Econ 198S
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Honor Thesis Proposal

Assessing the Performance of Actively Managed Global Funds

Abstract

It has been widely debated whether managed funds outperform their index counterparts. Many scholars have carried out empirical testing for U.S. managed funds, but few have examined global funds. This study compares the total returns and risk-adjusted returns for 29 largest global funds with that of a basket of Vanguard indexes over 5 two-year periods from January 1997 to December 2006. We discover that the global funds outperform the basket of indexes before expenses. Also, the global funds outperform the indexes by an increasing amount in later periods than in earlier ones, implying accumulated experience and improved fund management skills of fund managers over time. Moreover, the average of the return differentials in favor of global funds in five periods is lower than the return differential over the entire 10-year period, indicating fund managers' superior style-picking skills. After expenses, the indexes win on average, because most global funds have high expense ratios (of up to 2 %.) However, low cost global funds, such as the Vanguard Global Equity, make an exception.

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I. Introduction

The mutual fund, a vehicle of collective investment, is well known for its liquidity, ease-of-use, and unique diversification capabilities. It has grown significantly since its birth in 1924. In 1951, there were approximately 100 funds. As of April 2006, there are more than 8600 funds in the United States, with combined assets of $9.207 trillion dollars. As a popular investment option today, mutual funds have drawn attention from both the business world and academia. One of the most popular questions of debate among scholars is: How well do actively managed funds perform comparing to index funds? Actively managed funds and index funds are two general categories of mutual funds. Index funds replicate the movements of an index of a financial market, requiring minimal human management. Therefore, index funds involve lower fees compared to actively managed funds. On the other hand, managed funds involve active human supervision in the stock selection and portfolio management process with the goal of outperforming a benchmark index. Thus, investing in these funds usually requires a higher fee.

Numerous studies have been done on the performance of U.S. managed funds versus index funds. Since Jensen (1968), many studies find that actively managed funds underperform comparable indexes. Gruber (1996) reaches the same conclusion by investigating the performances of 270 American open end and closed end mutual funds as well as index funds over the period of 1985-1994. However, Reinker and Tower (2004) discover that Vanguard's actively managed U.S. funds outperformed its index funds from 1977-2003. Many scholars also investigate how active management contributes to the superior performance of managed funds. Chen, Jegadeesh and

Wermers (2000) examine the stockholdings and trades of U.S. mutual funds between 1975 and 1995, and claim that managed funds possess better stock selection skills—they purchase stocks with significantly higher returns compared to those they sell. They also find that the difference in returns is partially due to the difference in the characteristics of the Buys and Sells, such as price momentum. Chen, Jegadeesh and Wermers do not incorporate cost perspective into their comparison of managed funds and index funds. Kizer (2005) discovers that the differences in performance of the Vanguard managed fund and index fund reflect differences in style. Reinker and Tower (2005) further claim that good style-picking skill, rather than stock-picking skill, determines the superiority of the Vanguard managed portfolio. They show that style-adjusted performance of managed portfolio underperforms the index portfolio approximately by the amount of extra expenses charged by the managed portfolio. Although many studies have compared the performance of managed U.S. funds with that of their index counterparts, few have examined systematically whether managed international funds outperform the indexes that mirror their performance. In this study, we investigate the performances of global managed funds and their index counterparts, and answer the following questions:

1. How well do actively managed global funds perform compared to their index counterparts over the past 10 years?

2. What factors contribute to the superior performance of global managed funds or index funds?

3. After accounting for turnover and expense ratios, does the difference in the performances of global funds and index funds in one period predicts that in the following period?

To answer these questions, we look at global funds that are unconstrained on the weights placed on different types of investment. We ask whether an investor does better to invest

in such a global fund or in the basket of domestic and international index funds that has the highest month to month return correlation with it. We pick Vanguard's international index funds, which have relatively low expense ratios of around 0.5%, and Vanguard's domestic index funds that have an expense ratio of around 0.2%, to serve as the basket. Then, we calculate the risk and return for the basket of indexes and compare them to each of the 29 largest global funds, which invest at least 80% of their assets in equity. Our conclusion is: before expenses, global managed funds outperform their corresponding indexes; and after expenses, global funds underperform the index basket.

Section II reviews relevant literatures on actively managed U.S. mutual funds and index funds. I survey various methodologies of comparing the performances of managed funds and index funds, numerous datasets that have been analyzed, and the corresponding conclusions. I also discuss the lack of research in the field of global funds and how this research fills this gap. Following Section II, Section III discusses the theoretical framework of this study, which is borrowed from previous researches and improved to fulfill the particular needs of this study. Section IV details the data we analyze — 29 global funds and a basket of Vanguard's low cost global indexes. We collect the data from three major sources[1]: Morningstar Principia Database, CRSP Survivor-Bias Free US Mutual Fund Database, and DataStream Database. Section V presents the methodology and the result from the empirical tests we carried out. Section VI serves as the conclusion of the paper. It summarizes the answers to the three questions raised in Section I, the Introduction Section.

[1] To get more detailed information on data and databases, please refer to Appendix B.

II. Literature Review

A large number of studies have been done on U.S. actively managed mutual funds. Scholars who write on this topic usually investigate one or both of the following questions: 1. Do U.S. managed funds outperform or underperform index funds? 2. What factors contribute to the superior performance of managed funds/index funds? Scholars hold diverse opinions on these questions.

Regarding the first question, many studies, such as Jensen (1968), Malkiel (1995), Gruber (1996), and Bogle (2002a), claim that U.S. managed funds underperform index funds. Others, such as Minor (2001) and Reinker and Tower (2004), discover that U.S. managed funds do better than their index counterparts. The differences in findings are mainly attributed to using different data sets and methodologies.

Malkiel (1995) compares the returns of managed funds with those of Wilshire 5000 Index and S&P 500 Index over the period from 1971-1991. Gruber (1996) looks at performances of 270 American open end and closed end mutual funds as well as index funds over the period of 1985-1994. Minor (2001) compares the risk, return and risk-adjusted return for managed funds under each of Morningstar's nine equity categories to those for their index counterparts for a period from 1990 to 1994. Gruber and Minor analyze data sets that span relatively shorter periods; therefore, their findings cannot eliminate the influence of random disturbances. Compared to Gruber's and Minor's studies, Malkiel's research covers a longer period, but lacks information on mutual fund performance for the most recent 15 years. Reinker and Tower (2004) focus on low-expense managed U.S. funds in the Vanguard family, and look at the longest period: from 1977-2003. In this study, we look at the performances of 29 global managed funds and a

basket of Vanguard index funds over the past ten years—the longest period with data available. We pick the global funds that are least restricted in stock selection and have relatively low expense ratios.

Regarding methodology, Bogle (2002a) compares the risk-adjusted and style-adjusted return of managed portfolio with that of the indexes. He finds that the indexes outperform their corresponding managed portfolios after risk and style adjustments. He also points out that other factors, such as the stronger survivorship bias in managed funds, the overstatement of some managed funds' returns, and greater tax liability of managed funds, all increase the superiority of index funds. Minor (2001) reaches an opposite conclusion from Bogle's while applying a similar analysis on mutual funds over the period of 1990-1994. One possible reason that may have caused this divergence in results is that Minor and Bogle select different fund classes. Reinker and Tower (2004) apply a slightly different approach. They construct synthetic portfolios of funds that weigh each fund in proportion to its assets and then compare the risk-adjusted returns of the entire synthetic portfolios. They believe that this aggregation method is better than averging the performance of individual funds as it accords with the investment habits of investors. In this study, we examine how a global fund performs compared to a basket of domestic and international index funds plus a constant term (Alpha), which best explains the month to month returns of the global fund[2]. We assume that an investor puts all his money into either a global fund or its index counterpart, and ask which investment option performs better. To answer this question, we compare the total return and risk-adjusted return for each global fund with that for the basket of Vanguard indexes. Although this

[2] The basket plus alpha best explains the returns of the global fund because it has the smallest mean square deviation of return from the global fund.

method provides a clear and straightforward comparison, it has flaws. The assumption that investors would invest solely on either a global fund or a basket of indexes is unrealistic. Most investors do not choose global funds as their only investment because these funds typically have very small share of assets in the U.S. market. For instance, the Vanguard Global Fund has only 44.5% of its assets in North America.

The second question has been studied by numerous scholars. Chen, Jegadeesh and Wermers (2000) believe that active management adds value to the superior performance of managed funds by possessing good stock selection skills. Others, such as Kizer (2005), Reinker and Tower (2005), and Tower and Zheng (2006), claim that good style-picking skill, rather than stock-picking skill, determines the superiority of managed funds. Chen, Jegadeesh and Wermers (2000) examines the stockholdings and trades of U.S. mutual funds existing between 1975 and 1995, and find that managed funds purchase stocks with significantly higher returns compared to those they sell during both the pre-event and the after-event periods. This holds across all styles—large stocks, small stocks, value stocks and growth stocks. Although Chen et.al.'s discovery is important, I think it is insufficient to show that managed funds prossess good stock selection skills, because choosing stocks to buy and to sell indicates only one aspect of the stock selection process. It has limited influence on the performance of the whole portfolio. As revealed in their study, stocks widely held by managed funds do not outperform other stocks[3]. Also, the influence of stock trades on the performance of the portfolio can be either positive or negative. According to portfolio management theory, adding a stock with positive return to a portfolio does not necessarily increase the risk

[3] Chen and etc's find that the stocks that are more widely held by managed funds yield higher returns than those that are less widely held; however, the difference is not significant.

adjusted return of the portfolio due to stock correlation effects. On the other hand, Reinker and Tower (2005) discover that good style-picking skill determines the superior performance of managed funds by comparing the style-adjusted returns of managed portfolio and index portfolio. They find that style-adjusted performance of the managed portfolio underperforms the index portfolio approximately by the amount of extra expenses charged by the managed portfolio.

