

# **Redemption Fees and the Risk-Adjusted Performance of International Equity Mutual Funds**

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## **Abstract**

In the wake of the market timing and late trading mutual fund scandals, many mutual funds adopted redemption fees to limit market timing. In this paper we investigate the impact of redemption fees on the risk-adjusted performance of U.S. based international equity funds, the very funds that many market timers used. We find three interesting results. First, using event study methodology we find that after the introduction of redemption fee there is a significant increase in the risk-adjusted fund performance. Second, we find that funds that introduced larger-size redemption fees have significantly better performance after the introduction of the redemption fee than other funds. Third, we find that the main reason for the improvement in fund performance after the introduction of the redemption fee is due to lower amounts of cash being held by the fund after the redemption fee. In sum our results suggest that implementation of redemption fees are performance enhancing for international equity funds. As such, long-term investors of international equity funds should actively look for international equity funds that have redemption fees.

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In the wake of the market timing and late trading mutual fund scandals, many mutual funds adopted redemption fees to limit market timing. In this paper we investigate the impact of redemption fees on the risk-adjusted performance of U.S. based international equity funds, the very funds that many market timers used. We find three interesting results. First, using event study methodology we find that after the introduction of redemption fee there is a significant increase in the risk-adjusted fund performance. Second, we find that funds that introduced larger-size redemption fees have significantly better performance after the introduction of the redemption fee than other funds. Third, we find that the main reason for the improvement in fund performance after the introduction of the redemption fee is due to lower amounts of cash being held by the fund after the redemption fee. In sum our results suggest that implementation of redemption fees are performance enhancing for international equity funds. As such, long-term investors of international equity funds should actively look for international equity funds that have redemption fees.

## **1. Introduction**

It is well-known that the correlation between international stock markets has increased over the past decades and that it is more pronounced during financial crises than over tranquil periods.<sup>1</sup> It is also well-known that up until 2003, most open-ended mutual funds in the U.S. allowed virtually free and unlimited liquidity to those investors who wished to buy or redeem fund shares. In addition, these same open-ended mutual funds also priced their funds using the 4 p.m. eastern U.S. time closing price, meaning that many assets in these mutual funds (namely international and other illiquid assets) did not reflect recent market movements.

This set of events lead to a very profitable trading strategy for active traders, namely the market timing of open-ended, U.S.-based mutual funds that held international equities. This practice allows fund investors to take advantage of time zone differences among stock markets around the globe. For example, European stocks finish trading several hours before the U.S. market close of 4 p.m. If in the intervening hours American stock prices escalated, Europe could be expected to follow suit the next day. Timers would then buy a European region fund today and sell it tomorrow to capture this increase. Indeed, Bhargava, Bose and Dubofsky (1998), Bhargava and Dubofsky (1999), Goetzmann, Ivkovic and Rouwenhorst (2001) and Greene and Hodges (2001) all find evidence that using market timing in these international funds led to returns much above the buy and hold strategy. For example, Bhargava, Bose and Dubofsky (1998) find that market timing of international mutual funds led to an annual return of 800 basis points above the strategy of buying and holding the Standard and Poor's 500 index.

Of course the high returns earned by market timers came at the expense of the passive, buy and hold investors in these funds. Since mutual funds had to increase their cash positions or sell investments at inopportune times to meet redemptions requests from market timers, the passive investor's returns were diluted. Indeed, over the period February 1998 to March 2000, Greene and Hodges (2001) show a significant negative dilution impact in these funds of 0.48 percent on an annualized basis.

In light of these academic studies and in the wake of the September 2003 New York Attorney General's complaint against fund companies for allowing market timing (and late

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<sup>1</sup> For example see Longin and Solnik (1995) and Longin and Solnik (2001).

trading), many mutual funds adopted redemption fees to halt market timers.<sup>2</sup> These redemption fees are applied to shares held by investors for short time periods and in effect penalize the investor who tries to market time.

In this paper we examine the impact of these redemption fees on the risk-adjusted performance of U.S. based international equity funds, the very funds that many market timers used. While others have found that market timing did dilute the performance of passive investors, our paper is the first to explicitly examine the impact that implementation of redemption fees has had on international equity mutual fund performance. In our analysis, we find significant evidence that the imposition of the redemption fees has improved the risk-adjusted performance of these international equity funds. As such, these results support the use of redemption fees in international equity mutual funds.

