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THE EFFICIENCY OF INTERNATIONAL MUTUAL FUNDS: AN EMPIRICAL INVESTIGATION

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ABSTRACT

THE EFFICIENCY OF INTERNATIONAL MUTUAL FUNDS: AN EMPIRICAL INVESTIGATION

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This dissertation tests the performance of actively managed international mutual funds against several global benchmarks that represent viable alternative investment strategies. Since open-end mutual funds cannot generally be sold short, investors can only profit from superior performance. Two-sided joint tests used in previous studies reject the null hypothesis too often because both superior and inferior performance contribute to rejection. I apply a one-sided multivariate test which recognizes the short-sale restriction to evaluate joint fund performance.

I find that the MSCI world index is not mean-variance efficient compared to 12 unmanaged country equity indices during the January 1985-March 1994 period. Even though the 35 international equity funds jointly outperform the MSCI world index, beating an inefficient benchmark does not imply managers

have superior investment skills. I use a 3-region equity benchmark to test their abilities to select securities and/or identify outperforming countries outside the U.S. and Japan. Then I use a 12-country equity benchmark to isolate managers' security selectivity ability. I do not find any evidence of security or country selectivity abilities. However, the funds outperform the Wilshire 5000 index, confirming that a passive U.S. investor can benefit by adding international equity funds to their domestic portfolio. I use the SB World Government Bond index as the benchmark for evaluating 18 international bond funds from January 1989-March 1994. The SB world bond index is mean-variance efficient versus 11 unmanaged country bond indices and again I find no evidence of superior performance among fund managers. Surprisingly, the international bond funds cannot beat the SB Broad™ Index, implying that adding these funds to a diversified domestic bond portfolio over my sample period does not lead to a higher Sharpe ratio.

I examine the effects of currency hedging in fund performance using three forward contracts, Deutschemark, Japanese Yen, and Canadian Dollar. My qualitative conclusions remain the same when the forward contracts are added to the benchmarks to control for hedging activities. I also compute the robust Positive Period Weight and the Treynor-Mazuy measures and they are very

similar to the Jensen measures for the same benchmark, confirming that my conclusions are not affected by nonlinearity in fund returns or timing activities of managers.

To my parents for their love, trust and support.

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1. Introduction

Many researchers (Solnik (1974), Eun and Resnick (1984) and Grauer and Hakansson (1987)) have documented the benefits of a globally diversified portfolio, yet only recently have U.S. investors become interested in investing overseas. International mutual funds provide U.S. investors easy access to investment opportunities abroad without direct dealings with foreign markets. With total assets increasing from $3.5 billion in 1985 to $108.9 billion in 1993, international equity funds represent one of the fastest growing segments of the industry (*Wiesenberger Investment Companies Yearbook*). Since global investment has gained popularity only in recent times, relatively few international funds operated long enough to be included in previous performance studies. Cumby and Glen (1990) and Eun, Kolodny and Resnick (1991) evaluate 15 and 13 equity funds respectively and there exists no rigorous study on the performance of international bond funds.

This dissertation fills this gap by empirically estimating the value provided by active international fund management. In addition, it makes several contributions to the mutual fund evaluation literature. First, I take into account the practical prohibition against short selling open-end funds when testing joint fund performance. Traditionally, mutual fund studies (Ippolito 1992) focus on

the performance of individual funds. However, simply measuring individual fund performance does not provide any insight on the optimal investment strategy for a passive investor. Out of a sample of 30 to 50 funds, one would expect to find a few funds exhibiting significant performance purely by chance. To conclude that active management adds value to a passive indexing strategy, the funds must jointly outperform the benchmark index. Cumby and Glen (1990) test the joint performance of their funds using a chi-square test. Their approach is asymptotically equivalent to the mean-variance test of Gibbons, Ross and Shanken (GRS, 1989). The GRS test rejects benchmark efficiency if adding mutual funds in unrestricted proportions to the benchmark produces a significant increase in the Sharpe (1966) ratio. Since open-end mutual funds cannot generally be sold short by investors, I incorporate a short-sale constraint into the GRS test. The short-sale constrained test rejects benchmark efficiency less frequently than the GRS test because underperforming funds no longer contribute to a higher Sharpe ratio. Investors cannot profit from inferior performance under the short-sale restriction because 1) portfolio holdings of mutual funds are not available in a timely manner, and 2) inferior performance may result from excessive operating expenses or management fees.

Secondly, I estimate transaction costs for the indexing strategies and account for them explicitly in the performance tests. Mutual fund returns are reported net of operating expenses. When evaluating fund performance, previous studies use total return on a benchmark which do not include the transaction costs involved to invest in the benchmark. Ignoring transaction costs of the indexing strategy creates a bias against the mutual funds.

Even if funds do not jointly outperform the benchmark index, investors can still profit if they can identify funds that beat the benchmark consistently. I test for performance persistence using the methodology of Grinblatt and Titman (1992).

The choice of a benchmark for international mutual funds remains a controversial issue. The world equity index, the adopted benchmark in previous studies (Cumby and Glen (1990), Eun, Kolodny and Resnick (1991), Droms and Walker (1994)), does not fully satisfy the optimality conditions postulated by asset pricing models. At the same time, researchers (Cooper and Kaplanis (1994)) document strong home bias by investors in various countries. If investors in one country prefer their home security, the optimal portfolio allocation for all other investors will deviate from market value weights and the world equity

index will be inefficient, and thus not an appropriate benchmark for evaluating fund performance. To test fund managers' investment skills requires a benchmark to be efficient relative to the opportunity set available to managers. However, constructing an efficient portfolio from the universe of world securities is not an easy task and such a strategy is impractical for a passive investor. Solnik (1994) discusses difficulties in deriving a theoretically optimal benchmark for international funds. Sharpe (1992) recommends that a feasible performance benchmark should be "1) a viable alternative, 2) not easily beaten, 3) low in cost, and 4) identifiable before the fact." I evaluate equity and bond funds against several passive global investment strategies that can be executed inexpensively by an U.S. investor. Each strategy is associated with a benchmark portfolio designed to test a specific service provided by international fund managers. To test the efficiency of these benchmark portfolios, I use national indices as surrogates for individual securities, an approach commonly used in testing international asset pricing models (Harvey (1990), Cumby and Glen (1990)).

Mean-variance performance statistics, including both the Jensen measure (1968) and the Sharpe ratio, may be biased if fund and index returns are not linearly related (Dybvig and Ross (1985)). Nonlinearity could result from

manager's market timing strategies or inherently nonlinear relations between individual stocks and benchmarks. Grinblatt and Titman (1989) develop the Positive Period Weight (PPW) measure which is not subject to this bias. As a check, I evaluate performance using both the Jensen and PPW measures. Another important consequence of a nonlinear return relation is that fund and benchmark returns are not jointly normal; therefore I estimate the PPW measures using the generalized method of moments.

The results of this study have several practical implications. Foremost, if the addition of actively managed international mutual funds does not improve the efficiency of passive strategies, an investor is better off purchasing index funds because an indexing strategy tends to have lower operating and management expenses. Today there are only a limited number of funds that track international equity indices and there is no international bond index fund. Secondly, performance measures are very sensitive to the benchmark used (Grinblatt and Titman, 1994 and Lehman and Modest 1987). Mutual fund rating services and academic researchers frequently use the world index or the S&P 500 index as benchmarks for international equity funds. If the world index is inefficient, it will not be appropriate for evaluating managerial ability.

Designing an efficient benchmark that isolates the manager's various investment skills is especially important in an international setting.

In section 2, I review studies on international asset pricing models, mutual fund performance measures and international mutual fund evaluation. I discuss estimation procedures and performance test statistics in section 3. Section 4 describes the data used in this study. Performance evaluation of international equity and bond funds appears in sections 5 and 6 respectively. Conclusions of this study and topics for future research are presented in Section 7.

2. Literature Review

2.1 International Capital Asset Pricing Models

Solnik (1974) is the first to extend the closed economy partial-equilibrium capital asset pricing model (CAPM) to an international framework. Assuming frictionless capital markets, perfect competition, riskless borrowing and lending, homogeneous expectations, and non-random domestic inflation, Solnik shows that in equilibrium an investor holds a portfolio of risky assets hedged against exchange rate risk and the risk-free asset denominated in the home currency. Since all investors hold risky assets in the same proportions in equilibrium, the world equity portfolio hedged against exchange risk is the optimal risky

portfolio. Adler and Dumas (1983) generalize the Solnik (1974) model by allowing domestic inflation to be stochastic. They show that in equilibrium, the optimal portfolio has two components: the universal log portfolio and the hedge portfolio. If inflation for the home country is random, investors hold risky assets in both portfolios and the equilibrium condition no longer implies that investors hold risky assets in the same proportion as the world market equity portfolio.

Glen and Jorion (1993) show that an ex post optimized portfolio containing national stock and bond indices and forward contracts is more efficient than a portfolio containing only stock and bond indices. Comparing the world index against a portfolio containing the world index and forward currency contracts, they conclude that hedging the value weighted world index does not improve its efficiency. They also do not find improvement in efficiency when forward contracts are added to the Salomon Brothers World Bond Index or a market value weighted index of world equity and bonds.

Cooper and Kaplanis (1994) documented substantial differences between actual portfolio holdings and market capitalization weights. The motivation for home bias is still unresolved. Cooper and Kaplanis estimate the Adler and Dumas (1983) model and conclude that hedging for inflation risk cannot explain

the observed home bias at "reasonable" risk aversion level. Including other institutional restrictions, such as withholding tax and transaction costs, the model still cannot sufficiently explain the observed home bias.

International asset pricing models do not prescribe an optimal benchmark for evaluating international mutual funds. Empirically, Cumby and Glen (1990) and Harvey (1990) cannot reject the mean-variance efficiency of the unhedged MSCI World Index using national indices. Cumby and Glen also cannot reject the efficiency of a benchmark containing the MSCI World Index and a portfolio of currency contracts. Harvey applies the mean-variance efficiency test developed by Gibbons, Ross and Shanken (GRS, 1989). Cumby and Glen use a large sample version of the GRS test and the Positive Period Weight (PPW) test of Grinblatt and Titman (1989). Even though the MSCI World Index does not satisfy the optimality conditions postulated by a theoretical asset pricing model, it possesses desirable attributes as a feasible benchmark and results of past empirical studies indicates that it is not easy to beat over the sample period of these studies. Section 4 discusses the benchmarks used in this study and how each benchmark is related to the hypothesis tested.

2.2 Mutual Fund Performance Measures

The Sharpe ratio (1966), the Treynor measure (1965) and the Jensen measure (1968, 1969) have been widely used in measuring mutual fund performance. The Sharpe ratio is defined as the mean divided by the standard deviation of fund excess returns. The Jensen measure is the intercept from regressing fund excess returns on a reference portfolio. The Treynor measure is the ratio of the mean excess return to the regression coefficient (beta) on a reference portfolio. It is well known that the Sharpe ratio is the appropriate mean-variance performance measure when the asset is the only investment held by an investor. The Jensen measure can be interpreted as the marginal improvement, in a mean-variance sense, to the reference portfolio when the asset examined is added to the investor's investment set. All three measures assume the existence of a risk-free asset.

Jobson and Korkie (1982) are the first to analyze the statistical properties of the sample estimators for Sharpe ratio and Treynor measure. They assume that asset returns are jointly normally distributed and derive approximations for the mean and variances of the Sharpe ratio, along with the asymptotic distribution and test statistic for comparing two or more Sharpe ratios. Gibbons,

Ross and Shanken (1989) propose a multivariate test to determine the relative mean-variance efficiency of two sets of portfolios. They also assume joint normality for asset returns and the existence of a risk-free asset. They show that their multivariate test statistic is a monotonic linear transformation of the difference between the maximized squared Sharpe ratios of two portfolios. Kandel and Stambaugh (1989) develop likelihood ratio tests to determine the mean-variance efficiency of a set of portfolios, including the Gibbons, Ross and Shanken (1989) test as a special case. They investigate more general cases when a risk-free asset does not exist and when the alternative hypothesis is not specified. In addition to tests for portfolios, they also derive an efficiency test for a set of factors.

All of the above statistical tests are developed based on the unconditional distribution of asset returns. When the model assumes the existence of a risk-free asset and asset returns are expressed as excess returns, the tests should be interpreted as conditional on the observed returns of the risk-free asset. I evaluate fund performance using the Jensen measure and a mean-variance test that takes into account the short sale restriction on open-end mutual funds. If fund managers have timing ability, the distribution of the benchmarks given the timing information will be different from the distribution observed by an

uninformed investor. Dybvig and Ross (1985) show that if distribution of the benchmarks conditional on the fund manager's information set differs from the unconditional distribution, the performance measures discussed above may be biased.

Treynor and Mazuy (1966) propose a quadratic regression of mutual funds on the market portfolio to estimate the timing and selectivity ability of mutual fund managers. They argue that if managers have timing ability, they will earn higher returns when the market is volatile. The regression intercept measures selectivity ability and the coefficient for the quadratic term measures timing ability. The Treynor-Mazuy measure is the sum of the regression intercept and the product of the coefficient for the quadratic term and the variance of the excess return on the market portfolio.

Admati, Bhattacharya, Pfleiderer and Ross (1986) propose two models for measuring timing information when fund manager's information set is not directly observable. The factor approach assumes asset returns are generated by a factor model. Distribution of the factors conditional on the information set of a manager with timing ability is different from the unconditional distribution. When manager has selectivity ability, distribution of risky assets conditional on

his decision information set is also different. The fund manager responds to the timing information by shifting investment among the timing portfolios. The number of timing portfolios equals the number of factors in the model. However, the composition of the timing portfolios depends on the selectivity ability of fund manager. Therefore, the timing ability and selectivity ability of the fund manager must be determined simultaneously.

The second model proposed by Admati, et al. is the portfolio approach. In this model, selectivity information is defined to be independent of timing information. Therefore, composition of the timing portfolio is invariant to the selectivity ability of fund managers. The number of parameters to be estimated using the portfolio approach is substantially reduced. The authors acquiesce that despite the conceptual appeal of the factor approach, the portfolio approach is more feasible to implement given the limited number of time series observations. In the case when the reference portfolio contains only one asset and when the response function of the informed investor is linear[1], the portfolio approach is equivalent to the quadratic regression of Treynor and Mazuy (1966).

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[1] A linear response function to the timing signal is consistent with a utility maximizing investor with constant absolute risk aversion.