Although numerous studies have been done on U.S. managed funds, limited studies focus on actively managed global funds. Zheng and Tower's 2005 and 2006 studies are among the few that examine the performance of global funds, but they do not adjust the investment styles of the funds. In this study, we look at 29 global funds that are least restricted in their stock selections from January 1997 to December 2006. We intend to answer the three questions raised in the Introduction Section by comparing the risk-adjusted and style-adjusted returns of these global funds with that of their index counterparts.

III. Theoretical Framework

Return and risk are two most important measures of the performance of a mutual fund. To assess the performances of managed funds and index funds, scholars usually compare the total returns and risk-adjusted returns of the two. Total return is the actual rate of return of a fund over a given period of time. It includes interest, capital gains, dividends and distributions realized over this period, but it does not incorporate risk. Comparing the total return measures of two funds is not sufficient to judge which fund has better performance, because higher return is always associated with higher risk, and a higher total return figure may be a result of taking excess risk. Therefore, people also

look at the risk-adjusted returns of mutual funds. As its name implies, risk-adjusted return measures how much risk a fund takes on to earn its returns. There are two widely used methods of calculating risk-adjusted returns: the Sharpe Ratio and the Modigliani (M^2) Method.

The Sharpe Ratio is a measure devised by William F. Sharpe to directly assess the risk-adjusted performance of a portfolio. It is defined in Equation I for portfolio p, where

$E[r_p]$ = Average return from portfolio p

r_f = Risk-free rate of interest

σ_p = Standard deviation of returns for portfolio p

$$\text{SHARPEp} = \frac{\text{Risk Premium for p}}{\text{Total Risk of p}} = \frac{E[r_p] - r_f}{\sigma_p} \qquad \text{(I)}$$

The figure in Appendix C illustrates how the Sharpe Ratio measures the slope of a line from the risk-free rate R_f to that of the risky assets.

Seeing the difficulty to interpret the Sharpe Ratio, Jensen's Alpha and Treynor Ratio measures for the average investor, Franco Modigliani and Leah Modigliani developed the M^2 Method[4]. This method assesses the risk-adjusted performance of a portfolio in two steps. The first step is matching the portfolio's risk to the level of risk in the unmanaged market benchmark by levering or unlevering the portfolio. We reduce the level of risk in a portfolio (as well as the expected return) by unlevering it; that is, selling a portion of the portfolio and using the proceeds to purchase risk-free assets, thereby increasing the proportion of investment in risk-free securities. Likewise, we increase the risk in a portfolio (as well as the expected return) by levering it; that is, increasing the

[4] The exposition on the M^2 method is drawn from Modigliani, F. and Modigliani, L.'s work in 1997, Risk-Adjusted Performance. *The Journal of Portfolio Management,* 23, 2, pp. 45-54.

investment in the portfolio through borrowing or short selling the riskless asset. The second step is measuring the returns of the risk-matched portfolio.

The formulas that Franco Modigliani and Leah Modigliani have devised to calculate the risk-adjusted performance (RAP) are as in Equations II and III, where

r_f = short-term risk-free interest rate;
r_i = average return of portfolio i;
r(i) = average return of risk-equivalent (or matched) portfolio, or the risk-adjusted return of portfolio i;
e_i = average excess return of portfolio i ($e_i = r_i - r_f$);
e(i) = average excess return of risk-equivalent portfolio i ($e(i) = r(i) - r_f$);
σ_i = standard deviation of r_i and e_i;
$\sigma(i)$ = standard deviation of r(i) and e(i);
S_i = the Sharpe ratio = e_i/σ_i;
r_M = average return of the market portfolio;
e_M = average excess return of the market portfolio

$$RAP(i) = (\sigma_M/\sigma_i)r_i - [(\sigma_M/\sigma_i) - 1]\, r_f = (\sigma_M/\sigma_i)(r_i - r_f) + r_f \qquad \text{(II)}$$

Or:

$$RAP(i) = (\sigma_M/\sigma_i)e_i + r_f = e(i) + r_f \qquad \text{(III)}$$

where

$$e(i) = (\sigma_M/\sigma_i)e_i$$

As implied by Equation III, RAP(i) and e(i) differ only by a constant, r_f. Therefore, a simpler alternative of measuring risk-adjusted performance is developed. It is based exclusively on excess returns, but ranks portfolios identically as RAP.

$$RAPA(i) = e(i) = (\sigma_M/\sigma_i)e_i \qquad \text{(IV)}$$

Ranking portfolios by the M^2 RAP(A) method yields the same results as ranking by the Sharpe Ratio, because part of the equation of RAPA is exactly the transformation of the Sharpe Ratio. Equation IV can be rewritten as $RAPA(i) = \sigma_M\,(e_i/\sigma_i)$, and e_i/σ_i is the Sharpe Ratio. Although RAP and the Sharpe Ratio provide same ranking of mutual

funds, the measures by the M^2 method are in basis points and are easier for the average investor to interpret. However, the M^2 method also has two weaknesses. First, the actual amount of RAP for any portfolio depends on what risk-free asset we uses to lever or unlever the portfolio, thereby different risk-free securities yield different RAP results. This will not cause problems for my research, as the ranking of portfolios remains the same no matter what risk-free security is chosen for leverage. Second, the M^2 method proposes that one can increase the expected return and risk in a portfolio by short selling the riskless asset. However, short sale of risk-free securities by mutual funds is not feasible in the market.

The graph in Appendix D illustrates how we adjust the risk levels of various portfolios to the level of the market portfolio. In the graph, the market portfolio P_M earns a total return of r_M with standard deviation σ_M. Portfolio 1 earns a total return of r_1, which is higher than r_2, the total return of Portfolio 2. At the same time, Portfolio 1 has a higher level of risk than Portfolio 2 as well. To compare the risk-adjusted performances of Portfolio 1 and 2, we draw the "leverage opportunity line" for each portfolio—a straight line starting from P_0, the portfolio of risk-free securities, passing through P_1 or P_2 and intersecting with the line $x = \sigma_M$. By unlevering, the risk-adjusted return and the level of risk of Portfolio 1 have moved down the leverage opportunity line to RAP(1) and σ_M, respectively. By levering, the risk-adjusted return and the standard deviation of Portfolio 2 have increased along the line to RAP(2) and σ_M, correspondingly. Since RAP(2) is higher than RAP(1), Portfolio 2 yields better risk-adjusted performance. The slope of the leverage opportunity line for any portfolio is that portfolio's Sharpe Ratio

$S_i = (r_i - r_f)/\sigma_i$. Therefore, Portfolio 2, which has the steepest slope or greatest Sharpe Ratio, yields the highest risk-adjusted return.

In this study, we calculate the risk-adjusted returns for mutual funds in a way similar to the M^2 method. We include a risk-free asset (e.g. the Short-term Treasury Bill) in the tracking index basket, and adjust the risk of the tracking portfolio of each global fund to equal the lowest standard deviation among all tracking portfolios by changing the amount of risk-free asset in each portfolio. This will avoid buying mutual funds on margin or selling them short. When the asset is truly risk-free, the frontier of return versus standard deviation for each tracking portfolio will be a straight line, and the ranking of risk-adjusted portfolios will be unique and coincide with the ranking by the Sharpe Ratio, regardless of the level of risk that is chosen. However, since the Short-term Treasury Bill is not completely risk-free, the ranking in not unique and deviates from the Sharpe Ratio ranking.

IV. Data

In this study, we look at a basket of Vanguard indexes and 29 largest global funds[5], including the Vanguard and Fidelity global funds, over the period from January 1997 to December 2006. We choose Vanguard because it is the only fund family that provides the public with a variety of relatively low-cost global managed and index funds. We pick the global funds that are least restricted in stock selection from their fund families and invest at least 80% of their assets in equity, and choose the class of fund that has no front end or deferred load, and has the smallest minimum investment.[6]

[5] For a complete list of the 29 global funds, please refer to Appendix A.
[6] This is typically investor class C or I.

We compare the performance of each global fund with that of the index basket in five sequential two-year periods. The basket of Vanguard indexes includes the 500 Index, Growth Index, Small Cap Index, Value Index, Total Stock Market Portfolio (based on the Wilshire 5000 Index), Europe Index, Pacific Index, Select Emerging Market Free Index, and Extended Market Index. The index funds in this basket all have relatively low expense ratios. In particular, the Vanguard's international index funds have expense ratios of around 0.5%, and the domestic index funds have expense ratios of around 0.2%. Most of the 29 global funds have high expense ratios (of up to 2%), however, there are some exceptions. In particular, Vanguard's global fund has an unusually low expense ratio of 0.5%. The Table below summarizes the characteristics of the global funds.

29 Global Funds	
Average Percentage of Asset in Equity	90.4
Average Gross Expense Ratio (%)	1.976
Average Turnover Ratio (%)	73.83
Mean Annual Return (10 yrs)	7.763
Average Sharpe Ratio	1.16

The main variables of my data set include monthly real return, expense ratio, turnover ratio, and percentage of cash in the portfolio. Other variables include the regulatory ones that serve as the criteria of my data selection, such as the percentage of asset in equity and the origination year of a global fund, as well as the supplementary variables that I may consult in the analysis, such as the Sharpe Ratio and the percentage of asset invested in each region. Using the main independent variables, such as the monthly real return, we construct the tracking index portfolio of each global fund, and calculate the dependent variables: geometric alpha, arithmetic alpha, T-statistics, variance of the tracking basket, variance of the global fund, and R^2.