The rest of this paper is organized as follows. In Section 2 we provide a brief literature review, Section 3 provides a description of the data and Section 4 provides the methodology and results. We conclude with Section 5.

## **2. Literature Review on Redemption Fees**

The most relevant paper in the literature is Finke, Nanigian and Waller (2009), which examines the relationship of the size and duration of redemption fees on risk-adjusted domestic equity mutual fund performance. Specifically, they examine the explanatory power of the redemption fee size and/or duration on the risk-adjusted performance of all domestic equity funds that had already instituted redemption fees. They find a positive relationship between the size and duration of the redemption fee and fund performance, thus providing more support for the idea that redemption fees help long-term investors.

Additionally, Finke, Nanigian and Waller (2009) examine the average difference in portfolio turnover and cash holdings two years after the initiation of a redemption fee relative to the two years prior to the initiation of the fee of domestic equity funds that instituted redemption fees in 2005. They find that both turnover and cash holdings are significantly lower after the institution of the redemption fee.

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<sup>2</sup> Also note that the SEC adopted a new rule, 17 CFR Part 270, on May 23, 2005 that allowed open-end mutual funds to impose a redemption fee, not to exceed two percent of the amount redeemed, to be retained by the fund. Hence many funds that had not already imposed redemption fees were encouraged to do so at this time.

Our paper is distinct from Finke, Nanigian and Waller (2009) in at least two ways. First, we examine international equity mutual funds while they examine domestic equity funds. This is an important difference, as international equity funds were arguably the first type of mutual funds to be market timed given that their 4 p.m. eastern prices do not reflect recent market movements. Indeed, most of the first papers on market timing were about international equity funds, i.e., Bhargava, Bose and Dubofsky (1998), Bhargava and Dubofsky (2001), Goetzmann, Ivkovic and Rouwenhorst (2001) and Greene and Hodges (2001). Hence, international equity funds are the most relevant types of funds for which to examine the performance impact of redemption fees. Second, for each fund in our sample we use an event study methodology where we examine the changes in risk-adjusted performance between the period three years after and three years before the redemption fee was introduced. This event study methodology allows us to better control for differences between funds as we are examining the same fund across time. Conversely, through a cross-sectional analysis, Finke et al. (2009) examine the impact of the redemption fee size and duration on the domestic equity fund performance after the fee institution. As a result there may be fund specific qualities that cannot be adequately controlled for in the analysis.

Another relevant paper is Greene, Hodges and Radowski (2007). They examine how redemption policies affect daily fund flows in open-end mutual funds. They use a sample of funds that imposed redemption fees to examine whether the distribution of daily fund flows changes after the initiation of the redemption fee. They find that after the initiation of the redemption fee the volatility of fund flows is significantly lower, thus again providing evidence that the redemption fee is a useful tool in reducing market timing.<sup>3</sup>

### **3. Data**

Using the CRSP Survivor-Bias-Free Mutual Fund Database we collected all funds that meet each of the following four criteria. First, each fund had to be a U.S.-based, open-ended international

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<sup>3</sup> Lynch and Tan (2009) also investigate redemption fees using a numerical approach. They find that redemption fees are useful in reducing market timing and that they do not impact the utility of the long-term investor.

equity mutual fund.<sup>4</sup> Second, each fund had to have implemented a redemption fee, for the first time, after September 3, 2003, the date of the release of the New York State Attorney's complaint against the fund industry which started the market timing and late trading mutual fund scandals.<sup>5</sup> Third, each fund had to have at least three years of monthly return data before and after the implementation of the redemption fee. Fourth, a fund was only included in the sample if it had kept the size and duration of the redemption fee the same for the three years after the redemption fee was initially imposed. Hence, funds could not change their redemption fee structure for the first three years after initial implementation. Note also that we exclude index funds from our sample and, if a fund had multiple-share classes we retain only the fund share class with the longest history.