Grinblatt and Titman (1989) propose the Positive Period Weight (PPW) measure for evaluating performance of mutual funds. Unlike other performance measures, the PPW measure is not biased by timing ability of fund managers. Grinblatt and Titman define the PPW measures as:

$$PPW = \sum_{t=1}^{T} w_t a_t$$

where

$w_t = f(p_t, T)$,

$$\text{plim}\left[\sum_{t=1}^{T} w_t p_t\right] = 0,$$

$$\left|\text{plim}[T w_t]\right| < \infty,$$

$$\sum_{t=1}^{T} w_t = 1, w_t > 0 \text{ for all t.}$$

p_t is the excess returns on the benchmark portfolios and a_t is the excess returns on mutual funds. The period weights, w_t, can be interpreted as normalized marginal utilities and the PPW measure represents change in the uninformed

investor's expected marginal utility from adding mutual fund to his existing portfolio.

Grinblatt and Titman (1994) examine the performance of U.S. mutual funds using the Jensen measure, the PPW measure and the Treynor-Mazuy Total Performance measure. They use four benchmarks: the equally-weighted U.S. equity index, the value-weighted U.S. equity index, a 10 factor portfolio, and an 8 characteristic-based portfolio. They find that all the performance measures are sensitive to the choice of benchmarks. All three measures produce similar results for the same benchmark.

2.3 Performance Persistence

The efficient market hypothesis posits that any superior mutual fund performance is distributed randomly among managers and over time. The ability to predict future performance using historic performance represents a violation of the efficient market hypothesis. For passive investors, studying fund ranking and past return statistics will not add value to their investment unless superior performance persists. Grinblatt and Titman (1992) test for performance persistence and find positive performance persistence among their sample of 279 funds from 1975 to 1984. Hendricks, Patel and Zeckhauser (1993) use a sample of

no-load growth-oriented equity funds from 1975-1988. They find that funds that outperform their peers for the last four quarters continue to earn returns higher than the average fund in the following quarter. However, these funds do not exhibit superior performance against the benchmarks. They also find that poor performers continue to earn below average returns. Their overall result is consistent with the positive performance persistence observed by Grinblatt and Titman (1992). Bauman and Miller (1994) compare fund performance over complete stock market cycles and find that funds that outperform over one cycle tend to continue to perform well. Goetzmann and Ibbotson (1994) also find positive persistence after controlling for cross-correlations among funds.

2.4 International Mutual Fund Performance Evaluation

Cumby and Glen (1990) compare the performance of fifteen international mutual funds against two benchmarks from January 1982 through June 1988. One of the benchmarks is the Morgan Stanley Capital International (MSCI) World Index and the other contains the MSCI World Index and an equally weighted portfolio of Eurocurrency deposits. They apply the Jensen (1968, 1969) measure and the PPW measure of Grinblatt and Titman (1989) to their data. Using MSCI national indices as dependent variables, Cumby and Glen do not

reject the efficiency of the benchmarks in their study. Univariate tests for the international mutual funds do not reject zero performance using either the Jensen measure or the PPW measure. A large number of the estimated performance measures are negative. Cumby and Glen use an asymptotic two-sided test for the joint performance of all fifteen funds. With the Jensen measure, they reject the joint hypothesis just above the five percent significance level. With the PPW measure, they reject the joint hypothesis at the five percent significance level. The test statistic for the PPW measure used by Cumby and Glen (1990) and Grinblatt and Titman (1994) assumes that fund and benchmark returns are jointly normal. If fund managers have timing ability, fund and benchmark returns will not be linearly related and will not satisfy the joint nomarlity assumption. I estimate the PPW measures for my funds using the generalized method of moments (GMM), which provides consistent estimates even when returns are not jointly normal.

Eun, Kolodny and Resnick (1991) examine the performance of thirteen international mutual funds from 1977 through 1986 against three benchmarks: the S&P 500 Index, the MSCI World Index and a portfolio of U. S. multinational firms. They use the Sharpe ratio, the Treynor measure and the Jensen measure. Five of the Jensen measures are significant when the S&P 500 Index is used as the

benchmark. In all the other tests the null hypothesis cannot be rejected using the Jensen measure. Eun, Kolodny and Resnick do not report a significance level for the Sharpe ratio or the Treynor measure. Contrary to the Cumby and Glen (1990) study, most of the estimated Jensen measures are positive using the MSCI World Index as the benchmark even though these measures are not statistically significant in either study.

Droms and Walker (1994) examine the performance of international mutual funds using an error component model. They investigate the cross-sectional relationship between fund performance and four fund characteristics: total assets, expense ratio to average net assets, turnover rate and load fee versus no-load fee. Their sample includes 108 funds from 1971 to 1990. They do not find a statistically significant relationship between fund performance and fund characteristics.

3. Methodology

3.1 A Mean-variance Spanning Test with a Short-sale Constraint

In this study, I evaluate individual and joint fund performance against several passive investment strategies. Sections 5.1 and 6.1 contain detailed descriptions of the benchmarks used in each passive strategy. Gibbons, Ross,

and Shanken (GRS, 1989) develop a multivariate test for comparing the mean-variance efficiency of two sets of assets. They show that their test statistic can be interpreted as the difference between the maximized squared Sharpe ratios of the two portfolios. Let p_{kt} denote the excess return on passive asset k in month t and let a_{it} denote the excess return on mutual fund i in month t. A passive benchmark, $\{\mathbf{p_t}\}$, includes only the passive assets while the combined investment set, $\{\mathbf{p_t,a_t}\}$, includes the passive assets and the mutual funds. To determine the performance of a single mutual fund, a fund investment set, $\{\mathbf{p_t,a_{it}}\}$, can be formed. The null hypothesis of the GRS test is that $\{\mathbf{p_t}\}$ spans the mean-variance space of $\{\mathbf{p_t,a_t}\}$. In other words, adding mutual funds to the passive benchmark does not increase its Sharpe ratio. The necessary and sufficient condition for the null is that the intercepts are jointly zero, $\beta_0 = 0$, in the following regression:

$$\mathbf{a_t = \beta_0 + p_t B + e_t} \qquad (1)$$

where t = 1,2,..T, and $e_{t,i}$, $e_{t,j}$, i,j=1,2..,N, are jointly normal with zero mean, covariance matrix Σ, and $E(e_{ti}\, e_{sj}) = 0$ for $t \neq s$. The regression intercept of a single fund, β_{0i}, is the Jensen measure. The alternative hypothesis of the GRS test is that the Jensen measures are not jointly zero, $\beta_0 \neq 0$. The GRS test statistic is:

$$F_{MV} = \frac{\hat{\beta}_0' \hat{\Sigma}^{-1} \hat{\beta}_0}{1 + \bar{p}' \bar{V}_p^{-1} \bar{p}} \left(\frac{T}{N} \right) \left(\frac{T - N - K}{T - K - 1} \right). \quad (2)$$

F_{MV} has an F distribution with N and (T-N-K) degrees of freedom under the null and is equivalent to the Jensen measure t statistic when evaluating a single fund. The large sample version of the GRS test is a Wald test, with the test statistic $WALD_{MV}$ distributed as χ^2 with N degrees of freedom.

Using the GRS test to evaluate fund performance has one major disadvantage. Since the alternative hypothesis is defined as $\beta_0 \neq 0$, both positive and negative Jensen measures can trigger rejection of the null. This criterion is appropriate only if investors can exploit both inferior and superior fund performance. In practice, investors can increase the Sharpe ratio of their portfolio by buying outperforming funds, but not by shorting underperforming funds because open-end mutual funds cannot be sold short.[2] One might argue that if the underperformance results from inferior security selection, and investors could observe the portfolio composition of the fund, they could get around the short sale restriction on the fund by shorting or underweighting the

[2] Two brokerages, Jack White and Co. and Fidelity, offer limited opportunities to short sell open-end funds. Fidelity limits its offerings to a few of its own sector funds, and charges a brokerage commission to sell and then repurchase the funds. The number of funds offered by Jack White depends on what funds are internally available in customer margin accounts.

individual stocks held by the fund. However, portfolio compositions are not publicly available in a timely manner. Moreover, underperformance resulting from excessive management fees or transaction costs cannot be exploited by trading on individual stocks. I show in Appendix B that given the short-sale constraint, a zero vector of Jensen measures is no longer the necessary and sufficient condition for the null, and the GRS test rejects too often.

As an example of the GRS test rejecting too frequently, Cumby and Glen (1990) test the joint performance of international funds using a chi-square test that is asymptotically equivalent to the GRS test. Their joint test rejects the efficiency of the world index with a p-value of 0.055, yet 12 of their 15 funds have negative Jensen measures. While Cumby and Glen correctly conclude their funds underperform overall, their joint test erroneously suggests the world index is inefficient.

Since investors cannot short sell open-end funds, a fund adds value only if the optimal weight on the fund is positive in a portfolio containing the benchmark and the fund. Let

$$\begin{bmatrix} \mathbf{p}_t \\ \mathbf{a}_t \end{bmatrix} \Big| r_f \sim \mathcal{N}(\mu, V) \tag{3}$$

where

$\mathbf{p}_t$ is an 1xK vector of benchmark excess returns in month t;

$\mathbf{a}_t$ is an 1xN vector of mutual fund excess returns in month t;

r_{ft} is the risk-free rate in month t;

μ is an (K+N) x 1 vector of expected excess returns. μ can be partitioned into $\mu' = [\mu_p' \ \mu_a']$ where μ_p is an Kx1 vector of benchmark expected excess returns and μ_a is an Nx1 vector of mutual fund expected excess returns.

$\mathbf{V}$ is the covariance matrix of the excess returns on all assets. The (K+N) x (K+N) matrix, $\mathbf{V}$, can be partitioned into $\mathbf{V} = \begin{bmatrix} \mathbf{V}_p & \mathbf{V}_{pa} \\ \mathbf{V}_{pa}' & \mathbf{V}_a \end{bmatrix}$ where $\mathbf{V}_p$ is the KxK covariance matrix of benchmark excess returns; $\mathbf{V}_a$ is the NxN covariance matrix of mutual fund excess returns; and $\mathbf{V}_{pa}$ is the KxN covariance matrix of benchmarks and mutual funds.

The optimal portfolio weights for the combined investment set are computed by solving the following problem:

$$\mathbf{w} = \underset{\{\mathbf{w}\}}{\text{Argmin}}\ \mathbf{w}'\mathbf{V}\mathbf{w} \qquad (4)$$

subject to: $\mathbf{w}'\mu = c$

where $\mathbf{w}' = \{w_p' \ w_a'\}$ are the optimal weights on $\{\mathbf{p}_t' \ \mathbf{a}_t'\}$ and c is a scalar constant.

The solutions to (4) are:

$$\mathbf{w}_p = \frac{\mathbf{w}'\mathbf{V}\mathbf{w}}{\mathbf{w}'\boldsymbol{\mu}} \mathbf{V}_p^{-1}[\boldsymbol{\mu}_p - \mathbf{V}_{pa}\Sigma^{-1}\beta_0]$$

$$\mathbf{w}_a = \frac{\mathbf{w}'\mathbf{V}\mathbf{w}}{\mathbf{w}'\boldsymbol{\mu}} \Sigma^{-1}\beta_0 \qquad (5)$$

where Σ^{-1} is the covariance matrix of $\mathbf{a}_t$ conditional on $\mathbf{p}_t$. Since the first term, $(\mathbf{w}'\mathbf{V}\mathbf{w})/(\mathbf{w}'\boldsymbol{\mu})$, is a positive constant, the null and alternative hypotheses can be written in terms of the conditional moments of $\mathbf{a}_t$ and $\mathbf{p}_t$, H_0: $\Sigma^{-1}\beta_0 = \mathbf{0}$ versus H_a: $\Sigma^{-1}\beta_0 \geq \mathbf{0}$. When evaluating a single fund, the correct null and alternative hypotheses are $\beta_0 = 0$ and $\beta_0 > 0$ respectively because Σ^{-1} is a positive scalar. When evaluating joint performance of multiple funds, the null is the same as in the GRS test, $\beta_0 = \mathbf{0}$. If Σ^{-1} is diagonal, the appropriate alternative is H_a: $\beta_0 \geq \mathbf{0}$. If Σ^{-1} has non-zero off-diagonal elements, there are two cases when $\beta_0 \geq \mathbf{0}$ does not equal $\Sigma^{-1}\beta_0 \geq \mathbf{0}$. The first case is when the optimal weight on a fund is positive even though its Jensen measure is negative. The second case is when the optimal weight on a fund with a positive Jensen measure is negative. These cases occur only if the diversification benefit outweighs the reduction in expected returns from including the underperforming fund or excluding the outperforming fund. To fully account for these diversification effects, the residual covariance matrix and the regression coefficients must be estimated simultaneously in a nonlinear

programming problem.[3] Given the limited number of time series observations and the high degree polynomial in the problem, estimating all the parameters simultaneously is impractical. To make estimation feasible, I use $\beta_0 \geq \mathbf{0}$ as the alternative. Intuitively, when the Jensen measure for one mutual fund is positive, an investor can improve the mean-variance efficiency of his investment set by purchasing the fund. Therefore even if the short-sale constraint is binding on some of the funds, the investor can still be better off by purchasing at least one of the funds which have positive intercepts.