The data we use have some limitations. Most importantly, the international indexes are not fully developed. For instance, there is no International Mid-Cap Index or Small Cap Value Index. This makes the index basket incomplete. Also, global managed funds and indexes exist for a relatively short period. Since we could only examine their performances over the past ten years, the findings may not be representative due to the influence of random disturbances. Moreover, in the basket of global indexes, a few regions are over represented, as some index funds put most weights of investment on the same region/country. For instance, both the Pacific Index and the EM Index have Hong Kong as their third most-heavily exposed region. However, since the Pacific Index has only 5% of assets in this region and the EM Index has only 11.4%, the overlapping problem is not significant. Lastly, we focus entirely on open-end funds, and do not take closed-end global funds[7] into account. While taking closed-end global funds into consideration would provide more comprehensive results; we decide not to do so, because there are only a few closed-end global funds, and the data on these funds are not very good to work with.

We obtain the data from three major data sources: the Morningstar Principia Database, the CRSP Survivor-Bias Free US Mutual Fund Database, and the DataStream Database[8]. The Morningstar Principia Database contains over 150 data items for each of the 17,000 mutual funds, as well as data on more than 150 Exchange Traded Funds and over 200 benchmark indexes. The CRSP Survivor-Bias Free US Mutual Fund Database provides information on open-ended mutual funds beginning at varying times between

[7] A closed-end global fund issues a fixed number of shares in an actively managed portfolio of global securities. These shares are traded in the market just like common stock. Different from open-end global funds, the market price of the shares of closed-end global funds is determined by supply and demand instead of net-asset value (NAV).
[8] Please refer to Appendix B for a detailed description of the three databases.

December 1961 and 2003. It includes a history of each mutual fund's name, investment style, fee structure, asset allocation, monthly total returns, and the like. The DataStream Database provides mutual fund data, such as price information for open-end funds, under its investment trusts and unit trusts sections.

V. Methodology, Empirical Specification and Findings

For each global fund, we regress its monthly real returns on the basket of Vanguard indexes from January 1997 to December 2006. In the regression, we constrain all the coefficients to be positive and the sum of them to be one. We intend to get the equation:

Global Return = β_1*500 Index + β_2*Growth Index +…+ β_{13}*Short-term Treasury Bill

where $\beta_1 \geq 0$, $\beta_2 \geq 0$,…, $\beta_{13} \geq 0$, and $\beta_1 + \beta_2 + \ldots + \beta_{13} = 1$. The chart below illustrates the indexes, their coefficients and the constraints on the coefficients.

Coefficient	Variable	Constraint
β_1	500 Index	≥ 0
β_2	Growth Index	≥ 0
β_3	Large Cap Index	≥ 0
β_4	Mid Cap Index	≥ 0
β_5	Small Cap Growth Index	≥ 0
β_6	Small Cap Index	≥ 0
β_7	Small Cap Value Index	≥ 0
β_8	Value Index	≥ 0
β_9	Total Stock Market Portfolio	≥ 0
β_{10}	Europe Index	≥ 0
β_{11}	Pacific Index	≥ 0
β_{12}	Emerging Market Index	≥ 0
β_{13}	Short-term Treasury Bill Index	≥ 0

This allows us to find the index portfolio that minimizes the sum of the squares of the deviations of a global fund's monthly returns from its average return minus that of the

index portfolio minus its average return[9]. This index portfolio best predicts the monthly fluctuations in returns of the global fund[10]. The coefficient of each index represents the share of the index in the portfolio that best explains the real monthly returns of the global index. Take Vanguard's global fund as an example. The regression yields that:

Geometric Alpha	0.279	Pacific Stock Index	0.223
Arithmetic Alpha	0.273	Small Cap Index	0.071
T-Statistics	3.056	Total Stock Market	0.000
S&P 500	0.000	Value Index	0.436
Emerging Market	0.070	Variance of the Tracking Basket	18.303
Europe Stock Market	0.199	Variance of the Managed Fund	17.289
Extended Market	0.000	R^2	0.898
Growth Index	0.000		

Vanguard Global Equity Return = 0.070*Emerging Market Index Return + 0.199*Europe Index Return + 0.223*Pacific Index Return + 0.071*Small Cap Index Return +0.436*Value Index Return + 0.279

Therefore, the Vanguard global fund can be thought of as a fund that invests 7% rebalanced every month in the Emerging Market Index, 19.9% in the Europe Index, and so forth, except that it returns on average 0.279% more each month than the tracking index basket. Then, we calculate the geometric average continuously compounded rate of return as a percentage per year, denoted as G, for both the tracking index and each global fund. The formula is:

$G = 12*100*[\sum_{i=1:n} \ln(r_i+1)]/n = 12*100*g$

where,

r_i = rate of return of the month i

g = geometric average monthly return = $[\sum_{i=1:n} \ln(r_i+1)]/n$

[9] For a graphical presentation, please refer to Appendix E.
[10] This index portfolio does not have the highest correlation of returns with that of the global fund.

The Vanguard global fund yields a geometric average continuously compounded return of 8.45% per year, while the index basket yields a 4.79% return. Therefore, the Vanguard global fund wins by 3.66%.

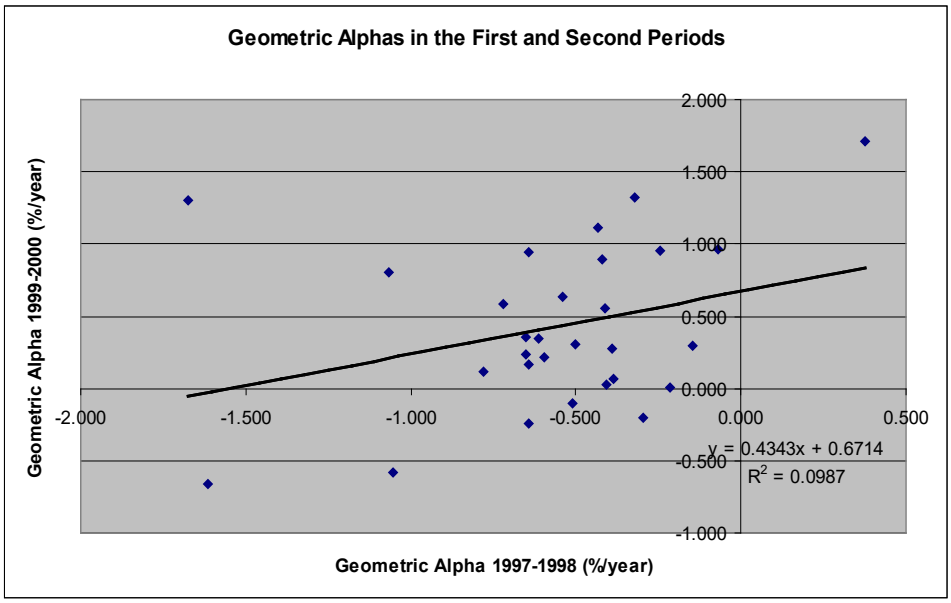
The standard deviations of the monthly returns for the Vanguard global fund and the index basket are 4.12% and 4.88% per month, respectively. Therefore, the tracking index has higher risk. We adjust the risk of the tracking index by adding a constant proportion of treasury bills to it and shrinking the equity in it by just enough to lower its standard deviation of return to 4.12%. This process also lowers the annual return of the index basket to 4.77% per year. Thus, the risk adjusted return differential in favor of the Vanguard global fund rises to 3.68%.

When we divide the 10-year period into two equally sized periods, the first 5-year period generates an annual continuously compounded return differential in favor of the Vanguard global fund of 0.327% per year, and the second half gives the return differential in favor of the global fund of 3.87% per year. The average is 2.10% per year, less than the 3.66% differential over the entire period. This implies that the global fund adjusts its investment style presciently in order to take advantage of the assets that are about to appreciate. Therefore, prescient style picking contributes to the superior performance of the global fund. We confirm this hypothesis by breaking the 10-year period into five equally sized periods, and comparing the average of the return differentials in the five periods with the return differential over the entire period for all global funds combined. We summarize the results in table as follows.

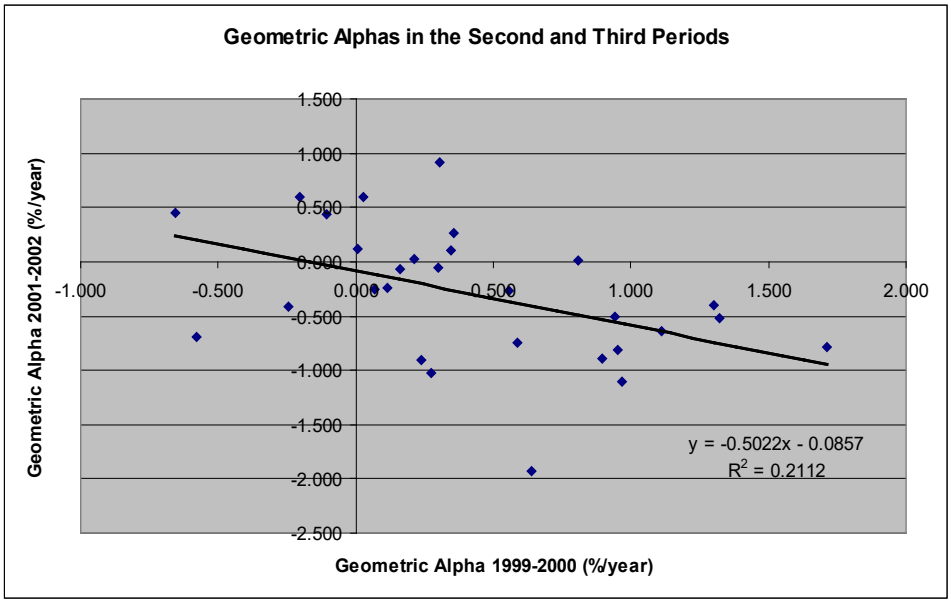
Geometric Alpha 1997-2006	-0.123
Geometric Alpha 1997-1998	-0.561
Geometric Alpha 1999-2000	0.428
Geometric Alpha 2001-2002	-0.301
Geometric Alpha 2003-2004	-0.230
Geometric Alpha 2005-2006	-0.093
Average Geometric Alpha over the 5 Periods	-0.151

Since the geometric alpha over the whole period from 1997 to 2006 (-0.123) is larger than the average geometric alpha over the 5 periods (-0.151), we confirm that global funds make style adjustment over time. Also, we expect the global funds to outperform indexes more in later periods than in earlier ones in general, because fund managers accumulate experience, move up the learning curve and improve their management skills over time. The tables in Appendixes F-K summarize the results in the entire ten-year period and each of the five two-year periods.