This sampling procedure yielded 157 funds. For each of these funds we collect the monthly returns as well as quarterly cash holdings, expense and turnover ratios. Note that although CRSP reports expense and turnover ratios quarterly, both are annual figures so they do not change for a fund for four consecutive quarters.<sup>6</sup>

Table 1, Panels A-C, provides some descriptive statistics of our sample of 157 international equity funds. In Panel A, we present the number of funds in the various international equity categories and the average net asset value of the fund for the entire six year period (pre- and post-redemption fee). The results show that most of the funds are "international funds" which means that they may invest in any area of the world. These same international funds are also the largest funds as they have the largest mean net asset value. In Panel B we provide the number of funds that introduced a redemption fee in each quarter from the third quarter of 2003 to the fourth quarter of 2006 (again we require each fund to have three years of

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<sup>4</sup> We limit our analysis to U.S. mutual funds that invest their assets primarily in stock markets outside the U.S.

<sup>5</sup> The scandals started on September 3, 2003 when Elliot Spitzer announced the issuance of a complaint against the hedge fund company Canary Capital Partners LLC.

<sup>6</sup> The expense ratio is the ratio of total investment that shareholders pay for the fund's operating expenses, which include 12b-1 fees. The turnover ratio is defined as the minimum of aggregated sales or aggregated purchases of securities, divided by the average 12-month total net assets of the fund.

monthly returns before and after the introduction of the redemption fee).<sup>7</sup> The results also show that most of the redemption fees were introduced in the three quarters after the New York State Attorney’s Complaint was issued (September 3, 2003). Finally in Panel C we provide the mean, median and standard deviation of the performance metrics (Sharpe and single-index alpha) for the pre- and post-redemption fee periods. The results show that the mean and median performance is higher in the post-redemption fee period while the standard deviation remains roughly the same.

#### 4. Methodology and empirical results

##### 4.1 Changes in performance

In order to test for changes in fund performance, we employ an event study methodology, where the event is the redemption fee institution. Only funds that have six years of return history, three years before and three years after a redemption fee institution are included in our analysis.<sup>8</sup> As a measure of fund performance we use two well-known performance metrics, the Sharpe ratio and the single-index alpha.

The Sharpe ratio is:

$$Sharpe_i = \frac{\overline{R_{it} - R_{ft}}}{\sigma_i} \quad (1)$$

Type equation here.

where  $R_{it} - R_{ft}$  are the monthly returns, in excess of the 90-day T-bill rate,  $R_{ft}$ , of the  $i$ th mutual fund during the in-sample period, and  $\sigma_i$  is the standard deviation of  $R_{it} - R_{ft}$ .

The single-index alpha is defined as:

$$R_{it} - R_{ft} = \alpha_i + \beta_i RMRF_{it} + \varepsilon_{it} \quad (2)$$

where  $RMRF_t$  are index returns in excess of the risk-free rate. We follow Tkac (2001) in that we use different Morgan Stanley Capital International (MSCI) indices for different types of international equity funds. We proxy the market return by the MSCI index return based on the

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<sup>7</sup> The definitions of the 11 categories identified in CRSP for our sample funds are presented in Table A.1 in the Appendix.

<sup>8</sup> Note that the month that the redemption fee is introduced is not included in pre-fee or post-fee periods. For example if the redemption fee was introduced in March 2004 the pre-fee period would be March 2001 to February 2004 and the post fee period would be April 2004 to March 2007.

fund strategy. Table A.1 in the Appendix summarizes how we match the fund's Lipper class name with the corresponding MSCI index.

For each fund we separately estimate both performance metrics for the three year time periods *before* and *after* the month of the introduction of the redemption fee. We then compute the difference in means of the performance metrics before and after the introduction of the redemption fee.<sup>9</sup>

Table 2, Panel A summarizes the t-test and Wilcoxon signed rank test for the change in the Sharpe ratio's mean and median, respectively. Table 2, Panel B reports the t-test and Wilcoxon signed rank test for the change in single-index alpha's mean and median. The results show clear benefits from the introduction of the redemption fee. For both the Sharpe ratio and the single index alpha we see that after the introduction of the redemption fee the risk-adjusted performance is significantly higher. More specifically, we find that the mean and median of changes in the Sharpe ratio after the implementation of the redemption fee are 0.2507 and 0.3487 respectively, and that these increases are statistically significant at the one percent level. We find that the mean increase in alpha after the implementation of the redemption fee is 0.0005 and that this result is statistically significant at the 10 percent level. We also find the median of the change in alpha after the introduction of the redemption fee is 0.0003 and this result is statistically significant at the five percent level.