Gourieroux, Holly and Monfort (1982), henceforth GHM, outline a two-stage estimation procedure for the inequality-constrained model. In stage one, I estimate (1) subject to $\beta_0 = \mathbf{0}$, and compute the null restricted regression residual $\hat{\mathbf{e}}_t$ and covariance matrix $\hat{\Sigma}$. In the second stage, I estimate:

$$\hat{\mathbf{e}}_t = \gamma_0 + \mathbf{p}_t\gamma + \mathbf{v}_t$$

$$\text{subject to } \gamma_0 \geq \mathbf{0} \qquad (6)$$

$$\text{for } t = 1,2,..T$$

[3] Consider the case for testing performance of equity mutual funds using the world index. With 35 funds and one index, the total number of parameters to be estimated is 700.

where $\mathbf{v}_t$ is assumed normally distributed with zero mean and covariance matrix $\hat{\Sigma}$ computed in stage one under the null restriction. The determination coefficient R^2 is defined as:

$$R^2 = 1 - \sum_{t=1}^{T} \frac{(\hat{\mathbf{e}}_t - \tilde{\gamma}_0' - \mathbf{p}_t\tilde{\gamma})\hat{\Sigma}^{-1}(\hat{\mathbf{e}}_t - \tilde{\gamma}_0' - \mathbf{p}_t\tilde{\gamma})'}{\hat{\mathbf{e}}_t\hat{\Sigma}^{-1}\hat{\mathbf{e}}_t'}, \tag{7}$$

where $\tilde{\gamma}_0$ and $\tilde{\gamma}$ are computed in stage two. GHM define the Kuhn-Tucker statistic as:

$$KT_{MV} = (TN)R^2 \tag{8}$$

where T is the number of time series observations and N is the number of funds in the sample. KT_{MV} is asymptotically distributed as a weighted mixture of χ^2 under H_0.[4]

3.2 Measuring Timing Ability

A number of researchers, including Dybvig and Ross (1985), Admati, Bhattacharya, Pfleiderer and Ross (1986), and Grinblatt and Titman (1989), have

[4] Wolak (1991) shows that the upper and lower bounds for the critical value of KT_{MV} computed by Kodde and Palm (1986) are tight for linear inequality constrained models such as ours. If the test statistic KT_{MV} falls between the upper and lower bounds, the bounds test is inconclusive. For such cases, I use a Monte Carlo simulation method suggested by Wolak (1989b) to approximate the critical values.

shown that market timing strategies of fund managers can bias the Jensen measure. Admati, et. al (1986) provide two models which disentangle the timing portion and the selectivity portion of a performance measure. I define a fund manager as an index timer if his investment set includes only the risk-free asset and the benchmark and his investment decision is conditional on the timing signal he receives. This definition of index timing is consistent with the portfolio model by Admati, et. al (1986). They show that the covariance matrix of the noise of the timing signal and the risk aversion coefficient of the informed investor can be estimated by a quadratic regression of the mutual funds on the timing portfolios. If the coefficients of the quadratic terms are significantly different from zero, the expected returns of mutual funds conditional on the benchmark are not linear and the Jensen measures may be biased. I estimate the following quadratic regression to test for a linear return relationship between mutual funds and the benchmarks:

$$a_{it} = \varpi_{i,o} + \sum_{j=1}^{k} p_{jt}\varpi_{i,j} + \sum_{j=1}^{k} p_{jt}^{2}\varpi_{i,j+k} + \sum_{l=1}^{k}\sum_{\substack{m=1 \\ m\neq l}}^{k} p_{lt}p_{mt}\varpi_{i,2k+l+m} + \upsilon_{it} \qquad (9)$$

where i = 1,2,..N,

t = 1,2,..T,

$\varpi_{i,m}$ is the coefficient for fund i on index m for m <=k,

$\varpi_{i,m}$ is the quadratic coefficient for fund i on index m for m > k,

m = 1,2.. (1+K+K*(K+1)/2),

ν_{it}, ν_{jt} are distributed jointly normal for i,j=1,2..,N with zero mean and variance-covariance matrix Ψ. $E(\nu_{t,i}\, \nu_{s,j}) = 0$ for $t \neq s$.

When the benchmark contains a single index, (9) is the quadratic regression used in Treynor and Mazuy (1966) who show that mutual fund performance comprises two components. The timing component is the product of the quadratic coefficient and the variance of the benchmark, and the security selectivity component is the regression intercept in (9). The Treynor-Mazuy performance measure is the sum of the timing and the security selectivity components:

$$\text{Treynor-Mazuy measure}_i = \varpi_{i0} + \varpi_{i2} * \text{var}(p_t) \qquad (10)$$

3.3 The Positive Period Weight Measure

Grinblatt and Titman (1989) develop the Positive Period Weight (PPW) measure for evaluating performance of mutual funds. Unlike other performance

measures, the PPW measure is robust to nonlinearity between mutual fund and benchmark returns. To compute the PPW measures, I assume that the investor has a power utility function with risk aversion parameter θ,

$$E[U(W_t)] = E\left[\frac{1}{1-\theta} W_t^{1-\theta}\right] \tag{11}$$

where W_t is wealth at time t with $W_t = W_0^*(1 + r_{ft} + \mathbf{p}_t \varphi)$. The investor selects optimal weights φ on the benchmarks $\mathbf{p}_t$ to maximize expected utility given the risk-free rate r_{ft}. Maximizing (10) yields:

$$E[(1 + r_{ft} + \mathbf{p}_t \varphi)^{-\theta} \mathbf{p}_t'] = \mathbf{0}. \tag{12}$$

I choose θ to be five to ensure that the optimal weights will sum close to one.[5] The PPW measure represents the change in expected marginal utility from adding the actively managed fund to the benchmark strategy:

$$E[(1 + rf_t + \mathbf{p}_t \varphi)^{-\theta} \mathbf{a}_t'] = \mathbf{PPW}. \tag{13}$$

The null hypothesis is that investing in mutual funds does not improve a passive investor's expected utility, **PPW = 0**. Since (13) implies that buying a fund with a

[5] Cumby and Glen (1990) use a power utility function with a coefficient of relative risk aversion of six when computing the PPW measure.

positive PPW measure improves utility, the short-sale constraint is not binding for funds with positive measures.

I use the Generalized Method of Moments (GMM) to estimate (12) and (13). The GMM procedure provides consistent estimates even when the active funds and indices are not jointly normal. It is important to use a consistent estimation method because if fund managers have timing ability, fund and benchmark returns will not be jointly normal. Given K benchmarks and N funds, there are K+N moment conditions. With K parameters to estimate, there are N over-identified restrictions that can be used to test the null. Using the separability result for GMM estimation by Ahn and Schmidt (1994), I estimate (12) and (13) in a two-step procedure. In step one, I solve for φ in the following system of nonlinear equations:

$$\mathbf{g}(\varphi) = \frac{1}{T}\sum_{t=1}^{T}[(1 + r_{ft} + \mathbf{p}_t\varphi)^{-\theta}\mathbf{p}_t'] = \mathbf{0}. \tag{14}$$

The **PPW** estimates are:

$$\hat{\mathbf{PPW}} = \frac{1}{T}\sum_{t=1}^{T}[(1 + r_{ft} + \mathbf{p}_t\hat{\varphi})^{-\theta}\mathbf{a}_t'], \tag{15}$$

where $\hat{\varphi}$ is the solution to (14).[6] The vector $\hat{\mathbf{PPW}}$ is asymptotically normal with mean **PPW** and variance Ω.[7] The joint test statistic is:

$$WALD_{PPW} = \hat{\mathbf{PPW}}' \hat{\Omega}^{-1} \hat{\mathbf{PPW}}. \tag{16}$$

$WALD_{PPW}$ is distributed asymptotically as χ^2 with N degrees of freedom.

Equation (13) implies that the utility of the passive investor can be improved by positive investment in the fund when the PPW measure is greater than zero. Therefore the short-sale constraint will not be binding for funds with positive PPW measures. To impose the short-sale constraint, the parameter space for $WALD_{PPW}$ must be restricted. Andrews (1994) derives the Directed Wald statistic which restricts the parameter space for $WALD_{PPW}$. However, the distributional properties and robustness of the Directed Wald statistic for nonnormal variables are not well known. Since I use the PPW measure primarily as a check for whether the Jensen measures are biased by market timing or

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[6] To be consistent with Grinblatt and Titman (1989), we normalize (9) and (10) by dividing through by $\frac{1}{T}\sum_{t=1}^{T}[(1+r_m+p_t\hat{\varphi})^{-\theta}]$.

[7] Ω is the lower right sub-matrix of $A = [D'B^{-1}D]^{-1}$, where D is the gradient of (13) and (14) with respect to φ and PPW. B is the asymptotic covariance matrix of (13) and (14). The diagonal elements of Ω is equivalent to the heteroskedastic variances used by Cumby and Glen (1990) and Grinblatt and Titman (1994) only if p_t and a_t are jointly normal.

nonlinearity, I did not compute the Directed Wald statistic in the performance test.

3.4 Measuring Performance Persistence

I apply Grinblatt and Titman's (1992) method to test for performance persistence. First, I divide the sample into two subperiods and compute the Jensen measures for each subperiod using (1). Secondly, I regress the Jensen measures from the second subperiod on the Jensen measures from the first subperiod. If performance persists, the regression coefficient should be positive. Since the fund return residuals are likely to be cross-correlated, I use the correction method suggested by Grinblatt and Titman to compute t statistics. Let α_i be the difference between the Jensen measure of fund i and the average Jensen measure for all funds from the first subperiod. By construction, the α_i's sum to zero. Next, I create a portfolio using the α_i's as weights. The excess return on this α-weighted portfolio over the second subperiod is:

$$a_{pt} = \sum_{i=1}^{N} \frac{\alpha_i a_{it}}{\mathrm{var}(\alpha)} \qquad (17)$$

where $\alpha_i = \beta_{0i} - \sum_{i=1}^{N} \frac{\beta_{0i}}{N}$, t = T_1 + 1, .., T, and var(α) is N times the cross-sectional variance of the Jensen measures computed from the first sub-period. The intercept from regressing a_{pt} on the excess returns of the benchmarks, $\mathbf{p}_t$, is algebraically identical to the least squared slope coefficient from the cross-sectional regression of the sub-period Jensen measures. However, the t statistic of the intercept will not be biased by cross-correlations among the Jensen measures.

4. Data

4.1 Monthly Returns on Mutual Funds and Indices

Monthly total returns for mutual funds are obtained from Morningstar *OnDisc*. Monthly total returns on international and national equity and bond indices, spot and forward exchange rates and 30-Day U.S. Treasury Bill are from Ibbotson and Associates. Appendix A contains Ibbotson's and Morningstar's documentation on the characteristics and methods of calculation for each index. Monthly excess returns on indices and mutual funds are computed by subtracting the 30-Day Treasury Bill return from total returns. Table 1 contains summary statistics for the indices and mutual funds.

The sample period for equity funds is from January 1985 through March 1994. I look for funds with inception dates earlier than December 1984 and "International Equity" or "World Equity" as the investment objective as of March 1994. There are 38 funds satisfying this criteria. Three of these 38 funds were deleted from the sample. Vontobel EuroPacific was founded in December 1984 but does not have returns information for the first few months in 1985. Two funds, Lexington Worldwide Emerging Markets and Phoenix Worldwide Opportunities changed names and investment policies in 1991 and 1990 respectively. Thus, there are 35 international equity funds remaining in the sample.

The bond mutual fund sample contains funds with "Worldwide Bond" as the investment objective in March 1994 and an inception date earlier than December 1988.[8] There are 24 funds which satisfies this criteria and have continuous returns from January 1989 through March 1994. Six of these 24 funds were deleted from the sample. Two funds, Bull & Bear Global Income and API Global Income changed investment objective during the sample period. Franklin/Templeton Global Currency only invests in short-term instruments.

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[8] When I set the criteria for the fund inception date to be earlier than December 1984, only one bond fund is available.

Merrill Lynch Global Convertible invests mostly in convertible preferred stocks and convertible bonds. Prudential Intermediate Global Income was named Prudential Intermediate Income before 1990.[9] Franklin Partners Tax-Advantage International is open only to non-U.S. investors. There are 18 international bond funds with continuous returns from January 1989 through March 1994 in the sample. Issues relating to survivorship bias are discussed in section 5.6 and section 6.5 for equity and bond funds respectively.

4.2 Currency Hedging

The international asset pricing model by Solnik (1976) states that hedging against exchange rate risk is necessary for the world equity market portfolio to be efficient. Glen and Jorion (1993) study various hedging strategies and show that adding forward contracts improves the efficiency of a portfolio containing national equity and bond indices in unrestricted proportions. However, they do not find improvement in efficiency when hedging a market value weighted portfolio. If mutual fund managers outperform an unhedged passive

[9] I cannot obtain the investment objective of the Prudential Intermediate Income fund prior to 1990. This fund was not covered by either Wiesenberger or Morningstar prior to 1993.

benchmark, the performance may be due to currency hedging and not necessarily security or country selectivity.

I apply two currency hedging strategies to the passive benchmarks. The first strategy chooses the optimal weights on the equity/bond indices and currency forward contracts simultaneously. To implement this strategy, I add three forward contracts: deutschemark, Japanese Yen and Canadian Dollar, to each of the benchmark portfolios.[10] Monthly return $f_{i,t}$ on a forward contract in currency i is defined as the U. S. dollar payoff at time t from buying $(1/S_{i,t-1})$ contracts at time t-1:

$$f_{i,t} = (S_{i,t} - F_{i,t-1})/S_{i,t-1} \tag{18}$$

where $S_{i,t}$ is the spot exchange rate in U. S. dollars per currency i at time t and $F_{i,t-1}$ is the one month forward rate for currency i at time t-1 for delivery at time t. The forward contract returns, $f_{i,t}$, are added as independent variables to the benchmark portfolio, $\mathbf{p}_t$, when estimating performance using (1). The exchange rate component of the dollar return on a fund is now captured by the forward contracts, and no longer contributes to the fund's Jensen measure.

[10] The other European currencies are highly collinear with the Deutschemark and are not used.

The second strategy is often referred to as unitary hedge because the hedge ratio for each currency is one. The unitary hedged return on a country index (uhp_{it}) is computed as the U.S. dollar excess return plus the return from selling $P_{i,t-1}$ forward contracts at time t-1, where $P_{i,t-1}$ is the price of index i denominated in currency i,

$$uhp_{i,t} = p_{i,t} - f_{i,t}. \tag{19}$$

Unitary hedged regional indices are constructed using beginning of month market value weights and hedged returns on 14 national equity indices.[11] Forward contract prices for the 14 countries begin in December 1985. Therefore the sample period for performance tests applying the unitary hedge strategy is from January 1986 through March 1994 for equity funds. Ibbotson and Associates provide hedged regional and country bond index returns computed by Salomon Brothers. The unitary hedged excess returns computed using (19) are very similar to the Salomon Brothers hedged returns.

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[11] The 14 countries are: Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom and the United States. The total market value of these 14 countries averages 96% of the world market during the sample period from January 1986 through March 1994.

The two hedging strategies have important practical implications. The unitary hedge strategy is easy to implement but does not take into account correlations between currency and index returns. Furthermore, only the initial investment is hedged. On the other hand, the simultaneous hedging strategy significantly increases the number of assets to be managed. To assess the role of currency hedging on fund performance, I repeat the mean-variance and PPW tests using both hedging strategies. If funds outperform the unhedged benchmarks but fail to outperform the hedged benchmarks, currency hedging is an important factor in fund performance.

5. Performance Tests of International Equity Funds

5.1 Hypotheses and Benchmarks

I test for three attributes of international equity fund performance. First, I test for security selectivity, the ability of managers to choose securities that outperform their respective country indices. Second, I examine whether international funds provide effective global diversification for U.S. investors. Third, I examine country selectivity, the ability of fund managers to identify superior performing countries in the world.