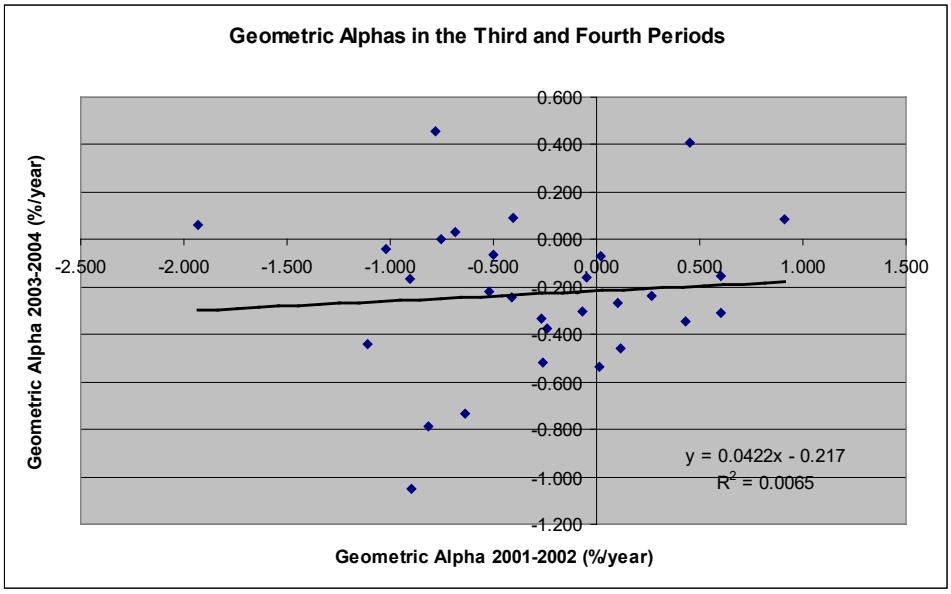
Moreover, we hope to examine whether the return differential of global funds and index funds in one period will predict that in the following period. To do so, we regress the geometric alpha of the first two-year period with of the second two-year period, and so forth; and then analyze whether there is a positive relationship between the two. The four graphs below summarize the results.

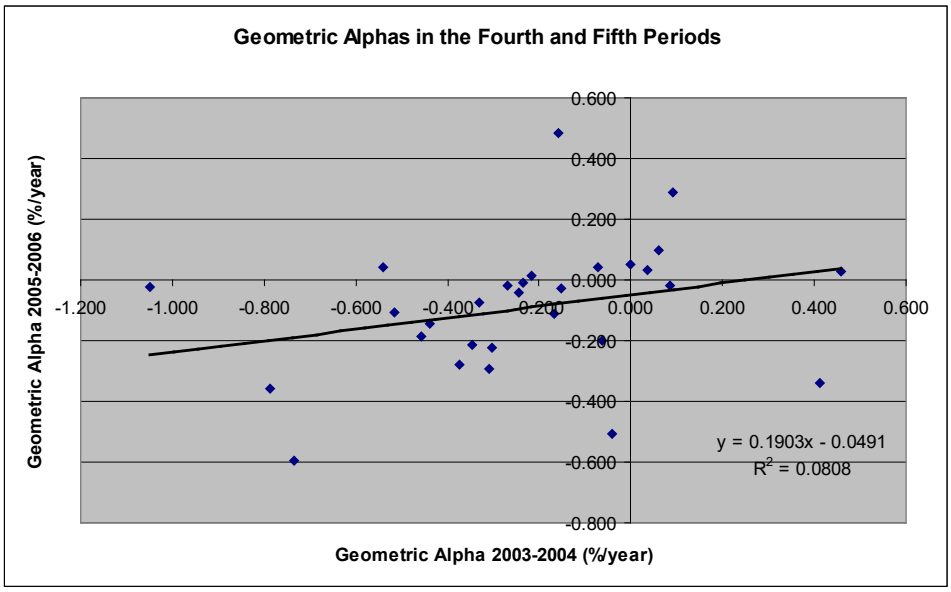


This graph illustrates a positive relationship between the geometric alpha of the first two-year period and that of the second two-year period. However, this relationship is not significant and does not explain much of the data points.



The second graph suggests a contradicting result – there is an insignificant negative relationship between the geometric alpha of the second period and that of the third period. This means, the geometric alphas are not necessarily predictable.

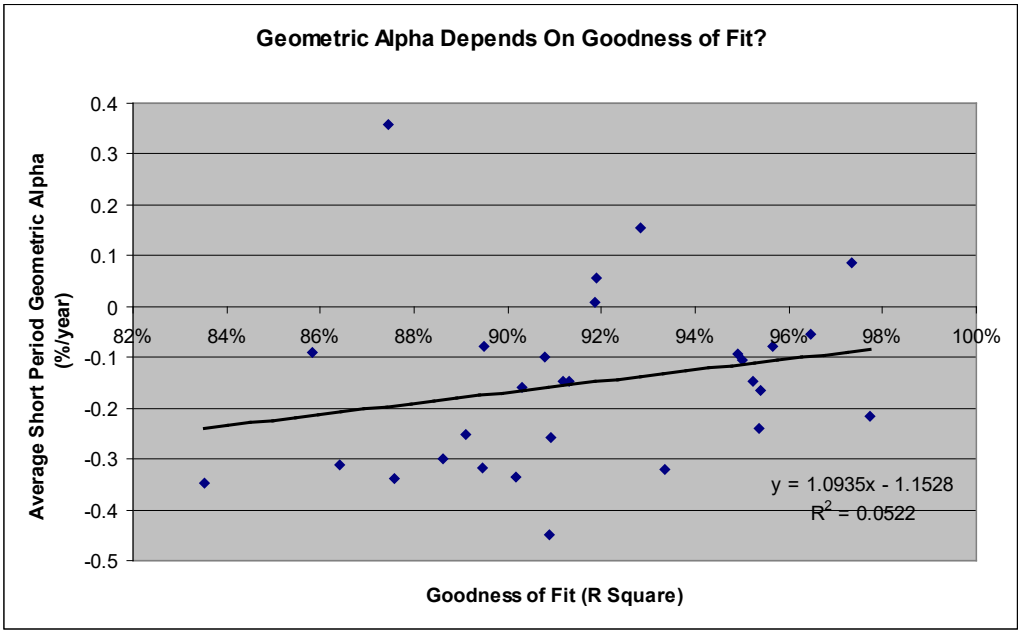




Both the third and fourth graphs show a positive but insignificant relationship between the geometric alpha in one period and that in the following period, which coincide with the first graph. Why did the geometric alphas in the second and third periods tell a different story from the rest of times? We notice that the movements of the stock market may have an impact on the results. During all sub-periods from 1997 to 2006, major stock markets around the globe kept rising except for the 2001-2002 period, which is the third period in our analysis. Therefore, when it moves from the second period (1999-2000) to the third one (2001-2002), the stock market reverses from positive to negative. This causes the negative relationship between the geometric alphas in the second and third period. Similarly, when it moves from the third period to the fourth one, the stock market changes its sign again from negative to positive. Although, the geometric alphas yield a positive relationship this time, it is the weakest among the three, as part of its relationship is offset by the stock market reversal. Further, we believe that: if the stock

market does not reverse, it is very likely that the return differential of a global fund and its index counterparts in one period predicts that in the following period.

Furthermore, we investigate whether there is a relationship between the geometric alpha and the goodness of fit. The plot below suggests an insignificant positive relationship between the two. This means, it is possible that the global funds that are more closely tracked by their index baskets are more likely to outperform the indexes. This conclusion is counterintuitive, as global funds always have higher expenses and turnovers than their index counterparts, and they also keep a portion of cash in the managed portfolios, which drags them from performing as well as the indexes that closely track them. Further research will be needed to discover the relationship between the geometric alpha and the goodness of fit, and to explain the counterintuitive conclusion we reached in this case.



Although on average, the global funds underperform their index counterparts due to higher expense ratios and turnovers, there are five global funds that outperform their tracking baskets over the past ten years. Not surprisingly, these funds have relatively low expenses and turnovers compared to their peers. They are very likely to keep the superior performances as long as they keep the expenses and turnovers low. If so, they will be good investment options for investors in the future. The table below summarizes the characteristics of these global funds.