As redemption fees are characterized by their size and duration of time that they are imposed, fund performance around the redemption fee institution may be significantly impacted by these two variables. Thus, we redo the t-test and Wilcoxon test to account for differences in redemption fee size and duration length and report the results in Table 2. We consider a fee to be

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<sup>9</sup> It should be noted that in our initial draft of the paper we experimented with using a control group, which contained U.S. open-ended international equity funds that did not have redemption fees, over the same time period as the funds in our current sample. However, due to difficulties in creating a non-redemption fee sample, we decided not to go in this direction. The difficulty arises from the fact that to arrive at an appropriate set of control funds, we have to use a matching algorithm to match funds without redemption fees to those in our sample. An appropriate algorithm matches funds on fund style, fund loads and expense ratios, and fund turnover. The problem is that since we are dealing with U.S.-based, open-ended, international funds with six years of data we have very few funds that appropriately match our sample of funds. As a result we cannot really create an adequate full control sample and decided not to pursue the control group.



small in size if it is lower than two percent, and large if it equals two percent (the SEC-imposed cap). Likewise, we consider the length of the fee duration to be small if it is in effect for less than two months (our sample fee duration average), and large if it is longer than two months. The results for both the Sharpe ratio and the single-index alpha show that funds that introduced large-size redemption fees have significantly better performance after the introduction of the fee than other funds. For example, for funds that implemented a large redemption fee, we find that the mean Sharpe ratio increases by 0.2661 and that this result is significant at the one percent level. On the other hand, funds with small size redemption fees show no significant difference in performance after the introduction of the redemption fee (in both the Sharpe ratio and single-index alphas). The results for small fees, however, should be read with caution, as only 14 of the 157 funds have fees lower than two percent.

In terms of the length of the duration of the redemption fee we find somewhat mixed results. Using the Sharpe ratio we find that funds with various types of duration lengths (small, average and large) have significantly better performance after the introduction of the redemption fee. However, using the single index alpha we find that funds with all types of duration did not have significantly better performance.

As a robustness check for Table 2 we also report the number of funds in our sample in which the risk-adjusted performance *increased* and *decreased* after the introduction of the redemption fee. We then use a Chi-Square test where the null is that the number of funds with increases in performance is same as the number of funds with decreases in performance. The results are reported in Table 3. For the Sharpe ratio, they are very similar to those reported in Table 2, namely that significant evidence exists that fund performance increases after the redemption fee is introduced. Specifically, after the introduction of the redemption fee, we find that 128 of 157 funds had higher Sharpe ratios than before the redemption fee implementation. The results are somewhat weaker when using the single-index alpha. We find that a majority of the funds (88 of 157) did show an increase in performance after the introduction of the redemption. However, the Chi-square test is not significant at traditional levels.

In sum, the results using the Sharpe ratio show strong support for the idea that the introduction of redemption fees increase fund performance. Using the single-index alpha we also find evidence that performance increases after the introduction of the redemption fee but the results are not as strong as those reported for the Sharpe ratio. Since a large percentage of the

funds in our sample are “international equity,” these weaker results may be attributed to our inability to accurately match the index that best fits these funds. Additionally, we show that larger redemption fees are more likely to increase fund performance than smaller sized fees and that the duration of the redemption fee does not seem to matter in terms of changing fund performance.