5.1.1 Hypothesis 1 - International mutual funds do not exhibit security selectivity ability.

Security selectivity has been the focus of numerous performance evaluation studies (Ippolito (1992)). Since international fund managers engage in country as well as security selection, I use a 12-country benchmark to isolate their security selectivity ability. Estimating individual sensitivities to each of the 12 countries removes country selection related performance from the Jensen measure. For example, a fund that earns high returns by overweighting a country that beats the world index will exhibit a high sensitivity to that country, but will not obtain a positive Jensen measure against the 12-country benchmark. Managers must select securities that outperform their respective country indices for H1 to be rejected. [12]

The 12-country benchmark includes Australia, Belgium, Canada, France, Germany, Hong Kong, Italy, Japan, the Netherlands, Switzerland, the United Kingdom and the United States. These 12 markets make up approximately 96%

[12] I assume that each of the 12 country indices is efficient relative to securities within a country. Individual securities from all 12 countries are needed to test the efficiency of the 12-country benchmark. At present, I do not have data on individual securities from all 12 countries. If the funds reject the 12-country benchmark, a formal efficiency test on the 12-country benchmark must be performed before I can conclude that managers have security selectivity ability.

of the world equity market over our sample period. The GHM test rejects H2 if the Sharpe ratio of the optimal combination of the 12 country indices is significantly improved by purchasing the 35 mutual funds.

5.1.2 Hypothesis 2 - International mutual funds do not provide efficient global diversification.

Global diversification is an important service provided by international funds. Capital market theory suggests restricting investment to domestic assets is inefficient *a priori*. In Table 1, all countries except Canada have return correlations with the U.S. market below .61, indicating a potential for risk reduction from investing in foreign securities. Nonetheless, I may fail to reject H2 if international funds incur excessive expenses, offsetting their diversification benefits.

I use the broadly-based Wilshire 5000 as a proxy for the U.S. equity market. Rejecting H2 using the GHM test implies that a portfolio containing both international funds and the Wilshire 5000 index has a better risk-return tradeoff than the Wilshire 5000 alone. If fund managers do not exhibit superior security selection skills but outperform the Wilshire 5000 index, I attribute their performance to providing effective global diversification.

5.1.3 Hypothesis 3 - International mutual funds do not exhibit country selectivity ability.

Even if fund managers do not have security selectivity ability, they may be able to identify countries that outperform the world index. If the world index is efficient vis-à-vis unmanaged country indices, and a fund has a positive Jensen measure against the world index but not against the 12-country benchmark, then country selectivity must be a factor in the fund's performance. If the world index is inefficient, it will not be an appropriate benchmark for testing H3.

Table 2 contains results of the GRS mean-variance efficiency tests on the MSCI World Index using monthly dollar excess returns on national indices as dependent variables. The national indices are unmanaged and their returns are not affected by active security selection. I use the GRS test because the national indices can be easily underweighted or shorted using futures contracts.[13] Both the GRS and PPW tests reject the efficiency of the world index at 5%. This is the first study to reject the efficiency of the unhedged world index using an unconditional test. Harvey (1991) cannot reject the mean-variance efficiency of

[13] Futures contracts exist for most of the major stock exchanges in the countries of my sample except for Belgium, Italy and Switzerland. Negative investment in the national indices can be accomplished easily using futures contracts.

the MSCI World Index using 17 national indices as dependent variables using the GRS test. His sample period is from February 1970 through May 1989. The bottom panel of Table 2 contains subperiod results of efficiency test on the world index. I obtain a p-value of 0.194 for the efficiency test over Harvey's sample period using my 12 countries. When I extend the sample period to January 1970 through March 1994, I reject world index efficiency with a p-value of 0.065. Over the January 1990-March 1994 subperiod, p-value for the efficiency test is 0.037. Adding a dummy variable to control for the October 1987 crash does not alter my conclusion. The regression intercepts for Belgium and the Netherlands are positive and significant at the 5% level. The PPW measures are very similar to the regression intercepts. Since the world index is inefficient during my sample period, it will not be an appropriate benchmark for testing H3. If the funds outperform an inefficient world index using the GHM test, I can only infer that adding international funds to a naive world indexing strategy improves its efficiency. Since the Solnik (1976) CAPM states that the world index must be hedged against exchange rate risk to be efficient, I perform the GRS test using a 4-asset benchmark[14] composed of the world index and 3 forward contracts on

[14] The 4-asset benchmark allows the optimal weights on the 3 forward contracts and the world index to be chosen simultaneously. This technique is the first hedging strategy discussed in section 4.2.

Deutschemark, Japanese Yen and Canadian Dollars. Adding the 3 forward contracts as independent variables removes the exchange rate component in the regression intercept. The GRS test also rejects the efficiency of the 4-asset benchmark, indicating that exchange rate movement is not a major factor in rejecting the world index over my sample period.

Since the MSCI World Index is inefficient, I use a 3-region equity benchmark to test for country selectivity ability of fund managers outside the U.S. and Japan. The 3 regions are U.S., Japan and the rest of the world. In Table 2, both the GRS and the PPW tests do not reject the efficiency of the 3-region benchmark. To outperform the 3-region equity benchmark, fund managers must select countries other than the U.S. and Japan, or individual securities that have superior performance. If the funds outperform the 3-region benchmark but not the 12-country benchmark, the most likely source of performance is from identifying outperforming countries outside of the U.S. and Japan.

5.2 Transaction Costs

Even passive investment strategies incur transaction costs. Since mutual fund returns are reported net of expenses, comparing the performance of active funds against an index which does not reflect the transaction costs of a passive

strategy is biased against the funds. To attenuate this bias, I estimate the transaction costs for the indexing strategies by regressing returns on index mutual funds against the indices they imitate. I select the index mutual funds using the secondary investment objective by Morningstar. Composition of these index funds either replicates the market value weights of an index or is determined by a random sampling method to maximize the correlation between index return and fund return. I use the Vanguard Index Total Stock Market fund which tracks the Wilshire 5000 index, the Vanguard International Equity Index European which tracks the MSCI EAFE Europe index, and the Vanguard International Index Pacific which tracks the MSCI EAFE Pacific index. The regression equation for estimating these transaction costs is:

$$m_{it} = \delta_{0j} + \delta_{1j} I_{jt} + \varepsilon_{jt} \qquad (20)$$

where $j = 1,2,..,N$, $t = 1,2,..,T$, $\varepsilon_{jt} \sim NID(0, \upsilon_j^2)$,

m_{jt} = monthly return on index mutual fund j,

I_{jt} = monthly return on the index tracked by mutual fund j,

δ_{0j} = estimator of transactions costs for index j.

If an index fund perfectly tracks the index without expense, the R^2 in (20) will be unity and intercept zero. Fund expenses give rise to a negative intercept, assuming tracking error averages to zero. The absolute value of the intercept

plus an amortized Vanguard transaction fee is the estimate of the expenses of a passive indexing strategy. In Table 3, all R^2's exceed 0.989, indicating little tracking error. The estimated monthly transaction costs are 0.036% for the Wilshire 5000 index, 0.042% for the Europe index and 0.031% for the Pacific index. These estimates exceed the expense ratios reported by the index funds for 1993, because expense ratios include administrative expenses but not commissions or bid-ask spreads. When evaluating performance of actively managed equity funds, the estimated transaction costs are subtracted from excess returns on the benchmarks.[15]

5.3 Empirical Results of International Equity Mutual Funds

5.3.1 Mean-variance Performance Tests

Univariate and joint performance test results for the 35 international mutual funds appear in Table 4. The intercepts in the univariate regressions are the traditional Jensen performance measures. Only two of the 35 funds have positive Jensen measures against the 12-country benchmark, and 15 are

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[15] Transaction costs for the world index and the 3-region benchmark are market value weighted averages of the costs for the Wilshire 5000, the Europe index and the Pacific index. The weights are computed using market capitalization values of the corresponding FTA international indices as of March 1994. For the 12-country benchmark, individual country returns are adjusted using transaction costs from their respective regions.

significantly negative at 10%. The GHM test does not reject the efficiency of the 12-country benchmark. Finding no evidence of security selectivity ability among international fund managers is consistent with results from domestic studies (Jensen (1968), Lehman and Modest (1987), Grinblatt and Titman (1994)).

In contrast, most of the Jensen measures are positive when the Wilshire 5000 Index is used as the benchmark with one significant at 5% and five significant at 10%. These results are consistent with the international diversification benefits reported by Eun and Resnick (1984) and Grauer and Hakansson (1987). The GHM test rejects the Wilshire 5000 at slightly above 5%, implying that international funds provide effective global diversification to U.S. investors, even after accounting for their expenses.

Even without security selectivity ability, managers can still be rewarded by overweighting countries that outperform the world index. Out of 35 funds, 27 Jensen measures are positive against the world index but only one is significant at 10%. In previous tests using the world index, Eun, Kolodny and Resnick (1991) find that 11 of 13 Jensen measures over 1977-86 are positive with none significant, while Cumby and Glen (1990) find that 12 of 15 Jensen measures are negative over January 1982-June 1988 with none significant. My results are more

in agreement with the findings of Eun, Kolodny and Resnick. The GHM test reject the efficiency of the world index at a p-value of 0.0530. This is the first paper to find that international funds as a group outperform the world index.[16] Cumby and Glen (1990) also reject the world index using their funds but they use a two-sided joint test and attribute inferior rather than superior performance as the cause of rejection. Since the world index is inefficient during my sample period, the superior performance of the funds only implies that managers have successfully exploited this inefficiency.

To access the investment skills of fund managers, I use the efficient 3-region benchmark. In Table 4, 22 Jensen measures are negative, with one significant at the 1% level, one at 5%, and one at 10% against this benchmark. Only one fund has a positive and significant Jensen measure. The GHM test does not reject the 3-region benchmark, suggesting that managers are not able to select outperforming countries outside the U.S. and Japan nor do they have security selectivity ability.

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[16] Since my sample period include the 1987 stock market crash, I introduce a dummy variable for October 1987 and repeat the performance tests. More Jensen measures (31 of 35) are positive from the dummy regression and the overall conclusions remain the same after controlling for the October 1987 crash.

In summary, I find that international equity funds provide diversification benefits for U.S. investors. Since the MSCI World Index is inefficient during my sample period, it is not an appropriate benchmark for testing manager's investment skills. My results suggest that international fund managers successfully exploited the observed inefficiency in the world index. Using the 12-country and the 3-region equity benchmarks, I find no evidence of security or country selectivity ability. For all 4 benchmarks, the p-values of the GRS test are lower than those of the GHM test. The difference is most pronounced when a large portion of the funds has negative performance, giving rise to low p-values in the GRS test and high p-values in the GHM test. The null hypothesis of this study is that actively managed international funds do not add value to a passive investment strategy. Therefore, the null should not be rejected by inferior performance, because investors cannot profit from inferior performance due to the short-sale constraint on open-end mutual funds. The rejection region of the GHM test is consistent with the null hypothesis whereas the GRS test rejects the null too frequently.

5.3.2 Positive Period Weight Measures

As discussed in section 3.2, the Jensen measure and the mean-variance tests may be biased if fund and benchmark returns are nonlinearly related. To

examine whether this potential source of bias affects the results in section 5.3.1, I compute the robust Positive Period Weight (PPW) measures. Consistent with the mean-variance tests, I subtract transaction costs from the excess returns on the benchmarks when computing the PPW measures. Table 5 contains the estimated PPW measures for individual funds. The univariate PPW measures are similar to the Jensen measures. With the 12-country benchmark, 21 PPW measures are significantly negative at 5%. For the Wilshire 5000 Index, the PPW measure estimates are positive for 32 out of 35 funds with one significant at 5% and two at 10%. For the MSCI World Index, 23 of 35 funds have positive PPW measures but only one is significant at 10%. For the 3-region benchmark, 24 of 35 funds have negative PPW measures with one significant at 1%, three at 5% and four at 10%.

The PPW measures and the GMM estimation procedure are robust to nonlinearity between fund and benchmark returns and nonnormal residuals. The similarity between the PPW and Jensen measures suggests that any downward bias in the Jensen measures introduced by market timing strategies (Grinblatt and Titman (1989)) is not economically significant in my sample.

5.3.3 Nonlinearity Between Fund and Benchmark Returns

Studies of U.S. mutual funds find that managers have significant timing ability.[17] Eun, Kolodny and Resnick (1991) use the S&P 500 Index and the market timing model by Henriksson and Merton (1981) and find some evidence of negative timing ability among international fund managers but they do not provide statistical significance. Cumby and Glen (1990) use the Treynor-Mazuy model and find significant negative timing coefficients against the world index for most of the their international funds.

As a comparison to existing literature, I estimate the timing and security selectivity performance of the 35 international funds using (9). Table 6 contains the quadratic coefficients and the Treynor-Mazuy total performance measures. With the MSCI World Index as the benchmark, 34 out of 35 funds have negative quadratic coefficients and 30 are significant at 5%.[18] The quadratic coefficients

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[17] Lehmann and Modest (1988) use an APT model and report significant regression coefficients on the squared terms of the factors. Chang and Lewellen (1984) and Henriksson (1984) use the Merton model and find significant negative timing ability among fund managers. Jagannathan and Korajczyk (1986) demonstrate that the nonlinear pricing relationship can be due to the option like feature of common stocks and not an indication of the timing ability of fund managers.

[18] Since the MSCI World Index is inefficient during my sample period, it may not be a good benchmark for testing timing ability. I estimate (9) using unmanaged national indices as dependent variables. The

using the Wilshire 5000 Index are all negative and significant at 5% for 28 out of 35 funds. My results are consistent with Cumby and Glen (1990) and Eun, Kolondy and Resnick (1991). Even though the quadratic coefficients are significantly negative, the Jensen measures in section 5.3.1 are very similar to the robust PPW measures in section 5.3.2, suggesting that my conclusions from the GHM tests are not materially affected by the observed nonlinearity. To further examine the implications of the observed nonlinearity, I compute the Treynor-Mazuy Total Performance Measure defined in section 3.2 equation (10). All three measures are in agreement, providing evidence that any potential bias in the Jensen measures and the mean-variance tests are not economically significant.