Fund Name	Geometric Alpha	Arithmetic Alpha	T-Statistics	Variance of the Tracking Basket	Variance of the Managed Fund	R Square	Tracking Basket
Allianz RCM Gl Sm Cap C	0.436	0.538	2.428	32.977	54.930	0.803	0.92*Extd + 0.08*Pac
Vanguard Global Equity	0.279	0.273	3.056	18.303	17.289	0.898	0.07*EM + 0.199*Eur + 0.223*Pac + 0.071*SmCp + 0.436*Value
Evergreen Global Op C	0.078	0.130	0.717	30.131	41.829	0.826	0.005*EM+ 0.133*Eur + 0.637*Extd + 0.022*Pac + 0.203*SmCp
Security Global C	0.073	0.084	0.723	22.887	25.644	0.884	0.041*EM+ 0.346*Eur + 0.253*Extd +0.022*Gr+0.125*Pac+ 0.212*SmCp
T Rowe Price Glob Stock	0.045	0.049	0.882	19.648	20.315	0.966	0.063*EM + 0.366*Eur + 0.099*Extd + 0.262*Gr + 0.130*Pac

VI. Conclusion

By comparing the performances of 29 largest global funds with that of a basket of Vanguard indexes over the period from January 1997 to December 2006, we find that global funds have superior performance before expenses. Moreover, the average of the return differentials in favor of global funds in five periods is lower than the return differential over the entire 10-year period, implying fund managers' superior style-

picking skills. After expenses, the indexes win by 0.123%/year on average, because most global funds have high expense ratios (of up to 2 %.) However, low cost global funds, such as the Vanguard Global Equity, still outperform the tracking basket after expenses. Therefore, in general, investors do best by investing in a basket of global and domestic indexes. However, low-cost global funds are good investment options as well.

Appendix A: The List of 29 Global Funds

Fund Name	Percentage of Asset in Equity	Origination Year
Seligman Global Growth I	94.1	1995
Morgan Stanley Gl Div Gr C	93	1993
Lord Abbett Glob Equity C	92.6	1988
Phoenix Worldwide Strat C	92	1976
Seligman Global Sm Co I	91.7	1992
Vanguard Global Equity	91.7	1995
USAA World Growth	90.3	1992
Dreyfus Prem Worldwide Gr C	90.1	1993
ING Global Value Choice	90	1993
Allianz RCM Gl Sm Cap C	88.8	1997
Credit Swisse TR Gl Sm Cp	88.5	1996
GE Global Equity C	88.5	1993
First Inv Global A Lw	88.3	1981
Eaton Vance Global Gr C	87.8	1995
Evergreen Global Op C	87	1988
T Rowe Price Glob Stock	86.9	1996
Citizens Glob Equity Std	86.6	1994
AIM Global Growth C	86.4	1994
UBS Global Equity C	86.3	1994
Amer Funds Small World C	86.2	1990
MFS Global Growth C	86.1	1993
Janus Worldwide	85.2	1991
Oppenheimer Quest Int'l C	84.7	1990
Security Global C	82.9	1993
Templeton Glob Sm Co C	82.7	1981
MFS Global Equity C	82.4	1987
Harding Loe Uner Glob Eq	81.7	1996
Fidelity Worldwide	81.5	1990
Columbia Worldwide Equity C	80.3	1991

Appendix B: Data Sources

We collect data on Vanguard's global managed funds and index funds from the following three sources:

1. Morningstar Principia Database
2. CRSP Survivor-Bias Free US Mutual Fund Database
3. DataStream Database

The descriptions of the databases are as follows:

1. Morningstar Principia Database[11]

This database consists of eight modules that provide data on nearly 17,000 mutual fund share classes, 5,800 stocks, 4,700 separate accounts, 700 closed-end funds, and 42,000 variable annuity subaccounts, as of Dec. 31, 2004. The Mutual Fund Module also contains data on more than 150 Exchange Traded Funds, over 200 benchmark indexes, categories, and objectives, as well as over 150 data items for each of the 17,000 mutual funds. In addition, this module provides complete fund holdings details and NASD-reviewed investment and portfolio reports. The Mutual Fund Advanced Module offers additional information such as over 1,800 Mutual Fund Pages with critical commentary and additional historical information, archive of analyst and industry commentary and fund manager profiles, historical data with monthly returns dating back to 1970, load-, tax-, and inflation-adjusted returns, complete fee structure breakdowns and historical style, composition, and risk trends. This database is updated monthly or quarterly.

2. CRSP Survivor-Bias Free US Mutual Fund Database[12]:

This database provides information on open-ended mutual funds beginning at varying times between December 1961 and 2003. These funds are of all investment objectives, mainly equity funds, taxable and municipal bond funds, international funds and money market funds. The database includes a history of each mutual fund's name, investment style, fee structure, holdings, asset allocation, monthly total returns, monthly total net assets, monthly/daily net asset values, and dividends. Also, it provides schedules of rear and front load fees, asset class codes, and management company contact information. The database is updated quarterly and distributed with a quarterly lag. It is delivered in ASCII and SAS formats. Its data is based on the Standard & Poor's® Fund Services® Database.

3. DataStream Database[13]:

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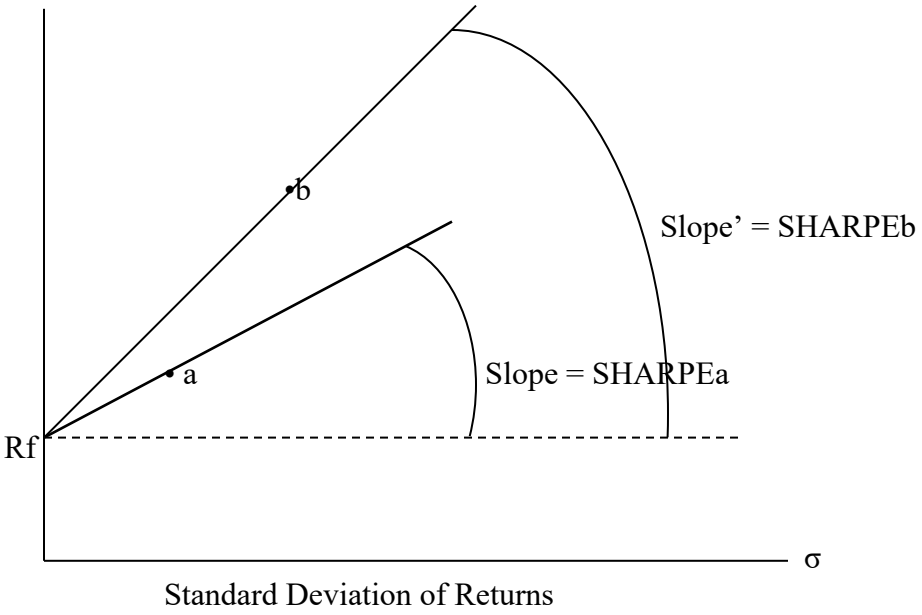
[11] The description given here is based on the information about Morningstar Principia Database that is retrieved October 18, 2006, from http://corporate.morningstar.com/us/asp/subject.aspx?xmlfile=41.xml

[12] The description given here is based on the information from CRSP Survivor-Bias-Free US Mutual Fund Database Guide, Version CA292.200601, by the Center for Research in Security Prices (CRSP), Graduate School of Business, University of Chicago. Retrieved October 18, 2006, from http://wrds.wharton.upenn.edu/support/docs/crsp/mutual_funds_guide_200602.pdf

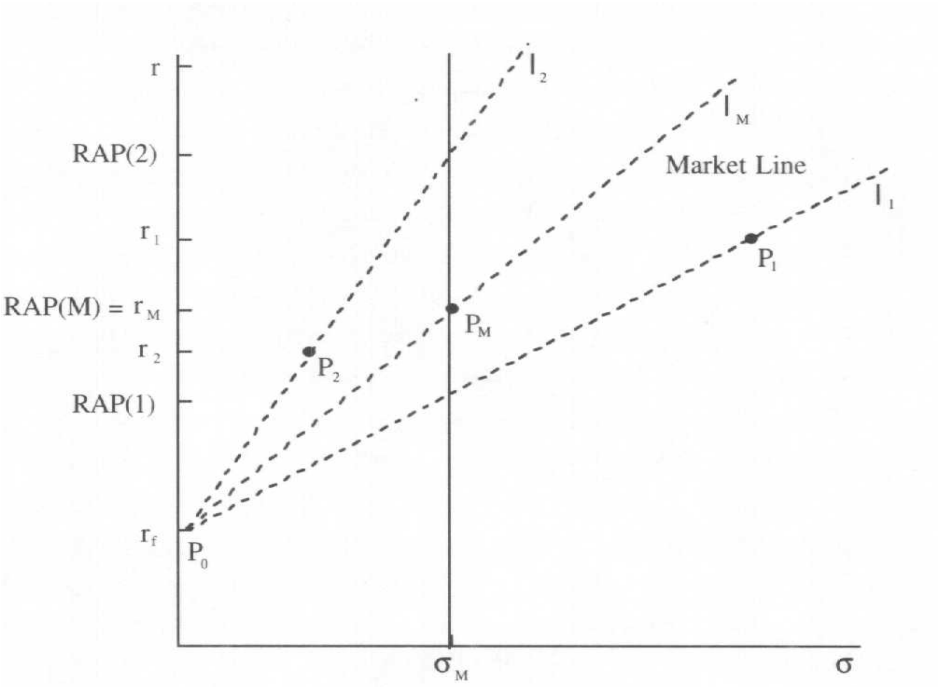
This database contains an enormous number of economic, company and financial data. It has approximately 84000 data series on bond, 1632 series on commodities, more than 175000 series on economic indicators, approximately 104000 series on equity, and 15678 series on warrant, as of January 1999. It also contains information about futures/options, indices, interest/exchange rates and mutual funds. Its mutual fund data is under investment trusts and unit trusts. This data includes price information (Net Asset Value) for open-end mutual funds. Also, this database treats closed-end mutual funds as regular stocks. In total, it covers 198 markets, 96 different countries and 22 different composite geographic areas.