#### ***4.2 Explaining the Changes in Performance after the Introduction of the Redemption Fee***

In section 4.1 we find that there is generally a significant improvement in risk-adjusted fund performance after the introduction of the redemption fee. To better explain the improvement in performance we estimate equation (3):

$$\begin{aligned} \Delta Performance_i = & \beta_0 + \beta_1 * size_i + \beta_2 * duration_i + \beta_3 * \Delta NTA_i + \beta_4 * \Delta exp_i \\ & + \beta_5 * \Delta turn_i + \beta_6 * \Delta cash_i + \varepsilon_i \end{aligned} \quad (3)$$

where  $\Delta Performance_i$  is the change in risk-adjusted performance of fund  $i$  between the three-year period after and the three-year period before the introduction of the redemption fee (again the three-year post-fee period minus the three-year pre-fee period). We measure risk-adjusted performance using both the Sharpe Ratio and the single-index alpha.  $Size_i$  and  $duration_i$  are the size and duration of the fund  $i$ 's redemption fee.  $\Delta NTA_i$ ,  $\Delta exp_i$ ,  $\Delta turn_i$  and  $\Delta cash_i$  are changes in the average of monthly logged net total assets, the average annual expense ratio, the average annual turnover ratio, and the average quarterly cash holdings of fund  $i$  between the three-year period after and the three-year period before the introduction of the redemption fee.

One problem that we encountered here is that many of the 157 funds in our sample do not have a full six-year history of the cash holdings or turnover ratio data. Indeed, only 76 of the 157 funds have full data on cash holdings and only 82 have full data on the turnover ratio. Nevertheless, we estimate two models using equation (3). Model 1 only uses the size and duration variables and is based on the full sample of 157 funds. Model 2 uses all the variables in equation (3) and is based on the 76 funds (of the 157) that have full data on cash holdings, expense and turnover ratios three years before and after the fee initiation. The estimation results are reported in Table 4.

Our findings show that only two variables are consistent across both performance metrics. First, in Model 1, the size of the redemption fee is positively and significantly related to the change in performance after the fee is introduced. As expected, the positive impact of the redemption fee introduction on performance is greater for funds with larger redemption fees. Second, in Model 2 we find that cash held is negatively and significantly related to fund performance (in both the Sharpe and single-index alpha cases); lower amounts of cash held by funds after the redemption fee introduction seem to best explain why fund performance increases after the redemption fee. On average, cash holdings (as a percent of total assets) significantly decline by 0.66% in the 3-year post-fee period compared to the 3-year pre-fee period (not reported). Changes in expense ratios, fund size and turnover are not consistently significantly related to changes in fund performance. Hence, our results show that risk-adjusted fund performance does not seem to be a result of funds having lower expense ratios after the introduction of the redemption fee.

## **5. Conclusions**

In response to the market timing and late trading mutual fund scandals in 2003, many mutual funds adopted redemption fees. The rationale of imposing redemption fees was that they would limit market timing behavior, which in turn meant that funds could hold less cash and not trade as much to meet the demands of market timers. Lower cash holdings and less trading would result in better performance for the long-term passive investor in the fund.

In this paper we examine the impact of these redemption fees on the risk-adjusted performance of U.S. based international equity funds, the very funds that many market timers used. Our paper is the first to explicitly examine the impact that implementation of redemption fees has had on international equity mutual fund performance.

Using event study methodology we report three interesting results. First, we show that the introduction of the redemption fee results in a significant increase in the risk-adjusted fund performance. Our results are stronger using the Sharpe ratio, but some evidence of this effect using the single-index alpha is also found. Second, we find significantly better post-fee performance for funds that introduced larger-size redemption fees (at the two percent level) than for other funds. Third, we find, albeit on a smaller sample of funds, that the main reason for the improvement in fund post-fee performance is lower fund cash holdings after the introduction of

the redemption fee. On the other hand, changes in expense ratios, fund size and turnover are not consistently significantly related to changes in fund performance.

In conclusion, our results suggest that the implementation of redemption fees is performance enhancing for international equity funds. As such, long-term investors of international equity funds should actively look for international equity funds that have redemption fees.