5.4 Performance Tests Results with Currency Hedged Equity Benchmarks

Table 7 contains the mean-variance and PPW test results when the simultaneous hedging strategy is applied using three forward contracts: the deutschemark, Japanese Yen and Canadian Dollar. All but one Jensen measures are negative against the 12-country benchmark and forward contracts and 8 are significant. Using the world index and forward contracts, five funds have

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quadratic coefficient are negative for 10 countries and positive for Japan and Italy, with 2 significant at 1% and 3 significant at 5%. Considering the results for the national indices, the mutual fund results could be driven by an inherent nonlinearity with respect to the benchmarks, and not timing ability per se.

positive and significant Jensen measures at 5%. For the 3-region equity benchmark, hedged versus unhedged univariate results are also similar, especially for the 4 funds with significant Jensen measures. The GHM tests for the simultaneously hedged benchmarks have slightly higher p-values but the overall conclusions are the same. Since the results using the simultaneous hedging strategy are consistent with those using the unhedged benchmarks, it does not appear that currency hedging makes a significant aggregate contribution to international equity fund performance.

Test results using unitary hedged benchmarks are in Table 8. As noted in Section 4.2, the sample period for the unitary hedge is from January 1986 through March 1994.[19] Results of the performance tests using the unitary hedge method are quite different. Only two funds have negative Jensen measures against the 11-country benchmark[20] and 15 measures are positive and significant. For the world index, 32 Jensen measures are positive with 5 significant at 5%. Using the 3-region equity benchmark, 32 Jensen measures are positive and 8 are

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[19] I repeat performance tests using the unhedged benchmarks over the January 1986-March 1994 subperiod and the results are the same as the entire sample period.

[20] There is no forward contract for the Hong Kong Dollar. Therefore the Hong Kong Index cannot be hedged directly using the unitary hedge method, leaving 11 countries in the benchmark.

significant. The GHM tests reject all three unitary hedged benchmarks at 5%. During most of my sample period, the U.S. Dollar depreciated against the major currencies except the Canadian Dollar. If the future spot rate $S_{i,t}$ is greater than the forward rate $F_{i,t-1}$, an unitary hedged portfolio will have a lower return than an unhedged portfolio. Since the future spot rates were higher than the forward rates for all 10 currencies[21] for most of the period, it is not surprising that funds outperform the unitary hedged benchmarks. The PPW measures are similar to the Jensen measures, confirming that any bias in the mean-variance tests is not economically significant.

5.5 Performance Persistence

Even if mutual funds as a group do not exhibit superior performance, investors can still benefit if an individual fund can consistently outperform the benchmark. Several domestic studies find evidence of persistence (Grinblatt and Titman (1992), Hendricks, Patel and Zeckhauser (1993), and Goetzmann and Ibbotson (1994)). I divide the equity fund sample into subperiods of 56 and 55 observations respectively, and estimate Jensen measures β_0^1 and β_0^2 for each

[21]The 10 currencies are: Australian Dollar, Belgium Franc, Canadian Dollar, French Franc, Deutschemark, Lira, Yen, Gilder, Swiss Franc and British Pound.

subperiod. A positive slope coefficient from regressing β_0^1 on β_0^2 implies persistence. I use the method of Grinblatt and Titman (1992) to compute the slope coefficient, which corrects the t-statistic for correlations in the Jensen measures. In Table 9, the funds exhibit persistence only against the 3-region benchmark. As indicated in Table 4, most funds have negative Jensen measures against the 3-region benchmark. If the observed persistence orginates from inferior performance, the ability to predict poor results is not valuable to investors. I find no evidence of performance persistence using the other three benchmarks.

5.6 Survivorship

Since I require the funds to have continuous return histories through out the entire period, my sample is subject to survivorship bias. There were 3 funds in existence in 1985 which merged with other funds or changed their investment objective during my sample period. Templeton Global I merged with Templeton Global II in 1988 and later became Templeton Smaller Company Growth. Sci/Tech Holdings changed to Merrill Lynch Health Care A in 1992. World of Technology was acquired by Financial Strategic Portfolios in 1988. The monthly total return on the discontinued funds during their existence averaged 0.4%

below the average for all international equity funds listed in Wiesenberger's *Investment Companies Yearbooks*. Therefore, the joint performance of the surviving funds may be overstated.

5.7 Summary of Empirical Tests on Equity Funds

This section examines the performance of international equity mutual funds relative to several passive global investment strategies. Using individual national indices as active assets, I reject the unconditional efficiency of the world index, indicating that the world index is not appropriate for evaluating managers' investment skills. I use the 12-country benchmark to test for security selectivity ability and the 3-region benchmark to test for country selectivity ability outside the U.S. and Japan. Since open-end mutual funds cannot generally be sold short, I use the GHM test which takes into account the short-sale constraint. I allow for transaction costs on the indexing strategies when evaluating fund performance. My results demonstrate that joint tests which ignore the short-sale constraint, such as the GRS test, reject the benchmarks too frequently.

The GHM test rejects the Wilshire 5000 index, implying that actively managed international equity funds provide global diversification to U.S.

investors. Both the 12-country and the 3-region benchmarks are not rejected, indicating fund managers do not have security or country selectivity ability. However, international funds outperform the world index as a group, suggesting that managers successfully exploited an inefficiency observed during my sample period.

These conclusions do not change substantially when the passive strategy incorporates currency hedging using forward contracts in unrestricted proportions. Results from quadratic regressions suggest that the return relationship between international funds and the benchmarks is nonlinear. I estimate the Positive Period Weight (PPW) measure by Grinblatt and Titman (1989) which is not biased by the observed nonlinearity. I use the generalized method of moments in my estimation which is robust to departure from joint normality. The PPW results are similar to the Jensen measure results, indicating the observed nonlinearity does not affect the overall qualitative conclusions.

6. Performance Tests of International Bond Mutual Funds

International bond funds are a relatively new investment vehicle for U.S. investors. The *Morningstar Mutual Fund Source Book* did not have a category for international bond funds until Fall 1988. This is the first study of their

performance. In addition to testing whether fund managers have superior investment skills, I also examine whether actively managed international bond funds provide effective global diversification to U.S. investors. The benefits of a global *equity* portfolio have been advocated by several studies (Solnik (1974), Eun and Resnick (1984) and Grauer and Hakansson (1987)), but only recently have U.S. investors shown interest in international bonds. In Table 1, foreign country bond indices have return correlations with the U.S. market below .58, indicating a strong potential for risk reduction from adding foreign bonds to a domestic portfolio. My observations are consistent with the findings in Odier and Solnik (1993). Despite the low correlations among international bond indices, fund managers may fail to outperform the U.S. domestic bond index if they incur excessive expenses.

Odier and Solnik (1993) show that currency fluctuation has a greater impact on the volatility of foreign bonds than foreign stocks. A recent Business Week (1995) article reports that currency hedging reduced returns on international bond funds. Section 6.3 examines the role of currency hedging in international bond fund performance.

6.1 Hypotheses and Benchmarks for International Bond Funds

6.1.1 Hypothesis 4 - International bond fund managers do not have security selectivity ability.

I use the Salomon Brothers (SB) World Government Bond Index as a proxy for the market value weighted world bond index. As shown in Table 10, the GRS test does not reject the efficiency of the SB world bond index against 11 unmanaged country government bond indices. The countries are Australia, Belgium, Canada, France, Germany, Italy, Japan, The Netherlands, Switzerland, the United Kingdom and the United States. Five intercepts are positive but none is significant. Since the country bond indices are not actively managed, they should not exhibit timing ability. I use equation 9 to test whether excess returns on the SB world bond index are linearly related to excess returns on the country bond indices. In Table 10, 7 of 11 coefficients on the squared world index are positive but none is significant and the joint test does not reject a linear return relationship. As expected, the PPW measures are very similar to the regression intercepts from equation 1. The empirical results support the SB world bond index as an appropriate benchmark for evaluating managers' investment ability during my sample period. To outperform the SB world bond index, fund

managers must successfully select countries or individual government bond issues within each country.

Since corporate bonds usually have higher default risk and higher return than government bonds, using the world government bond index as a benchmark does not capture performance related to the risk-return characterisitcs of corporate bonds. If international bond funds invest in foreign or domestic corporate bonds, they may outperform the SB world bond index even if the managers do not have investment abilities. To examine whether the risk-return factor of coporate bonds is a an important component in international bond fund returns, I construct a 3-asset benchmark containing the SB non-U.S. government bond index, the SB U.S. government bond index and the regression residuals of the Lehman Brothers (LB) Corporate Bond index on the U.S. government bond index.[22] This 3-asset benchmark will provide some insight on the determinents of international bond fund returns.

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[22] Ibbotson and Associates only provides annual returns on foreign corporate bond indices. By regressing the Lehman Brothers Corporate Bond Index on the U.S. government bond index, I remove the U.S. bond market influence from the residuals. I then use the regression residuals as a proxy for the risk-return factor of domestic as well as foreign corporate bonds.

6.1.2 Hypothesis 5 - International bond funds do not provide efficient global diversification.

I use the Salomon Brothers (SB) Broad™ Index as the benchmark for testing H5. The bonds comprising the Broad™ Index include SB high-grade corporate bonds and 7, 10 and 30 year U.S. Treasury bonds. Rejecting the benchmark using the GHM test implies that adding international bond funds to the SB Broad™ Index produces a higher Sharpe ratio.

6.2 Empirical Results of International Bond Funds

6.2.1 Mean-variance Tests

Table 11 contains results of the mean-variance test and Jensen measures for 18 international bond funds. As of March 1994, there is no index fund which tracks international bond indices[23]. Hence, I cannot estimate transaction costs for passive bond indexing strategies. When interpreting performance test results of bond funds, transaction costs remain a factor if the funds underperform the benchmarks. With the SB world bond index, 11 funds have positive Jensen measures but only one is significant at 10%. Of the 7 funds with negative

[23] There are only three U.S. bond indices, the LB Aggregate, the LB U.S. Government/Corporate and the Salomon Brothers Broad™, that are currently tracked by index funds.

measures, one is significant at 5%. The Jensen measures range from -0.1823% to 0.2557%, averaging 0.0025% per month. The average monthly expense ratio is 0.1235% in 1993 for the 18 funds in the sample. It appears that international bond fund managers generate enough return to pay for their expenses. Unfortunately, there is no index fund that tracks the world bond index to allow a direct comparison between the actively managed funds and an indexing strategy net of all expenses. The GHM test does not reject the SB world bond index, indicating that fund managers jointly do not exhibit superior performance. The p-value of the GHM test is 0.8788 versus the p-value of the GRS test is 0.0972, demonstrating once again that the GRS test rejects the null too often. The difference between the GRS test and the Wald test is most likely due to adjustment for degrees of freedom because there are only 63 monthly observations and 18 funds to be tested.

Even though international bond funds do not outperform the world bond index, they may still add value to an U.S. investor's domestic portfolio through diversification. As of today, there is no international index bond fund, leaving direct foreign investment the only other alternative available to a U.S. investor desiring global diversification in the bond market. Using the SB Broad™ Index as benchmark, only 2 funds have positive Jensen measures but none is

significant. The GHM test does not reject the SB Broad™ Index, implying that adding international bond funds does not increase its Sharpe ratio despite the low correlation between U.S. and foreign bond indices. Given that the SB Broad™ Index in Table 1 has the lowest standard deviation among all bond indices and an average excess return higher than the world bond index during my sample period, it is not surprising that international fund managers cannot outperform the U.S. bond market.

Next I estimate the funds' sensitivities to each of the 3 factors in the 3-asset benchmark. In Table 12 all the funds have positive and significant coefficients for both the non-U.S. and U.S. government bond indices. Coefficients on the non-U.S. index range from 0.1747 to 0.8831, averaging 0.4717 while coefficients on the U.S. index range from 0.1884 to 1.4425, averaging 0.5505. All the funds have a positive coefficient on the LB corporate bond residuals and 8 are statistically significant, suggesting that corporate bonds remain an important factor in international bond fund returns even after controlling for foreign and U.S. government bonds.

6.2.2 PPW Tests

If bond fund managers have timing ability, the Jensen measures may be biased downwards. To determine whether market timing explains the poor

performance found in section 6.2.1, I compute the Positive Period Weight (PPW) measures which is robust to bias due to market timing. Table 13 shows that the PPW measures are very similar to the Jensen measures reported in Table 11. For the world bond index, 11 of 18 funds have positive PPW measures. Only two funds have significant PPW measures, one positive and one negative. For the SB Broad™ Index, the PPW measures are also consistent with the results in section 6.2.1, suggesting that any downward bias in the Jensen measures induced by managers' timing strategies is not economically significant.

6.2.3 Market Timing and Overall Performance

I use the SB World Bond Index as the benchmark in equation 9 to test whether international bond fund managers have market timing ability. The SB World Bond Index is efficient and linearly related to unmanaged country bond indices. Results in Table 14 suggest that fund managers may practice some timing strategies. Out of 18 funds, 14 have positive quadratic coefficients and 5 are significant. The Wald test rejects the null that all funds have zero quadratic coefficients.

To examine the role of market timing in the funds' overall performance, I compute the timing and selectivity components of the Treynor-Mazuy

performance measure. Security selectivity related performance is captured by the intercept in equation 9 and timing related performance is the product of the quadratic coefficient and the variance of the world bond index. As expected, the timing components are relatively large for funds with significant quadratic coefficients. However, the total performance measures combining timing and security selectivity are similar in magnitude to the PPW and the Jensen measures. Averaging over 18 funds, the timing-related performance is 0.0892%, the security selection performance is -0.0882%, and the total performance is 0.0010% per month. The Treynor-Mazuy measures further corroborate that manager's timing activities do not materially affect the qualitative conclusions of the mean-variance tests in 6.2.1..

6.3 Performance Tests Results with Currency Hedged Bond Benchmarks

There is no data available on the actual hedging activities of fund managers. To examine whether currency hedging is a factor in fund performance, I compare returns on international bond funds against the world bond index hedged using forward contracts. I apply two hedging strategies, the first computes the optimal weights on the forward contracts and on the world

bond index simultaneously, the second uses a hedge ratio of one. I refer to the first strategy as simultaneous hedge and the second strategy as unitary hedge.