[13] Information about the DataStream Database is retrieved on October 18, 2006, from the following websites:
http://www.caf.dk/cafonly/databases/Datastream.html
http://www.library.hbs.edu/helpsheets/datastreamdetail.html

Appendix C: SHARPE Index of Portfolio Performance for Fund a and b



Appendix D[14]:



Legend:

y-axis: r = return; x-axis: σ = standard deviation = risk.

P_0 = a portfolio of risk-free assets with the risk-free rate of return, r_f;

P_i = portfolio i with total return r_i, risk σ_i, and risk-adjusted performance RAP(i); where:

P_M = the market portfolio;

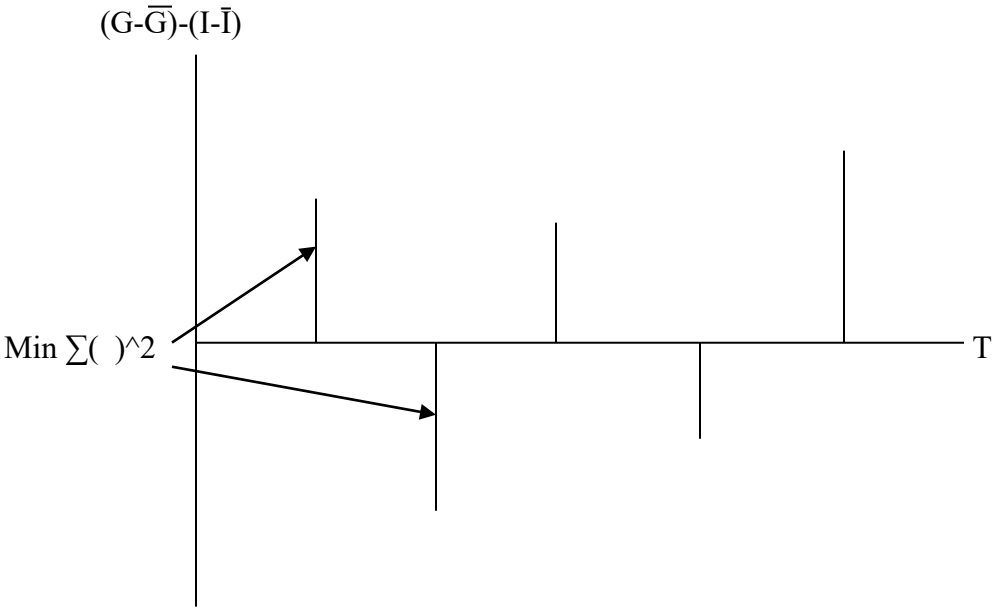
P_1 = portfolio 1;

P_2 = portfolio 2; and

RAP(i) = the risk-adjusted performance of portfolio i.

[14] Graph is taken from "Risk-Adjusted Performance—How to Measure it and Why" (1997) by Franco Modigliani and Leah Modigliani, from P49 of the Journal of Portfolio Management.

Appendix E:



Appendix F: Summary Result for 10-years Data (Jan 1997 - Dec 2006)

Managed Fund	Geometric a (%/yr)	Arithmetic a (%/yr)	t-stat	SP500 (%)	Emerging Market (%)	Europe Stock (%)	Extended Market (%)	Growth (%)	Pacific Stock (%)	Small Cap (%)	Total Stock (%)	Value (%)	Var Track B (%/mo)	Var Man Fund (%/mo)	R^2 (%)
AIM Gl Gr	-0.30	-0.27	-2.50	0	0	31	44	19	7	0	0	0	23.03	27.30	90
Allianz Gl SmCp	0.44	0.54	2.43	0	0	0	92	0	8	0	0	0	32.98	54.93	80
Amer Sm World	-0.07	-0.04	-0.39	0	6	4	69	0	6	16	0	0	31.63	36.31	92
Citizens Gl Eq	-0.22	-0.19	-1.16	0	0	39	37	23	2	0	0	0	22.48	30.16	81
Columbia WW	-0.30	-0.31	-2.65	29	0	32	27	0	4	0	0	8	20.15	18.05	83
CS Gl SmCp	-0.32	-0.24	-1.47	0	0	0	97	3	0	0	0	0	34.89	50.01	88
Dreyfus WW Gr	-0.14	-0.14	-2.01	62	0	33	0	2	3	0	0	0	18.27	17.35	94
Eaton Vance Gl Gr	-0.04	-0.01	-0.10	0	2	23	48	17	11	0	0	0	23.75	28.87	87
Evergreen Gl Op	0.08	0.13	0.72	0	1	13	64	0	2	20	0	0	30.13	41.83	83
Fidelity WW	-0.06	-0.06	-0.77	0	7	40	0	13	11	19	0	11	19.73	20.22	94
First Inv Gl A	-0.24	-0.24	-4.75	0	5	43	2	13	11	3	24	0	19.23	19.39	97
GE Gl Eq	-0.23	-0.23	-2.88	20	9	48	0	11	11	2	0	0	19.38	20.32	93
Harding Loe Uner	-0.14	-0.14	-1.74	0	10	32	4	12	12	9	0	21	19.71	19.17	92
ING Gl Valu Choice	-0.09	-0.05	-0.34	0	0	28	44	20	8	0	0	0	23.02	32.16	86
Janus WW	-0.20	-0.17	-1.20	0	0	34	36	24	6	0	0	0	22.16	27.78	84
Lord Abbett Gl Eq	-0.40	-0.41	-3.31	0	0	50	18	1	13	0	18	0	19.74	17.91	81
MFS Gl Eq	-0.04	-0.06	-0.69	36	0	40	0	0	12	10	0	2	17.95	14.78	90
MFS Gl Gr	-0.13	-0.11	-0.95	0	6	27	48	14	5	0	0	0	24.67	29.73	90
Morgan Gl Div Gr	-0.13	-0.13	-1.61	0	0	39	0	0	16	0	0	45	17.32	16.63	91
Oppenheimer Int'l	0.00	-0.01	-0.10	0	0	32	0	0	16	0	0	52	17.27	14.76	86
Phoenix WW Strat	-0.19	-0.19	-2.55	0	0	52	0	0	7	7	17	17	18.46	17.81	93
Securiity Gl	0.07	0.08	0.72	0	4	35	25	2	13	21	0	0	22.89	25.64	88
Seligman Gl Gr I	-0.35	-0.33	-2.81	0	1	29	38	24	8	0	0	0	22.39	26.36	88
Seligman Gl Sm Co	-0.32	-0.31	-2.53	0	0	21	33	0	13	34	0	0	25.12	27.84	88
T Rowe Price Gl	0.05	0.05	0.88	0	6	37	10	26	13	0	0	0	19.65	20.32	97
Templeton Gl Sm	-0.18	-0.18	-1.25	0	15	28	0	0	9	28	0	20	21.88	21.30	79
UBS Gl Eq	-0.24	-0.26	-3.27	1	0	42	0	0	12	3	0	42	17.55	14.30	91
USAA World Gr	-0.15	-0.15	-2.12	27	2	40	17	3	12	0	0	0	19.31	18.76	94
Vanguard Gl Eq	0.28	0.27	3.06	0	7	20	0	0	22	7	0	44	18.30	17.29	90

Appendix G: Summary Result for First Two Years (Jan 1997 - Dec 1998)