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**Table 1: Descriptive Statistics of the International Equity Fund Sample***Panel A: Number of Funds in categories.*

Lipper class name	Frequency	Percent (%)	Average Total Net Asset Value over the 6-year horizon (in million\$)		
			Mean	Min	Max
China Region Funds	3	1.91	93.75	9.34	196.90
Emerging Markets Funds	18	11.46	199.44	1.88	2226.35
European Region Funds	16	10.19	184.46	3.74	832.47
International Funds	93	59.24	491.92	0.11	11805.71
International Large-Cap Core	3	1.91	13.81	0.41	22.12
International Large-Cap Growth	2	1.27	372.07	323.76	420.38
International Small-Cap Funds	4	2.55	193.04	72.37	283.95
Japanese Funds	6	3.82	74.99	8.33	270.10
Latin American Funds	3	1.91	38.64	12.98	70.45
Pacific Ex Japan Funds	6	3.82	39.12	5.76	120.66
Pacific Region Funds	3	1.91	153.98	1.26	360.89

*Panel B: Number of Funds by Date of the Introduction of the Redemption Fee. The percentage of total sample is listed in parenthesis.*

	2003		2004				2005				2006			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
No. of Funds	4	26	28	39	2	6	29	6	8	2	1	2	1	3
	(2.55)	(16.56)	(17.83)	(24.84)	(1.27)	(3.82)	(18.47)	(3.82)	(5.10)	(1.27)	(0.64)	(1.27)	(0.64)	(1.91)

*Panel C: Descriptive Statistics of the Sharpe ratio and single-index alpha*

	Pre-fee 3-year period			Post-fee 3-year period		
	Mean	Median	Std	Mean	Median	Std
Sharpe ratio	0.0937	0.0787	0.1790	0.3445	0.3736	0.1754
Alpha	0.0008	0.0008	0.0041	0.0013	0.0011	0.0030

**Table 2: Changes in Risk-Adjusted Performance After Redemption Fee Introduction (Using Mean and Median Change After Introduction of the Redemption Fee).**

We compute the change in risk-adjusted performance of a fund after the introduction of the redemption fee. To do this we estimate the risk-adjusted performance of each fund for three years *after* and the three years *before* the introduction of the redemption fee. We then calculate the change in fund performance between these two periods, i.e. post-fee performance minus pre-fee performance. We then report the mean and median changes in risk-adjusted performance of the 157 funds in our sample. Panel A contains the Sharpe ratio results and Panel B has the single-index alpha results. Note that a fee size is small if it is lower than two percent, and large if it equals two percent. The average fee duration of our sample is two months. The fee duration is large if it is longer than two months, and small if it is in shorter than two months.\*\*\*, \*\*, \* indicate significance at the one, five and 10 percent levels respectively.

*Panel A: Sharpe Ratio*

	All funds	Funds by fee size		Funds by fee duration		
	N=157	Small N=14	Large N=143	Small N=92	Average N=46	Large N=19
Mean change (3 yr. post-fee period minus 3 yr. pre-fee period)	0.2507***	0.0942	0.2661***	0.2746***	0.1880***	0.2873***
t-test p-value	<.0001	0.2717	<.0001	<.0001	0.0010	0.0006
Median change (3 yr. post-fee period minus 3 yr. pre-fee period)	0.3487***	0.1907	0.3730***	0.3740***	0.1730***	0.3730***
Wilcoxon signed rank test p-value	<.0001	0.3258	<.0001	<.0001	0.0003	0.0024

*Panel B: Single-index alpha*

	All funds	Funds by fee size		Funds by fee duration		
	N=157	Small N=14	Large N=143	Small N=92	Average N=46	Large N=19
Mean change (3 yr. post-fee period minus 3 yr. pre-fee period)	0.0005*	-0.0021*	0.0008**	0.0004	0.0006	0.0006
t-test p-value	0.0911	0.0990	0.0126	0.3094	0.2118	0.4503
Median change (3 yr. post-fee period minus 3yr. pre-fee period)	0.0003**	-0.0033	0.0009***	0.0002	0.0010	-0.0001
Wilcoxon signed rank test p-value	0.0317	0.1040	0.0022	0.1681	0.0755	0.6507

**Table 3: Changes in Risk-Adjusted Performance After Redemption Fee Introduction (Using Number of Cases where the Performance Increased and Decreased After Introduction of Redemption Fee)**

