noninsured investors. Because we were unable to segment the funds linked to life insurance companies entirely into insured investors and noninsured investors, the data source can only be used for verifying that Group C comprised only noninsured investors; that Group B contained only insured investors cannot be guaranteed. In addition, we were able to perform frequency analysis by using monthly data only. Data on fund variable factors were lacking, which could have affected the accuracy of the regression analysis. Thus, we had to exclude these incomplete data.

Although we divided the overall sample into different risk levels to analyze the relationships between investment amounts, performance, and characteristics among insured investors, in addition to insured investors, the overall mutual fund market includes a variety of investors from various types of financial institutions. Thus, we were unable to clearly distinguish between the sources of each piece of data. Subsequent researchers can use the channels of other financial institutions when distinguishing groups of investors. Researchers can also cooperate with a number of life insurance companies. Such results could satisfactorily fit the behavior of actual insured investors, which would greatly contribute to both academic and practical fields.

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