Managed Fund	Geometric a (%/yr)	Arithmetic a (%/yr)	t-stat	SP500 (%)	Emerging Market (%)	Europe Stock (%)	Extended Market (%)	Growth (%)	Pacific Stock (%)	Small Cap (%)	Total Stock (%)	Value (%)	Var Track B (%/mo)	Var Man Fund (%/mo)	R^2 (%)
AIM Gl Gr	-0.65	-0.64	-5.74	0	4	48	21	28	0	0	0	0	25.13	27.44	96
Allianz Gl SmCp	0.38	0.49	1.61	0	3	24	38	0	0	35	0	0	33.35	55.36	85
Amer Sm World	-0.72	-0.71	-8.83	0	0	26	18	0	5	51	0	0	31.19	32.18	98
Citizens Gl Eq	-0.25	-0.21	-0.99	0	2	55	0	40	3	0	0	0	23.27	30.09	86
Columbia WW	-0.65	-0.66	-3.36	56	0	30	2	0	0	0	0	12	24.38	20.99	83
CS Gl SmCp	-0.54	-0.46	-2.24	0	0	0	100	0	0	0	0	0	40.93	58.04	93
Dreyfus WW Gr	-0.22	-0.21	-2.83	0	6	40	0	43	0	0	0	11	25.50	26.15	98
Eaton Vance Gl Gr	-0.43	-0.44	-2.99	0	0	27	50	24	0	0	0	0	28.56	27.22	93
Evergreen Gl Op	-1.67	-1.66	-8.38	0	0	55	23	0	0	23	0	0	26.21	29.43	88
Fidelity WW	-0.65	-0.62	-4.61	0	11	64	16	0	0	9	0	0	28.06	33.35	95
First Inv Gl A	-0.64	-0.63	-7.92	0	6	56	4	7	7	0	20	0	25.21	27.09	98
GE Gl Eq	-0.41	-0.39	-3.06	0	13	61	21	0	6	0	0	0	28.62	33.66	96
Harding Loe Uner	-1.07	-1.07	-12.72	0	2	36	0	0	7	6	0	50	24.90	24.94	97
ING Gl Valu Choice	-0.07	-0.02	-0.07	0	0	41	32	27	0	0	0	0	25.34	36.42	88
Janus WW	-0.42	-0.40	-2.85	0	0	71	5	25	0	0	0	0	22.84	26.39	93
Lord Abbett Gl Eq	-0.78	-0.76	-5.55	0	2	53	0	8	17	0	0	20	24.12	27.32	94
MFS Gl Eq	-0.41	-0.41	-4.57	27	2	36	0	0	5	14	0	17	25.01	24.31	97
MFS Gl Gr	-0.64	-0.61	-4.60	0	9	31	41	20	0	0	0	0	30.18	36.23	95
Morgan Gl Div Gr	-0.30	-0.31	-3.67	0	0	35	0	0	22	0	0	42	24.50	21.66	97
Oppenheimer Int'l	-0.61	-0.62	-5.09	0	0	36	0	0	6	2	0	57	24.14	22.92	94
Phoenix WW Strat	-0.38	-0.37	-2.82	0	2	63	15	21	0	0	0	0	23.80	26.84	94
Securiity Gl	-0.32	-0.34	-1.92	13	5	40	19	0	15	2	0	7	26.52	24.14	88
Seligman Gl Gr I	-0.39	-0.38	-3.06	0	4	52	20	18	6	0	0	0	25.13	27.44	95
Seligman Gl Sm Co	-1.05	-1.06	-5.09	0	0	50	0	0	0	50	0	0	26.78	25.08	84
T Rowe Price Gl	-0.14	-0.14	-4.76	3	5	42	10	25	16	0	0	0	25.54	26.16	100
Templeton Gl Sm	-1.61	-1.63	-8.16	0	5	49	0	0	0	42	0	4	27.77	24.67	85
UBS Gl Eq	-0.51	-0.55	-4.51	0	0	45	0	0	14	5	0	35	23.75	15.64	91
USAA World Gr	-0.60	-0.59	-5.26	0	7	48	34	7	3	0	0	0	27.82	29.51	96
Vanguard Gl Eq	-0.50	-0.51	-4.95	0	2	36	0	0	16	16	0	30	25.55	23.69	96

Appendix H: Summary Result for Second Two Years (Jan 1999 - Dec 2000)

Managed Fund	Geometric a (%/yr)	Arithmetic a (%/yr)	t-stat	SP500 (%)	Emerging Market (%)	Europe Stock (%)	Extended Market (%)	Growth (%)	Pacific Stock (%)	Small Cap (%)	Total Stock (%)	Value (%)	Var Track B (%/mo)	Var Man Fund (%/mo)	R^2 (%)
AIM Gl Gr	0.24	0.29	1.98	0	0	11	59	30	0	0	0	0	41.44	53.31	92
Allianz Gl SmCp	1.71	2.03	4.99	0	0	0	100	0	0	0	0	0	66.25	139.77	76
Amer Sm World	0.59	0.63	3.70	0	0	0	69	0	1	30	0	0	57.94	66.64	91
Citizens Gl Eq	0.95	1.04	3.77	0	0	22	61	17	0	0	0	0	39.95	61.12	75
Columbia WW	-0.24	-0.21	-1.34	17	0	21	42	0	0	0	0	20	24.13	30.49	83
CS Gl SmCp	0.64	0.81	3.01	0	0	0	89	11	0	0	0	0	59.30	96.48	85
Dreyfus WW Gr	0.01	0.00	-0.03	2	0	32	0	38	0	0	0	28	16.18	14.16	89
Eaton Vance Gl Gr	1.11	1.17	5.71	0	8	7	32	15	22	16	0	0	34.09	47.79	82
Evergreen Gl Op	1.30	1.47	5.43	0	0	0	65	0	0	36	0	0	57.57	97.16	85
Fidelity WW	0.36	0.35	5.73	0	0	42	0	24	9	17	0	8	17.47	16.32	95
First Inv Gl A	0.16	0.17	3.48	0	6	40	0	18	11	10	15	0	19.14	19.86	98
GE Gl Eq	0.56	0.57	5.86	8	0	54	0	26	8	4	0	0	17.32	19.26	90
Harding Loe Uner	0.81	0.82	7.58	24	21	32	0	0	6	10	0	7	18.58	20.80	89
ING Gl Valu Choice	0.97	1.04	5.08	0	15	1	55	29	0	0	0	0	44.25	62.56	86
Janus WW	0.90	0.94	4.51	0	0	13	46	35	0	7	0	0	37.13	48.25	82
Lord Abbett Gl Eq	0.11	0.11	0.55	0	0	42	21	8	0	20	0	9	23.16	22.24	64
MFS Gl Eq	0.03	0.03	0.22	26	0	52	0	8	7	7	0	0	15.46	15.31	81
MFS Gl Gr	0.94	1.03	4.86	0	0	28	57	15	0	0	0	0	37.16	57.55	84
Morgan Gl Div Gr	-0.20	-0.19	-1.46	0	0	45	0	0	9	0	0	46	12.01	14.39	76
Oppenheimer Int'l	0.35	0.34	2.99	0	0	29	0	0	16	0	0	56	12.93	12.37	78
Phoenix WW Strat	0.07	0.07	1.07	0	0	52	0	0	6	10	14	19	13.88	13.17	94
Securiity Gl	1.32	1.35	7.87	0	0	36	23	4	3	35	0	0	29.97	38.30	84
Seligman Gl Gr I	0.27	0.28	1.65	0	5	17	40	30	5	3	0	0	33.76	34.06	83
Seligman Gl Sm Co	-0.58	-0.56	-3.89	0	0	1	19	0	14	66	0	0	41.49	45.52	91
T Rowe Price Gl	0.30	0.30	6.96	24	3	36	12	14	11	1	0	0	19.34	18.89	98
Templeton Gl Sm	-0.66	-0.67	-4.55	0	11	33	0	0	12	18	0	27	15.84	13.83	69
UBS Gl Eq	-0.11	-0.11	-0.94	0	0	53	0	0	10	0	0	37	11.96	11.74	78
USAA World Gr	0.21	0.21	3.35	16	1	35	0	20	11	16	0	0	18.55	18.58	96
Vanguard Gl Eq	0.30	0.30	3.18	0	6	24	0	0	22	0	0	49	14.19	13.95	87

Appendix I: Summary Result for Third Two Years (Jan 2001 - Dec 2002)

Managed Fund	Geometric a (%/yr)	Arithmetic a (%/yr)	t-stat	SP500 (%)	Emerging Market (%)	Europe Stock (%)	Extended Market (%)	Growth (%)	Pacific Stock (%)	Small Cap (%)	Total Stock (%)	Value (%)	Var Track B (%/mo)	Var Man Fund (%/mo)	R^2 (%)
AIM Gl Gr	-0.90	-0.89	-6.60	0	0	38	37	19	6	0	0	0	33.23	34.91	92
Allianz Gl SmCp	-0.78	-0.75	-6.88	0	0	0	82	0	18	0	0	0	37.31	43.01	96
Amer Sm World	-0.75	-0.72	-6.86	0	6	0	88	0	0	6	0	0	44.52	50.57	96
Citizens Gl Eq	-0.81	-0.80	-8.66	0	2	40	17	40	2	0	0	0	33.10	36.54	96
Columbia WW	-0.41	-0.44	-3.41	0	0	34	0	18	30	0	5	13	25.25	18.84	85
CS Gl SmCp	-1.93	-1.88	-16.47	0	12	11	74	0	0	4	0	0	42.59	52.09	96
Dreyfus WW Gr	0.12	0.12	1.80	27	0	32	0	27	14	0	0	0	28.43	28.29	98
Eaton Vance Gl Gr	-0.64	-0.62	-5.37	24	13	3	23	20	18	0	0	0	31.24	35.20	94
Evergreen Gl Op	-0.40	-0.37	-2.70	0	0	8	72	0	6	14	0	0	39.68	46.13	94
Fidelity WW	0.27	0.27	4.00	39	0	15	0	7	15	24	0	0	29.03	29.44	97
First Inv Gl A	-0.07	-0.07	-1.55	60	0	29	0	1	8	2	0	0	29.74	30.70	99
GE Gl Eq	-0.26	-0.28	-5.15	49	5	34	0	0	9	0	0	3	29.95	27.46	98
Harding Loe Uner	0.02	0.01	0.17	0	1	35	0	17	10	1	37	0	29.67	28.54	98
ING Gl Valu Choice	-1.11	-1.08	-11.17	0	0	35	23	30	13	0	0	0	30.40	36.27	96
Janus WW	-0.90	-0.87	-9.25	23	6	11	34	19	8	0	0	0	33.75	38.15	96
Lord Abbett Gl Eq	-0.24	-0.27	-2.12	0	0	42	0	34	19	5	0	0	27.76	21.36	87
MFS Gl Eq	0.60	0.57	6.08	12	0	35	0	16	32	5	0	0	25.05	18.37	92
MFS Gl Gr	-0.50	-0.50	-9.53	0	10	17	32	25	16	0	0	0	32.30	33.43	99
Morgan Gl Div Gr	0.60	0.60	6.93	0	9	41	0	0	15	0	0	35	29.58	29.81	96
Oppenheimer Int'l	0.10	0.06	0.37	6	0	28	0	0	26	0	0	40	26.12	15.91	77
Phoenix WW Strat	-0.26	-0.28	-2.92	0	0	46	0	0	23	4	0	27	27.31	24.12	94
Securiity Gl	-0.52	-0.50	-5.54	4	5	16	9	19	15	33	0	0	31.46	35.98	96
Seligman Gl Gr I	-1.02	-1.00	-9.67	2	0	21	28	40	1	8	0	0	34.75	39.64	96
Seligman Gl Sm Co	-0.69	-0.68	-6.84	0	5	11	56	0	22	7	0	0	34.02	36.75	96
T Rowe Price Gl	-0.05	-0.05	-1.15	0	0	37	12	28	8	0	0	16	30.56	31.31	99
Templeton Gl Sm	0.45	0.46	2.50	0	36	8	0	0	30	26	0	0	33.54	34.72	84
UBS Gl Eq	0.43	0.42	5.87	0	1	36	0	12	7	0	0	44	30.01	27.37	97
USAA World Gr	0.02	0.02	0.36	0	4	33	18	26	19	0	0	0	29.16	29.20	98
Vanguard Gl Eq	0.91	0.92	6.92	0	11	9	0	0	29	16	0	35	27.66	28.54	90