To apply the simultaneous hedging strategy in performance evaluation, I increase the number of independent variables in equation 1 by three forward contracts: the deutschemark, Japanese Yen and Canadian Dollar. Adding the forward contracts removes the currency component in the Jensen measures. Against a benchmark containing the SB world bond index and three forward contracts, 12 of 18 funds have negative Jensen measures, ranging from -0.1974% to 0.2505%, averaging 0.0265% per month. All funds have lower Jensen measures against the simultaneously hedged world bond benchmark than the unhedged world bond index. The coefficients on the Canadian Dollar are positive for all funds with 13 significant and the coefficients on the Deutschemark and Japanese Yen are negative for most funds, with 8 and 10 significant respectively. The uniformity of the signs on the coefficients across funds is rather striking. The observed coefficients are consistent with short positions (hedging) on the deutschemark and Yen, and long positions on the

Canadian Dollar.[24] Even though returns on international bond funds are sensitive to exchange rate movements, the Jensen measures in Table 15 are essentially comparable to those in Table 11, especially for funds with statistically significant Jensen measures. Again, only two Jensen measures are significant, one positive and one negative. Interestingly, Scudder International Bond, the only fund with a significant positive Jensen measure, is the least sensitive to forward contract returns. The GHM test does not reject the simultaneously hedged world bond index, confirming that fund managers do not have security selectivity ability even after controlling for the effects of changes in exchange rates.

I use the U.S. Dollar Hedged Salomon Brothers World Government Bond Index as the unitary hedged world bond index. Salomon Brothers constructs U.S. Dollar Hedged returns for international and country bond indices using one-month forward contracts with the contract amount set to the bond price plus the accrued and expected coupon payment. I compute the unitary hedged

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[24] Even if managers do not make use of any currency hedging strategy, the funds may still obtain a positive coefficient on the Canada Dollar if they overweight Canadian government bonds. Similarily the negative coefficients could result from the funds underweighting German and Japanese government bonds.

returns for 7 countries[25] using equation 19 and my results are very similar to the returns from Salomon Brothers, with an average difference of 0.012% and average correlation over 0.98. If the future spot rate, $S_{i,t}$, is higher than the forward rate, $F_{i,t-1}$, hedging using the unitary strategy will result in lower returns than an unhedged strategy. At the same time, hedged returns often have lower volatility than unhedged returns. If a fund employs currency hedging, its performance may be reduced if the decrease in the hedged return is not off set by a corresponding decrease in volatility. Since the average future spot rates were higher than forward rates during my sample period for 10 currencies[26], currency hedging may be an explanation for their poor performance in Table 12. If fund managers have security and/or country selectivity ability but their performance is reduced by a unitary hedging strategy, they will outperform the SB U.S. Dollar Hedged World Bond Index but not the unhedged SB world bond index. Table 16 contains the performance results of the international bond funds. Ten funds have negative Jensen measures but none is significant. Most funds have worse performance against the unitary hedged world bond index than the unhedged

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[25] The 7 countries are: Australia, Canada, France, Germany, Japan, Switzerland and the United Kingdom.

[26] The 10 currencies are: Australia Dollar, Belgium Franc, Canadian Dollar, French Franc, Deutschemark, Lira, Japanese Yen, Gilder, Swiss Franc and British Pound.

index, with G.T. Global Strategic Income experiencing the largest decrease in its Jensen measure, from 0.052% to -0.1476%. A notable exception is T. Rowe Price International Bond whose Jensen measure increase from -0.1366% to -0.0072% when the world bond index is hedged. The GHM test does not reject the unitary hedged world bond index. The PPW and Treynor-Mazuy measures also demonstrate that the funds do not have exceptional performance. Interestingly, only one fund has a significant timing coefficient compared to 5 funds when the unhedged world bond index is used. Given that the funds underperform both the unitary hedged and the unhedged world index, currency hedging does not appear to be an explanation for the funds' lack of superior performance.

6.4 Performance Persistence

I divide the bond fund sample into subperiods of 32 and 31 observations respectively, and then estimate Jensen measures β_0^1 and β_0^2 for each subperiod. A significantly positive slope coefficient from regressing β_0^1 on β_0^2 implies persistence. I use the method of Grinblatt and Titman (1992) to compute the slope coefficient, which corrects the t-statistic for correlations in fund return residuals. I find no evidence of performance persistence against all three benchmarks in Table 17. The relatively small number of observations available

on international bond funds limits the power of the persistence test. Blake, Elton, and Gruber (1993) also do not observe any performance persistence in their sample of domestic bond mutual funds.

6.5 Discontinued Funds and Survivorship Bias

Morningstar first began a category for international bond funds in the Fall 1988 edition of *Mutual Fund Source Book*. Another popular mutual fund publication, *Investment Companies Yearbook* by Wiesenberger, did not have a classification for international bond funds until 1991. I look for funds with international bond as the investment objective in the *Mutual Fund Source Book* (Fall 1988) and funds with a primary objective as "I" (Income) and an investment policy of "C&I" (Canadian and International) and funds with an investment policy of "Bond" and names containing the words: "international", "world", "global", "foreign" plus "bond", "fixed income" in the 1989 *Investment Companies Yearbook*. I exclude funds that invest primarily in short-term instruments or stocks. There are 25 international bond funds listed in either the *Mutual Fund Source Book* or the *Investment Companies* as of December 1988.[27] Two funds:

[27] One fund, Keystone American World Bond, was first listed in Wiesenberger in 1990 even though the fund was found in January 1987.

Fennimore International Fund - Fixed Income, and Transatlantic Income Fund (later became Kleinwort Benson Global Income), were liquidated in 1990. Fund Source Global Bond, Hancock World Trust - World Fixed Income, and Pilgrim Foreign Invest International Bond were listed in the 1989 *Investment Companies Yearbook* but disappeared since the 1990 edition. Therefore return data on these three funds is only available until 1988. Meeschaert International Bond Trust changed name to Anchor International Bond Trust in 1990 and coverage on the new fund stopped after 1992. AMA Income Global Income and DFA Fixed Income Portfolio also disappeared since the 1992 edition. Monthly returns on the discontinued funds during their existence average 0.24% below the funds in my sample.

6.6 Summary of Empirical Tests on Bond Fund Performance

I use the SB World Government Bond Index as the benchmark to evaluate performance of international bond funds. Using 11 unmanaged country bond indices, the GRS test do not reject the efficiency of the SB World Government Bond Index and I did not find any evidence of nonlinearity. The international bond funds in my sample do not outperform the SB world bond index. The GHM test has a p-value of 0.8788 and the average Jensen measure is 0.0025% per

month. Using a 3-asset benchmark I find that international fund returns are sensitive to a corporate bond factor in addition to U.S. and non-U.S. government bonds. Surprisingly, the international bond funds do not outperform a domestic benchmark, the SB Broad™ Index. The robust PPW and Treynor-Mazuy performance measures are similar to the Jensen measures, confirming that conclusions from the mean-variance tests are not biased by fund managers' market timing strategies. Returns on international bond funds are sensitive to exchange rate movements. However, the funds do not outperform the SB Dollar Hedged world bond index, therefore their prosaic performance against the unhedged world bond index cannot be explained by a unitary hedge strategy.

The lack of superior performance against the world bond index prompts the question: why are there no international or regional bond index funds? In fact, there are only three domestic index bond funds, the Portico Bond Immdex which tracks the LB Aggregate Index, the SEI Index Bond Index which tracks the LB Corp/Gov't Index, and the Vanguard Bond Index Total Bond which tracks the SB Broad™ Index.

6.7 Balanced Benchmarks

Since a well diversified portfolio contains both stocks and bonds, a balanced benchmark is useful for evaluating mutual funds investing in both instruments. A market value-weighted world balanced index is a desirable candidate because it is identifiable ex ante and can be implemented by an indexing strategy. As discussed in section 2, an appropriate benchmark must be efficient relative to the investment opportunity set available to fund managers. Table 18 presents the mean-variance efficiency test of three balanced benchmark candidates. The GRS test rejects the world balanced index at just above 5% using 12 equity and 11 bond country indices. Twenty of 23 intercepts are positive and four are significant. Since the world balanced index is not efficient over the sample period, it is not an appropriate benchmark for performance evaluation. The 2-asset balanced benchmark containing the MSCI world equity and the SB world bond indices has a p-value of 0.1097 in the GRS test and is only marginally acceptable as a benchmark. Lastly I examine the 4-asset balanced benchmark containing three regional equity indices (U.S., Japan, and the rest of the world) and the SB world bond index. The GRS test for the 4-asset benchmark has a p-value of 0.2104 against 10 equity and 11 bond country indices. I control for the

effects of exchange rate changes using three forward contracts (Deutschemark, Japanese Yen, and Canadian Dollar) and the results remain essentially the same.

I compare the performance of 53 international equity and bond funds against these three benchmarks. Since the efficiency of the first two benchmarks are rejected by unmanaged country indices, superior performance by mutual funds against these benchmarks does not imply exceptional investment skills. In order to beat the efficient 4-asset balanced benchmark, fund managers must be able to identify outperforming countries, instruments (bond versus stocks), or securities within each country. In addition to the 3 international balanced benchmarks, I also compare the funds to a value-weighted U.S. balanced benchmark. Outperforming the U.S. balanced benchmark implies that the international funds provide global diversification to a U.S. investor holding a balanced domestic portfolio.

The sample period is from January 1989 through March 1994. Excess returns on international funds are computed net of expenses but excess returns on the benchmarks do not include transaction costs needed to implement an indexing strategy. Therefore, the empirical results in Table 19 may slightly understate fund performance. Since there are only 63 monthly observations and

there are 53 funds to be tested, inference based on the GRS test, a finite sample test, is more reliable and I do not report the Wald statistic from the large sample test. Both the GHM and GRS tests do not reject any of the benchmarks, implying that international fund managers do not exhibit superior performance. More than half of the funds have negative Jensen measures against the U.S. balanced benchmark. Only two funds have significant Jensen measures and they are both negative. The funds perform relatively well against the world balanced index, with 41 positive Jensen measures and 6 are significant. However, the GHM test indicates that jointly the funds do not outperform the world balanced index even though it is inefficient during my sample period. The funds perform substantially worse against the efficient 4-asset balanced benchmark, with 35 negative Jensen measures and 5 are significant. Only 2 funds have positive and significant Jensen measures. Table 20 contains the PPW measures for the 53 funds. The overall results of the PPW tests are consistent with the Jensen measures, indicating that any potential bias in the mean-variance tests introduced by nonlinearity or market timing is not economically important.

7. Conclusions and Future Research

This dissertation examines the value provided by actively managed international mutual funds. Within a sample of funds, a few will exhibit superior performance simply by chance. To conclude that active management adds value, the funds must jointly outperform a passive benchmark. With few exceptions, open-end mutual funds cannot be sold short. Therefore, investors can only profit from superior, not inferior performance. I compute the Jensen measures for individual funds and apply the GHM test, which accounts for the short-sale restriction, to determine if the funds jointly outperform the benchmark. As a robustness check, I also compute the PPW and Treynor-Mazuy performance measures.

Domestic mutual fund studies (Lehman and Modest 1987 and Grinblatt and Titman 1994) find that performance measures are sensitive to benchmarks. Selecting an appropriate benchmark for international equity and bond funds is not a trivial task. International asset pricing models do not identify an easily observable optimal portfolio. I use the 12-country equity benchmark, the 3-region equity benchmark, and the Wilshire 5000 Index to test the value provided by international equity funds. The two benchmarks for evaluating

international bond funds are the SB World Government Bond Index, and the SB Broad™ Index. With the exception of the world bond index, each of these benchmarks is identifiable ex ante, not easily beaten, and can be implemented through an indexing strategy.

The MSCI world index is not efficient during my sample period and therefore not an appropriate benchmark for evaluating managers' investment ability. Nonetheless, international equity fund managers successfully exploited this inefficiency and they outperform the MSCI world index during my sample period. Compared to the efficient benchmarks, equity and bond fund managers do not exhibit exceptional security or country selectivity abilities. The lack of superior investment skills among fund managers is consistent with evidence from domestic mutual fund studies. International equity funds provide effective global diversification to a U.S. investor holding a domestic equity portfolio. However, international bond funds do not outperform the domestic SB Broad™ Index during my sample period. I verify results of the mean-variance tests and the Jensen measures against the robust PPW and Treynor-Mazuy performance measures. All three performance measures are very similar for the same benchmark, confirming that my conclusions are not materially affected by any observed nonlinearity or timing strategies.

Results from this dissertation and studies on domestic funds suggest that active management cannot outperform indexing strategies. At the same time, growth in actively managed funds greatly exceeds index funds. The 1995 *Business Week Guide to Mutual Funds* contains ratings of over 1,800 mutual funds, but only 32 index funds are listed and the 10 largest equity funds and the 10 largest bond funds are all actively managed. Since fund managers do not produce superior risk-adjusted returns, their popularity must be due to other factors. There is very little research on the determinants of individual investors' choice of funds. Most studies (Chevalier and Ellison (1995), Sirri and Tufano (1993), Ippolito (1992)) focus on the relationship between historic performance and future cash flow into mutual funds and they find that funds with the highest returns attract more new investment. Ippolito (1992) identifies an asymmetry in investors' response to historic performance. He shows that growth rate for the best funds is larger than the rate of decrease for underperforming funds. These studies are the first few attempts to examine the characteristics of the individual investor's demand for mutual funds. As suggested by Brennan (1995), a fruitful area for future research is to gain better understanding of how the individual investor formulates his investment decision. For example, what information source does the individual investor rely on when making investment decisions? Can information with low search cost lead to a profitable investment strategy?

Do investors value non-financial factors when choosing an investment? Traditionally, academic research only emphasizes on the financial factors and rule out non-financial factors *a priori*. How do investors save? What are the time series characteristics of cash flows to mutual funds? The answers to these questions can provide important insights to the role of mutual funds as a financial intermediary.

Table 1
Summary Statistics: Monthly Excess Returns in US$ (%)

	Sample Average	Sample Standard Deviation
Equity Regional Indices: January 1985 to March 1994		
30-day Treasury Bill [a]	0.4781	0.1544
Wilshire 5000 Index	0.7695	4.5502
MSCI World Equity Index	0.8887	4.5380
World Equity excluding U.S. and Japan	1.2258	5.0118
US$ Hedge World Equity Index	0.4146	4.4713
Forward Contracts [b]*: January 1985 to March 1994*		
Deutschmark	0.6267	3.6980
Japanese Yen	0.7405	3.4685
Canadian Dollar	0.1714	1.3023
MSCI Country Equity Indices: January 1985 to March 1994		
Australia	1.1391	7.9917
Belgium	1.6707	6.2652
Canada	0.3350	4.6498
France	1.4862	6.8134
Germany	1.2641	6.9575
Hong Kong	2.1156	8.4229
Italy	1.3858	8.1230
Japan	1.2137	8.0674
Netherlands	1.3246	4.6339
Switzerland	1.4125	5.7150
United Kingdom	1.1541	6.3923
United States	0.7903	4.5132

[a] Statistics for the 30-day Treasury Bill are based on total return, not excess return.