We compute the change in risk-adjusted performance of a fund after the introduction of the redemption fee. To do this we estimate the risk-adjusted performance of each fund for three years *after* and the three years *before* the introduction of the redemption fee. We then calculate the change in fund performance between these two periods, i.e. post-fee performance minus pre-fee performance. We then report the number of funds in our sample in which the risk-adjusted performance *increased* and *decreased* after the introduction of the redemption fee. We then compute the results of Chi-Squared test where the null is that the number of funds with increases in performance is same as the number of funds with decreases in performance. Panel A has the Sharpe ratio results and Panel B has the single-index alpha results. Note that a fee size is small if it is lower than two percent, and large if it equals two percent. The average fee duration of our sample is two months. The fee duration is large if it is longer than two months, and small if it is in shorter than two months.\*\*\*, \*\*, \* indicate significance at the one, five and 10 percent levels respectively.

*Panel A: Sharpe Ratio*

	All funds	Funds by fee size		Funds by fee duration		
	N=157	Small N=14	Big N=143	Small N=92	Average N=46	Big N=19
# of funds whose Sharpe ratio fell after redemption fee introduction	29	4	25	15	12	2
# of funds whose Sharpe ratio increased after redemption fee intro.	128	10	118	77	34	17
Chi-squared test p-value	<.0001***	0.1088	<.0001***	<.0001***	0.0012***	0.0006***

*Panel B: Single-index alpha*

	All funds	Funds by fee size		Funds by fee duration		
	N=157	Small N=14	Big N=143	Small N=92	Average N=46	Big N=19
# of funds whose alpha fell after redemption fee introduction	70	10	60	43	17	10
# of funds whose alpha increased after redemption fee intro.	87	4	83	49	29	9
Chi-squared test p-value	0.1749	0.1088	0.0544*	0.5316	0.0768*	0.8185



**Table 4: Explaining Changes in Risk-Adjusted Fund Performance After the Introduction of the Redemption Fee**

We present the estimates of equation (3) below. Equation (3) is defined as:

$$\Delta Performance_i = \beta_0 + \beta_1 * size_i + \beta_2 * duration_i + \beta_3 * \Delta NTA_i + \beta_4 * \Delta exp_i + \beta_5 * \Delta turn_i + \beta_6 * \Delta cash_i + \varepsilon_i$$

where  $\Delta Performance_i$  is the change in risk-adjusted performance of fund  $i$  between the 3-year period after and the 3-year period before the introduction of the redemption fee (again the 3-year post fee period minus the 3-year pre-fee period). We measure risk-adjusted performance using the Sharpe Ratio and the single-index alpha.  $Size_i$  and  $duration_i$  are the size and duration of the fund  $i$ 's redemption fee.  $\Delta NTA_i$ ,  $\Delta exp_i$ ,  $\Delta turn_i$  and  $\Delta cash_i$  are changes in the average of monthly logged net total assets, the average annual expense ratio, the average annual turnover ratio, and the average quarterly cash holdings of fund  $i$  between the 3-year period after and the 3-year period before the introduction of the redemption fee. We estimate two models. The results reported in Model 1 are based on the full sample of 157 funds. Results reported in Model 2 are based on the 76 funds (of the 157) had full data on cash holdings, expense and turnover ratios three years before and three years after the fee initiation. P-values are in parentheses. \*\*\*, \*\*, \* indicate the difference is significant at the one, five and 10 percent levels respectively. A 6-leg Newey West correction for residuals is used.

*Panel A: Changes in Sharpe Ratio*

*Panel B: Changes in Single-index alpha*

Variable	Model 1	Model 2	Variable	Model 1	Model 2
Intercept	-0.1754 (0.5211)	0.0150 (0.9739)	Intercept	-0.0075*** (0.0002)	-0.0038 (0.2813)
Fee Size	22.5751* (0.0999)	13.8617 (0.5301)	Fee Size	0.4023*** ( $<.0001$ )	0.3075** (0.0335)
Fee Duration	-0.0057 (0.8747)	-0.0230 (0.5944)	Fee Duration <sup>1)</sup>	0.1397 (0.7455)	-0.2457 (0.7605)
$\Delta$ Net Total Assets		-0.0346 (0.1295)	$\Delta$ Net Total Assets <sup>1)</sup>		-0.8404*** (0.0049)
$\Delta$ Expense ratio		20.5055 (0.1164)	$\Delta$ Expense ratio		0.0525 (0.8195)
$\Delta$ Turnover ratio		0.0129*** (0.0014)	$\Delta$ Turnover ratio <sup>1)</sup>		0.0766 (0.2376)
$\Delta$ Cash holdings		-1.9846** (0.0342)	$\Delta$ Cash holdings		-0.0290* (0.0584)
Adjusted R-square	0.0174	0.1043	Adjusted R-squared	0.0579	0.1318
N	157	76	N	157	76