Appendix J: Summary Result for Fourth Two Years (Jan 2003 - Dec 2004)

Managed Fund	Geometric a (%/yr)	Arithmetic a (%/yr)	t-stat	SP500 (%)	Emerging Market (%)	Europe Stock (%)	Extended Market (%)	Growth (%)	Pacific Stock (%)	Small Cap (%)	Total Stock (%)	Value (%)	Var Track B (%/mo)	Var Man Fund (%/mo)	R^2 (%)
AIM Gl Gr	-0.17	-0.18	-2.76	0	0	25	11	48	14	0	3	0	9.39	7.84	92
Allianz Gl SmCp	0.46	0.47	4.56	0	0	5	28	2	28	36	0	0	13.09	15.33	90
Amer Sm World	0.00	0.01	0.10	0	15	3	77	0	5	0	0	0	14.39	15.88	95
Citizens Gl Eq	-0.79	-0.79	-12.81	0	0	34	0	44	7	4	0	10	10.39	10.57	95
Columbia WW	-0.24	-0.25	-6.33	28	4	10	0	15	8	2	35	0	9.09	8.93	97
CS Gl SmCp	0.06	0.10	0.73	0	0	11	40	0	7	43	0	0	14.98	22.83	88
Dreyfus WW Gr	-0.46	-0.46	-5.62	73	0	25	0	0	0	0	0	2	10.39	9.69	90
Eaton Vance Gl Gr	-0.74	-0.73	-8.23	0	0	30	2	0	9	59	0	0	14.85	16.28	93
Evergreen Gl Op	0.09	0.10	1.11	0	20	0	29	0	0	51	0	0	16.38	18.92	93
Fidelity WW	-0.24	-0.23	-6.36	0	9	24	20	7	14	0	0	27	11.68	12.53	98
First Inv Gl A	-0.30	-0.30	-8.20	24	0	36	0	19	12	9	0	0	10.76	10.90	98
GE Gl Eq	-0.33	-0.33	-6.56	61	1	31	0	0	7	0	0	0	10.38	10.19	96
Harding Loe Uner	-0.54	-0.53	-8.95	22	16	17	16	17	12	0	0	0	10.67	11.57	95
ING Gl Valu Choice	-0.44	-0.44	-8.85	6	4	18	0	22	21	0	0	30	9.49	8.66	96
Janus WW	-1.05	-1.05	-11.77	0	16	23	11	0	21	0	0	29	11.94	12.68	91
Lord Abbett Gl Eq	-0.37	-0.38	-5.32	29	0	26	0	13	12	0	0	19	10.00	9.29	92
MFS Gl Eq	-0.15	-0.16	-3.00	44	0	40	0	7	9	0	0	0	11.02	9.79	96
MFS Gl Gr	-0.06	-0.06	-2.02	0	0	32	10	36	15	0	7	0	10.02	10.63	99
Morgan Gl Div Gr	-0.31	-0.31	-4.85	18	0	50	0	0	15	0	0	16	12.30	11.94	95
Oppenheimer Int'l	-0.27	-0.27	-4.15	0	0	51	3	0	15	0	31	0	12.23	11.40	94
Phoenix WW Strat	-0.52	-0.51	-8.38	0	2	32	0	2	13	18	0	33	12.38	13.63	96
Securiity Gl	-0.22	-0.20	-2.89	0	15	36	35	0	15	0	0	0	13.51	16.21	95
Seligman Gl Gr I	-0.04	-0.03	-0.26	0	0	10	0	41	8	41	0	0	11.26	13.27	85
Seligman Gl Sm Co	0.03	0.04	0.43	0	14	0	0	13	17	55	0	0	13.50	14.71	92
T Rowe Price Gl	-0.16	-0.16	-3.90	0	0	32	3	29	13	0	0	24	10.35	10.27	98
Templeton Gl Sm	0.41	0.43	3.84	0	21	18	23	0	1	20	0	18	14.36	18.35	90
UBS Gl Eq	-0.35	-0.35	-7.37	26	0	37	0	0	12	0	0	25	11.45	11.04	97
USAA World Gr	-0.07	-0.08	-1.55	48	0	39	0	4	9	0	0	0	10.93	9.78	96
Vanguard Gl Eq	0.09	0.09	1.24	0	13	27	27	0	18	0	2	13	12.49	11.88	94

Appendix K: Summary Result for Fifth Two Years (Jan 2005 - Dec 2006)

Managed Fund	Geometric a (%/yr)	Arithmetic a (%/yr)	t-stat	SP500 (%)	Emerging Market (%)	Europe Stock (%)	Extended Market (%)	Growth (%)	Pacific Stock (%)	Small Cap (%)	Total Stock (%)	Value (%)	Var Track B (%/mo)	Var Man Fund (%/mo)	R^2 (%)
AIM Gl Gr	-0.11	-0.11	-2.13	0	6	42	14	6	13	0	21	0	6.85	7.12	95
Allianz Gl SmCp	0.03	0.04	0.40	0	24	9	22	0	18	27	0	0	12.11	15.41	91
Amer Sm World	0.05	0.06	0.85	0	23	16	0	0	13	49	0	0	12.26	12.87	96
Citizens Gl Eq	-0.36	-0.36	-6.80	0	0	33	17	11	19	0	0	21	5.78	5.77	94
Columbia WW	-0.04	-0.04	-1.36	18	4	27	0	13	17	0	0	22	5.33	5.26	98
CS Gl SmCp	0.10	0.11	1.00	0	0	0	23	0	28	49	0	0	9.93	12.11	88
Dreyfus WW Gr	-0.19	-0.19	-2.31	0	0	21	0	0	0	0	0	79	4.40	4.52	83
Eaton Vance Gl Gr	-0.59	-0.58	-6.72	0	18	33	0	0	10	40	0	0	10.83	13.32	93
Evergreen Gl Op	0.29	0.30	2.66	0	15	9	0	0	33	44	0	0	10.78	13.23	89
Fidelity WW	-0.01	-0.01	-0.15	0	14	22	8	36	19	0	0	2	7.51	8.32	96
First Inv Gl A	-0.23	-0.23	-5.11	0	2	31	14	13	15	0	0	23	5.84	5.70	96
GE Gl Eq	-0.07	-0.07	-1.22	0	9	34	8	23	26	0	0	0	7.37	7.70	95
Harding Loe Uner	0.04	0.04	0.99	0	6	20	0	4	31	21	0	19	7.37	7.20	97
ING Gl Valu Choice	-0.14	-0.14	-1.46	0	5	47	23	9	16	0	0	0	7.40	7.91	85
Janus WW	-0.02	-0.01	-0.12	0	0	26	0	59	15	0	0	0	5.41	7.62	82
Lord Abbett Gl Eq	-0.28	-0.28	-5.92	36	3	43	0	4	15	0	0	0	5.63	5.95	96
MFS Gl Eq	-0.03	-0.03	-0.61	51	0	44	0	0	5	0	0	0	4.98	4.22	93
MFS Gl Gr	-0.20	-0.20	-4.81	0	9	29	0	39	16	7	0	0	6.92	7.55	97
Morgan Gl Div Gr	-0.29	-0.29	-4.91	7	0	34	0	0	13	0	0	46	4.91	4.72	91
Oppenheimer Int'l	-0.02	-0.02	-0.17	0	0	60	0	0	19	5	0	15	6.46	7.23	85
Phoenix WW Strat	-0.10	-0.10	-3.64	27	0	40	0	9	18	6	0	0	5.62	5.98	98
Securiity Gl	0.01	0.02	0.34	0	7	12	21	34	21	5	0	0	7.44	8.65	95
Seligman Gl Gr I	-0.51	-0.50	-3.57	0	3	9	47	15	25	0	0	0	7.91	10.81	79
Seligman Gl Sm Co	0.03	0.04	0.47	0	14	25	0	0	12	49	0	0	10.72	12.27	92
T Rowe Price Gl	0.49	0.49	5.84	0	22	0	30	28	20	0	0	0	9.93	10.76	92
Templeton Gl Sm	-0.34	-0.33	-3.41	0	16	54	0	0	1	28	0	0	9.96	11.55	90
UBS Gl Eq	-0.21	-0.22	-4.42	43	0	17	0	0	17	0	0	22	4.51	4.19	93
USAA World Gr	0.04	0.04	0.75	51	0	43	0	0	6	0	0	0	4.95	4.03	93
Vanguard Gl Eq	-0.02	-0.02	-0.44	0	9	31	0	0	16	19	0	25	7.45	7.74	97

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