[b] Since forward contracts do not require initial investment, we standarize the forward contract returns by the initial spot price: $f_{i,t} = (S_{i,t} - F_{i,t-1})/S_{i,t-1}$ where $S_{i,t}$ is the spot exchange rate in U. S. dollars per currency i at time t and $F_{i,t-1}$ is the one month forward rate for currency i at time t-1 for delivery at time t.

Table 1 (cont'd).

	Investment Objective	Sample Average	Sample Standard Deviation
Equity Funds: January 1985 to March 1994			
Alliance Canadian	Foreign	0.1639	5.1920
Alliance Global Small Cap A	World	0.5124	6.2953
Alliance International A	Foreign	0.9450	5.3507
Bailard, Biehl International Equity	Foreign	0.6990	5.2541
Centerland Kleinwort International Equity B	World	1.0357	5.1152
Dean Witter WorldWide Investment	Foreign	0.7413	4.2240
EuroPacific Growth	Foreign	1.0744	4.2992
Fidelity Overseas	Foreign	1.2877	5.7635
First Invest Global	World	0.8814	5.5050
FT International Equity A	Foreign	0.9669	5.1026
G.T. Global New Pacific Growth A	Pacific	1.0146	5.5248
IDS International	World	0.8654	5.0865
Invesco Pacific Basin	Pacific	0.9306	6.2257
Japan	Pacific	1.1103	6.6873
Kemper International	Foreign	0.9274	4.7528
Keystone International	Foreign	0.6699	4.8447
Merrill Lynch Global Holding A	World	0.7641	3.9580
Merrill Lynch Pacific A	Pacific	1.3291	6.2727
New Perspective	World	0.9045	4.0611
Oppenheimer Global A	World	1.1874	5.4000
PaineWebber Atlas Global Growth A	World	0.9304	4.7760
Princor World	Foreign	0.6747	5.2529
Prudential Global B	World	0.7610	4.8699
Putnam Global Growth A	World	0.9993	4.5220
RSI Retirement International Equity	World	0.8483	5.0018
Scudder International	Foreign	1.0101	4.8447
Smith Barney Shearson Global Opportunity A	World	0.4566	4.7167
T. Rowe Price International Stock	World	1.1341	4.9524
Templeton Foreign	Foreign	1.0784	3.9158
Templeton Growth	World	0.8620	4.2586
Templeton Smaller Company Growth	World	0.7329	4.7092
Templeton World	World	0.7500	4.2494
United International Growth	Foreign	0.8638	4.5028
Vanguard International Growth	Foreign	1.0704	5.1442
Vanguard/Trustees' Equity International	Foreign	1.0117	4.4145

Table 1 (cont'd).

	Investment Objective	Sample Average	Sample Standard Deviation
Bond Regional Indices: January 1989 to March 1994			
30-day Treasury Bill [a]		0.4462	0.1827
SB World Government Bond Index		0.3373	1.8952
SB Non-U.S. Government Bond Index		0.3363	2.9557
SB Broad Index		0.3724	1.2095
LB Corporate Bond Index		0.4114	1.3691
SB US$ World Goverment Bond Index		0.2379	1.0442
SB Country Bond Indices: Jaunary 1989 to March 1994			
Australia		0.4893	3.2824
Belgium		0.5182	3.3762
Canada		0.2751	2.6388
France		0.5565	3.5071
Germany		0.3411	3.6784
Italy		0.4449	3.9599
Japan		0.4451	3.6068
The Netherlands		0.3763	3.6234
Switzerland		0.1687	3.6902
United Kingdom		0.3095	4.2298
United States		0.3595	1.3271
Bond Funds: January 1989 to March 1994			
Capital World Bond	Worldwide Bond	0.2579	1.6859
Fidelity Global Bond	Worldwide Bond	0.2528	1.8361
Franklin Global Govt Income	Worldwide Bond	0.1766	1.8250
G.T. Global Govt Income A	Worldwide Bond	0.3290	2.0958
G.T. Global Strategic Inc A	Worldwide Bond	0.4000	3.1271
Hancock Freedom Global Inc B	Worldwide Bond	0.0576	1.6272
Keystone Amer World Bond A	Worldwide Bond	0.1801	1.9072
Lord Abbett Global Income	Worldwide Bond	0.3370	1.9202
Merrill Lynch Global Bond A	Worldwide Bond	0.4074	2.0139
MFS World Governments A	Worldwide Bond	0.3295	2.1588
PaineWebber Global Income B	Worldwide Bond	0.2179	1.6302
Putnam Global Govtl Income A	Worldwide Bond	0.3406	1.9194
Scudder International Bond	Worldwide Bond	0.6138	2.3004
Smith Barney Shear Glob Bd B	Worldwide Bond	0.2117	1.6548
T. Rowe Price Intl Bond	Worldwide Bond	0.3231	2.7489
Templeton Income	Worldwide Bond	0.2189	1.6670
TNE Global Government A	Worldwide Bond	0.1216	1.8351
Van Eck World Income	Worldwide Bond	0.2295	2.1929

Table 1 (cont'd).

Correlations of Excess Returns on Equity Indices (January 1985-March 1994)

	Morgan Stanley Capital International Indices												
	MSCI World Index	Australia	Belgium	Canada	France	Germany	Hong Kong	Italy	Japan	Nether-lands	Switzer-land	U.K.	U.S.
MSCI World Index	1.0000												
Australia	0.4425	1.0000											
Belgium	0.6457	0.2719	1.0000										
Canada	0.6566	0.5781	0.4252	1.0000									
France	0.6871	0.2808	0.7263	0.4311	1.0000								
Germany	0.5552	0.2813	0.6545	0.3105	0.7112	1.0000							
Hong Kong	0.4714	0.5010	0.3316	0.5767	0.3295	0.3123	1.0000						
Italy	0.5221	0.1681	0.4495	0.3311	0.5289	0.5131	0.2271	1.0000					
Japan	0.7855	0.1772	0.4297	0.2749	0.4359	0.3052	0.1325	0.4471	1.0000				
Netherlands	0.7499	0.4500	0.6699	0.6195	0.6632	0.7056	0.4584	0.4215	0.4186	1.0000			
Switzerland	0.6963	0.3625	0.6184	0.4947	0.6267	0.6941	0.3880	0.4320	0.4083	0.7583	1.0000		
U.K.	0.7571	0.5072	0.5814	0.5813	0.5833	0.5004	0.4731	0.3455	0.4140	0.7457	0.6609	1.0000	
U.S.	0.7190	0.4042	0.4566	0.7427	0.5017	0.3618	0.4759	0.2545	0.2190	0.6058	0.5247	0.6017	1.0000

Correlations of Excess Returns on Bond Indices (January 1989-March 1994)

	Salomon Brothers International Bond Indices											
	SB World Bond Index	Australia	Belgium	Canada	France	Germany	Italy	Japan	Nether-lands	Switzer-land	U.K.	U.S.
SB World Bond Index	1.0000											
Australia	0.2098	1.0000										
Belgium	0.8043	0.0436	1.0000									
Canada	0.3573	0.5409	0.1224	1.0000								
France	0.8441	0.0667	0.9469	0.1075	1.0000							
Germany	0.8591	0.0550	0.9383	0.1089	0.9570	1.0000						
Italy	0.6658	-0.0173	0.7091	0.1774	0.7360	0.7303	1.0000					
Japan	0.7954	0.0602	0.5311	0.1089	0.5428	0.5859	0.3830	1.0000				
Netherlands	0.8653	0.0641	0.9417	0.1135	0.9636	0.9945	0.7214	0.5797	1.0000			
Switzerland	0.8066	0.0368	0.8571	0.0387	0.8615	0.8936	0.6472	0.5915	0.8997	1.0000		
U.K.	0.7916	0.2930	0.6885	0.3751	0.6990	0.6802	0.6249	0.5814	0.6853	0.6312	1.0000	
U.S.	0.6487	0.3156	0.2849	0.5793	0.3419	0.3312	0.2103	0.2766	0.3529	0.3277	0.4015	1.0000

Table 2

Tests of the Mean-variance Efficiency of the Equity Benchmarks

The sample period is January 1985-March 1994. The model is $\mathbf{a_t} = \beta_0 + \mathbf{p_t}B + \mathbf{e_t}$ where $\mathbf{a_t}$ are excess returns on country indices and $\mathbf{p_t}$ are excess returns on the world index and the 3-region benchmark. β_{0i} is the regression intercept and PPW_i is the positive period weight measure for country i. The null and alternative hypotheses of the GRS test are $\beta_0=0$ and $\beta_0 \neq 0$ respectively. The GRS statistic F_{MV} has an F distribution and the Wald test statistics, $WALD_{MV}$ and $WALD_{PPW}$, are distributed as χ^2.

Benchmarks	**MSCI World Index**			
Countries	β_0	t statistics[a]	PPW	z statistics[b]
Australia	0.4476	0.5600	0.3124	0.3818
Belgium	0.8784	2.0285 **	0.8581	1.9661 **
Canada	-0.2684	-0.7634	-0.3026	-0.8403
France	0.5683	1.2295	0.5553	1.2080
Germany	0.5075	0.9215	0.4533	0.8269
Hong Kong	1.3330	1.6570	1.1953	1.4752
Italy	0.5554	0.8552	0.5669	0.8718
Japan	-0.0312	-0.0602	0.0345	0.0652
The Netherlands	0.6422	2.1421 **	0.6145	2.0457 **
Switzerland	0.6290	1.6238	0.6025	1.5682
United Kingdom	0.2040	0.5123	0.1949	0.4922
United States	0.1539	0.4684	0.1203	0.3604
Joint tests on all countries	Statistic	P value	Statistic	P value
GRS Test: F_{MV} (12,98)	2.2142	0.0165 **		
$WALD_{MV}$, $WALD_{PPW}$ (12)	27.9902	0.0056 ***	27.3102	0.007 ***
Subperiod GRS Test of the World Index				
F_{MV}: (12,281) Jan 70-Mar 94	1.7253	0.0611 *		
F_{MV}: (12,219) Feb 70-May 89	1.3469	0.1937 [c]		
F_{MV}: (12,38) Jan 90-Mar 94	2.1485	0.0366 **		

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

[b] z statistic computed using the GMM estimated variance.

[c] Harvey (1990) reported their p value of the GRS test to be 0.304 for 17 countries.

Table 2 (cont'd).

Benchmarks	**4-asset Benchmark: MSCI World, Deutschemark, Yen, Canadian $**				**3-region Benchmark: U.S., Japan, the Rest of the World**			
Countries	β_0	t statistics[a]	PPW	z statistics[b]	β_0	t statistics [a]	PPW	z statistics[b]
Australia	0.5526	0.8438	0.2723	0.4482	-0.0269	-0.0365	-0.1889	-0.2674
Belgium	0.6615	1.6389	0.5315	1.3518	0.5991	1.6237	0.5960	1.5969
Canada	-0.1890	-0.7575	-0.5453	-2.3045 **	-0.4638	-1.7214 *	-0.4726	-1.7603 *
France	0.4232	0.9481	0.3069	0.7392	0.2177	0.5301	0.2306	0.5702
Germany	0.4269	0.8824	0.3533	0.8026	-0.0145	-0.0356	-0.0284	-0.0701
Hong Kong	1.6366	2.3401 **	1.4929	1.9582 *	0.8199	1.2014	0.6970	1.0594
Italy	0.4333	0.6725	0.0889	0.1179	0.3379	0.5350	0.3683	0.5889
Japan	-0.3783	-0.9596	-0.6292	-1.5807	na	na	na	na
The Netherlands	0.5805	2.2185 **	0.4923	1.8229 *	0.3474	1.5759	0.3563	1.6233
Switzerland	0.5974	1.6342	0.5083	1.2219	0.2936	0.9537	0.2980	0.9696
United Kingdom	0.1401	0.3695	-0.0216	-0.0561	-0.2203	-0.7774	-0.1767	-0.6363
United States	0.4488	1.9208 *	0.7784	3.3190 ***	na	na	na	na
Joint tests on all countries	Statistic	P value	Statistic	P value	Statistic	P value	Statistic	P value
GRS Test: F_{MV} (10,98)	2.5100	0.0066 ***			1.3542	0.2132		
$WALD_{MV}$, $WALD_{PPW}$ (12,10)	35.4305	0.0004 ***	56.2626	0.0000 ***	14.9976	0.1321	14.7890	0.1399

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

[b] z statistic computed using the GMM estimated variance.

Table 3
Transaction Costs Estimation

The estimated model is $m_{it} = \delta_{0i} + \delta_{1i}\, p_{it} + \varepsilon_{it}$ where m_{it} is the monthly excess return on index fund i and p_{it} is the monthly excess return on the fund's benchmark. The estimated total transaction cost is the absolute value of δ_{0i} plus the Vanguard transaction fee amortized over a a five year holding horizon. Vanguard charges a transaction fee for purchase of shares in their funds. The sample periods are from July 1990 through March 1994 for the Vaguard International Equity Europe and Pacific funds and from May 1992 through March 1994 for the Vanguard Index Total Stock Market fund.

Benchmark	Indexed Fund	Regression Intercept (δ_{0i})	t statistic	R^2	Vanguard Transaction Fee	Estimated Total Transaction Cost	Expense Ratio
Wilshire 5000	Vanguard Index Total Stock Market	-0.0314	-1.3361	0.9979	0.2500	0.0356	0.0167
MSCI Europe Free	Vanguard Intl Equity Europe	-0.0257	-0.3412	0.9894	1.0000	0.0424	0.0267
MSCI Pacific	Vanguard Intl Equity Pacific	-0.0145	-0.2226	0.9969	1.0000	0.0312	0.0267

Table 4
International Equity Mutual Fund Performance: Mean-variance Tests

The sample period is January 1985-March 1994. The model is $\mathbf{a}_t = \beta_0 + \mathbf{p}_t\mathbf{B} + \mathbf{e}_t$ where $\mathbf{a}_t$ are excess returns on mutual funds and $\mathbf{p}_t$ are excess returns on the benchmarks. β_{0i} is the Jensen measure for fund i. The null and alternative hypotheses of the GHM test are $\beta_0 = 0$ and $\beta_0 \geq 0$ respectively. The GHM statistic, KT_{MV} is asymptotically distributed as a weighted mixture of χ^2.

The null hypothesis of the GRS test is $\beta_0=0$ versus the alternative hypothesis that $\beta_0 \neq 0$. The GRS test statistic F_{MV} has an F distribution. The Wald statistics $WALD_{MV}$ is distributed as χ^2.