<sup>1)</sup>Multiplied by 1000

**Table A.1. International Mutual Funds in CRSP database**

Lipper Class Name	Definition	MSCI index
Canadian Funds	Concentrate investments in equity securities of Canadian companies.	MSCI Canada
China Region Funds	Concentrate investments in equity securities whose primary trading markets or operations are in the China region or in a single country within this region.	MSCI Golden Dragon
Emerging Market Funds	Seek long-term capital appreciation by investing primarily in emerging market equity securities, where emerging market is defined by a country's GNP per capita or other economic measures.	MSCI EM
European Region Funds	Concentrate investments in equity securities whose primary trading markets or operations are concentrated in the European region or a single country within this region.	MSCI AC Europe
International Funds	Invest their assets in securities with primary trading markets outside of the United States.	MSCI AC World Ex US
International Large-Cap Core Funds	Invest at least 75% of their equity assets in companies strictly outside of the U.S. with market capitalizations (on a three-year weighted basis) greater than 400% of the 75th market capitalization percentile of the S&P/Citigroup World ex-U.S. Broad Market Index.	MSCI AC World Ex US Large-Cap Core
International Large-Cap Growth Funds	Invest at least 75% of their equity assets in companies strictly outside of the U.S. with market capitalizations (on a three-year weighted basis) greater than 400% of the 75th market capitalization percentile of the S&P/Citigroup World ex-U.S. Broad Market Index.	MSCI AC World Ex US Large-Cap Growth
International Large-Cap Value Funds	Invest at least 75% of their equity assets in companies strictly outside of the U.S. with market capitalizations (on a three-year weighted basis) greater than 400% of the 75th market capitalization percentile of the S&P/Citigroup World ex-U.S. Broad Market Index.	MSCI AC World Ex US Large-Cap Value
International Small-Cap Funds	Invest at least 65% of their assets in equity securities of non-United States companies with market capitalizations less than US \$1 billion at time of purchase.	MSCI AC World Ex US Small-Cap
International Small/Mid-Cap Core Funds	Invest at least 75% of their equity assets in companies strictly outside of the U.S. with market capitalizations (on a three-year weighted basis) less than 400% of the 75th market capitalization percentile of the S&P/Citigroup World ex-U.S. Broad Market Index.	MSCI AC World Ex US Small/Mid-Cap
International Small/Mid-Cap Growth Funds	Invest at least 75% of their equity assets in companies strictly outside of the U.S. with market capitalizations (on a three-year weighted basis) less than 400% of the 75th market capitalization percentile of the S&P/Citigroup World ex-U.S. Broad Market Index.	MSCI AC World Ex US Small/Mid-Cap Growth
International Small/Mid-Cap Value Funds	Invest at least 75% of their equity assets in companies strictly outside of the U.S. with market capitalizations (on a three-year weighted basis) less than 400% of the 75th market capitalization percentile of the S&P/Citigroup World ex-U.S. Broad Market Index.	MSCI AC World Ex US Small/Mid-Cap Value
Japanese Funds	Concentrate investments in equity securities of Japanese companies.	MSCI Japan
Latin American Funds	Concentrate investments in equity securities with primary trading markets or operations concentrated in the Latin American region or in a single country within this region.	MSCI Latin America
Pacific Ex Japan Funds	Concentrate investments in equity securities with primary trading markets or operations concentrated in the Pacific region (including Asian countries) and that specifically does not invest in Japan.	MSCI AC Pacific Ex Japan
Pacific Region Funds	Concentrate investments in equity securities with primary trading markets or operations concentrated in the Western Pacific Basin region or a single country within this region.	MSCI AC Pacific