Benchmarks	12-country Benchmark		Wilshire 5000	
International Mutual Funds	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]
Alliance Canadian	-0.1429	-0.7958	-0.4490	-1.3351
Alliance Global Small Cap A	-0.4245	-1.5422	-0.4228	-1.8884 *
Alliance International A	-0.3948	-1.7308 *	0.4192	0.9778
Bailard, Biehl Intl Equity	-0.6014	-3.1215 ***	0.3280	0.7070
Centerland Kleinwrt Intl EqB	-0.2742	-1.4852	0.5639	1.2972
Dean Witter WorldWide Invmnt	-0.4079	-3.7868 ***	0.2451	0.8386
EuroPacific Growth	-0.0454	-0.3289	0.6164	1.8461 *
Fidelity Overseas	-0.0035	-0.0135	0.8300	1.7103 *
First Invest Global	-0.4175	-1.6140	0.2879	0.7095
FT International Equity A	-0.4473	-2.5249 **	0.5072	1.1567
G.T. Global New Pacific Gr A	-0.2636	-0.7876	0.6119	1.2031
IDS International	-0.4754	-1.9538 *	0.3995	0.8769
Invesco Pacific Basin	-0.5798	-2.0346 **	0.4127	0.7067
Japan	-0.1168	-0.4097	0.8778	1.3619
Kemper International	-0.3314	-1.8106 *	0.4880	1.2193
Keystone International	-0.5857	-3.4935 ***	0.2733	0.6519
Merrill Lynch Global Holdg A	-0.2441	-2.3907 **	0.2613	1.1244
Merrill Lynch Pacific A	0.0254	0.0581	0.9176	1.5297
New Perspective	-0.0430	-0.3874	0.3575	1.6436
Oppenheimer Global A	-0.1623	-0.6810	0.5911	1.4294
PaineWebber Atlas Global GrA	-0.2591	-1.3815	0.3952	1.0900
Princor World	-0.5593	-2.0635 **	0.1219	0.2957
Prudential Global B	-0.4168	-1.9244 *	0.2518	0.6538
Putnam Global Growth A	-0.1106	-0.6510	0.4469	1.5758
RSI Retrmnt Intl Equity	-0.4051	-2.5390 **	0.4404	1.0195
Scudder International	-0.3002	-1.8660 *	0.5230	1.3065
Smith Barney Shear Glob OppA	-0.7335	-4.2570 ***	-0.1269	-0.3945
T. Rowe Price Intl Stock	-0.2282	-1.6530	0.6742	1.6298
Templeton Foreign	0.1653	1.3342	0.6239	2.2808 **
Templeton Growth	-0.0653	-0.5140	0.2608	1.2417
Templeton Smaller Comp Grth	-0.2759	-1.3061	0.0806	0.3264
Templeton World	-0.1126	-0.8167	0.1252	0.7238
United International Growth	-0.2602	-1.6864 *	0.4180	1.1919
Vanguard Intl Growth	-0.2606	-1.5313	0.6447	1.4595
Vanguard/Trustees' Eqty Intl	-0.0974	-0.6772	0.6125	1.6620 *
Joint performance test on all funds	Statistic	P value	Statistic	P value
GHM Test: KT_{MV} (1 to 35)	27.22	0.6700	46.87	0.0633 *
GRS Test: F_{MV} (35;64,75,75,73)	1.84	0.0174 **	1.80	0.0176 **
Wald Test: $WALD_{MV}$ (35)	120.24	0.0000 ***	96.67	0.0000 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 4 (cont'd).

Benchmarks	World Index		3-region Benchmark	
International Mutual Funds	**Jensen** t statistics[a]		**Jensen** t statistics[a]	
Alliance Canadian	-0.4271	-1.0178	-0.6122	-1.9157 *
Alliance Global Small Cap A	-0.2664	-0.5462	-0.4501	-2.0608 **
Alliance International A	0.1116	0.3731	-0.1629	-0.7091
Bailard, Biehl Intl Equity	-0.1480	-0.5961	-0.2539	-1.2326
Centerland Kleinwrt Intl EqB	0.1915	0.7448	-0.0146	-0.0688
Dean Witter WorldWide Invmnt	0.0169	0.0937	-0.1599	-1.2503
EuroPacific Growth	0.4075	1.5534	0.1403	0.8332
Fidelity Overseas	0.3773	1.2485	0.2524	0.9616
First Invest Global	0.0004	0.0015	-0.1887	-0.7635
FT International Equity A	0.1440	0.5361	-0.0713	-0.3184
G.T. Global New Pacific Gr A	0.2943	0.7528	0.1162	0.3017
IDS International	0.0381	0.1323	-0.1671	-0.6636
Invesco Pacific Basin	-0.0502	-0.1379	-0.1145	-0.2869
Japan	0.1908	0.4532	0.3198	1.0913
Kemper International	0.1867	0.6824	-0.0634	-0.2983
Keystone International	-0.1465	-0.7086	-0.2592	-1.4246
Merrill Lynch Global Holdg A	0.0800	0.5097	-0.0751	-0.8235
Merrill Lynch Pacific A	0.3928	1.0196	0.4383	1.0313
New Perspective	0.2592	1.1161	0.0301	0.2850
Oppenheimer Global A	0.3723	1.0477	0.0375	0.1629
PaineWebber Atlas Global GrA	0.1386	0.5303	-0.0651	-0.3060
Princor World	-0.0493	-0.1294	-0.3842	-1.3906
Prudential Global B	-0.0432	-0.1715	-0.1881	-0.8132
Putnam Global Growth A	0.2756	1.1347	0.0122	0.0866
RSI Retrmnt Intl Equity	0.0066	0.0315	-0.1463	-0.9481
Scudder International	0.2185	0.8269	-0.0487	-0.2772
Smith Barney Shear Glob OppA	-0.3191	-1.1719	-0.5453	-2.8776 ***
T. Rowe Price Intl Stock	0.3098	1.3457	0.0740	0.4832
Templeton Foreign	0.4724	1.9835 **	0.2337	1.6774 *
Templeton Growth	0.2566	0.8466	0.0527	0.3103
Templeton Smaller Comp Grth	0.1128	0.3014	-0.0630	-0.2754
Templeton World	0.1360	0.4835	-0.0488	-0.3561
United International Growth	0.1335	0.6079	-0.0636	-0.3702
Vanguard Intl Growth	0.2338	0.9700	0.0000	-0.0003
Vanguard/Trustees' Eqty Intl	0.2906	1.3557	0.0961	0.6236
Joint performance test on all funds	Statistic	P value	Statistic	P value
GHM Test: KT_{MV} (1 to 35)	46.53	0.0534 *	37.51	0.2128
GRS Test: F_{MV} (35;64,75,75,73)	1.71	0.0263 **	1.84	0.0147 **
Wald Test: $WALD_{MV}$ (35)	94.47	0.0000 ***	109.40	0.0000 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 5
International Equity Mutual Fund Performance: PPW Measures

The sample period is January 1985-March 1994. PPWi is the Positive Period Weight Measure for fund i. The null hypothesis is **PPW = 0** versus the alternative hypothesis that **PPW ≠ 0**. The Wald statistic $WALD_{PPW}$ is distributed as χ^2.

Benchmarks	12-country Benchmark		Wilshire 5000	
International Mutual Funds	**PPW**	z statistics[a]	**PPW**	z statistics[a]
Alliance Canadian	-0.1923	-1.1338	-0.4713	-1.3977 *
Alliance Global Small Cap A	-0.4732	-1.8248 **	-0.4301	-1.9216 **
Alliance International A	-0.4477	-2.0255 **	0.3620	0.8632
Bailard, Biehl Intl Equity	-0.5894	-3.2234 ***	0.2905	0.6330
Centerland Kleinwrt Intl EqB	-0.3371	-2.0016 **	0.5122	1.1998
Dean Witter WorldWide Invmnt	-0.4077	-3.9218 ***	0.2179	0.7576
EuroPacific Growth	-0.0582	-0.4386	0.5683	1.7417 **
Fidelity Overseas	-0.0609	-0.2712	0.7915	1.6409 *
First Invest Global	-0.4407	-1.7998 **	0.2632	0.6546
FT International Equity A	-0.5043	-3.1415 ***	0.4485	1.0462
G.T. Global New Pacific Gr A	-0.2430	-0.7943	0.5509	1.1012
IDS International	-0.5385	-2.6864 ***	0.3317	0.7415
Invesco Pacific Basin	-0.6570	-2.7661 ***	0.3399	0.5913
Japan	-0.1992	-0.7370	0.8518	1.3380 *
Kemper International	-0.3854	-2.3295 ***	0.4359	1.1089
Keystone International	-0.6213	-3.8635 ***	0.2389	0.5780
Merrill Lynch Global Holdg A	-0.2229	-2.2099 **	0.2481	1.0758
Merrill Lynch Pacific A	-0.0864	-0.2420	0.8473	1.4284 *
New Perspective	-0.0193	-0.1869	0.3390	1.5740 *
Oppenheimer Global A	-0.1787	-0.8274	0.5369	1.3188 *
PaineWebber Atlas Global GrA	-0.2987	-1.8070 **	0.3438	0.9648
Princor World	-0.6413	-2.6464 ***	0.0522	0.1300
Prudential Global B	-0.4295	-2.2930 **	0.2119	0.5539
Putnam Global Growth A	-0.0699	-0.4225	0.4226	1.5095 *
RSI Retrmnt Intl Equity	-0.4066	-2.7729 ***	0.3995	0.9360
Scudder International	-0.3539	-2.4766 ***	0.4664	1.1927
Smith Barney Shear Glob OppA	-0.7827	-5.0104 ***	-0.1776	-0.5631
T. Rowe Price Intl Stock	-0.2529	-2.0601 **	0.6282	1.5463 *
Templeton Foreign	0.1588	1.3632 *	0.5936	2.2011 **
Templeton Growth	-0.0514	-0.4538	0.2389	1.1510
Templeton Smaller Comp Grth	-0.3252	-1.6044 *	0.0499	0.2054
Templeton World	-0.0828	-0.6704	0.1174	0.6835
United International Growth	-0.2559	-1.6498 **	0.3911	1.1305
Vanguard Intl Growth	-0.2793	-1.7620 **	0.5962	1.3709 *
Vanguard/Trustees' Eqty Intl	-0.1034	-0.7651	0.5805	1.6026 *
Joint performance test on all funds	Statistic	P value	Statistic	P value
Wald Test: $WALD_{MV}$ (35)	100.77	0.0000 ***	95.65	0.0000 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] PPW coefficients and z statistics are computed using the generalized method of moments.

Table 5 (cont'd).

Benchmarks	World Index		3-region Benchmark	
International Mutual Funds	PPW	z statistics[a]	PPW	z statistics[a]
Alliance Canadian	-0.4726	-1.1001	-0.6399	-1.9997 **
Alliance Global Small Cap A	-0.3330	-0.6787	-0.4713	-2.1570 **
Alliance International A	0.0534	0.1805	-0.2076	-0.9406
Bailard, Biehl Intl Equity	-0.1629	-0.6585	-0.2735	-1.3527 *
Centerland Kleinwrt Intl EqB	0.1499	0.5853	-0.0623	-0.3086
Dean Witter WorldWide Invmnt	-0.0142	-0.0782	-0.1769	-1.4114 *
EuroPacific Growth	0.3590	1.3615 *	0.0994	0.6226
Fidelity Overseas	0.3634	1.2033	0.2120	0.8200
First Invest Global	-0.0303	-0.1079	-0.2101	-0.8622
FT International Equity A	0.0968	0.3609	-0.1225	-0.5775
G.T. Global New Pacific Gr A	0.2442	0.6255	0.0644	0.1733
IDS International	-0.0166	-0.0565	-0.2444	-1.0340
Invesco Pacific Basin	-0.1136	-0.3126	-0.2181	-0.5840
Japan	0.2049	0.4807	0.2891	0.9972
Kemper International	0.1410	0.5138	-0.1034	-0.5039
Keystone International	-0.1644	-0.7991	-0.2851	-1.5980 *
Merrill Lynch Global Holdg A	0.0613	0.3874	-0.0719	-0.7760
Merrill Lynch Pacific A	0.3603	0.9195	0.3311	0.8149
New Perspective	0.2262	0.9627	0.0216	0.2059
Oppenheimer Global A	0.3109	0.8653	-0.0122	-0.0549
PaineWebber Atlas Global GrA	0.0902	0.3359	-0.1165	-0.5707
Princor World	-0.1231	-0.3185	-0.4460	-1.6917 **
Prudential Global B	-0.0776	-0.2994	-0.2355	-1.0409
Putnam Global Growth A	0.2398	0.9954	0.0088	0.0627
RSI Retrmnt Intl Equity	-0.0178	-0.0854	-0.1793	-1.1834
Scudder International	0.1660	0.6279	-0.1000	-0.6155
Smith Barney Shear Glob OppA	-0.3730	-1.3226 *	-0.5936	-3.2297 ***
T. Rowe Price Intl Stock	0.2746	1.1958	0.0408	0.2808
Templeton Foreign	0.4360	1.8174 **	0.2104	1.5413 *
Templeton Growth	0.2064	0.6758	0.0325	0.1964
Templeton Smaller Comp Grth	0.0495	0.1311	-0.1046	-0.4740
Templeton World	0.0961	0.3413	-0.0518	-0.3838
United International Growth	0.1084	0.4972	-0.0736	-0.4333
Vanguard Intl Growth	0.2004	0.8323	-0.0326	-0.2032
Vanguard/Trustees' Eqty Intl	0.2632	1.2501	0.0765	0.5081
Joint performance test on all funds	Statistic	P value	Statistic	P value
Wald Test: $WALD_{MV}$ (35)	92.97	0.0000 ***	104.82	0.0000 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] PPW coefficients and z statistics are computed using the generalized method of moments.

Table 6
International Equity Mutual Funds: Comparison of Performance Measures

The sample period is January 1985-March 1994. The Treynor-Mazuy model is $a_t = \varpi_0 + p_t\varpi_1 + p_t^2\varpi_2 + e_t$ where a_t are excess returns on mutual funds and p_t is excess returns on the world index. $\varpi_{2,i}$ is fund i's regression coefficient for the squared excess returns on the world index. The Jensen measure model is $a_t = \beta_0 + p_t B + e_t$ where β_{0i} is the Jensen measure for fund i. PPW_i is the Positive Period Measure for fund i.

Benchmark: World Equity Index			Timing	Security Selectivity	Treynor-Mazuy	PPW Measure	Jensen Measure
International Mutual Funds	ϖ_2	t statistics[a]	$\varpi_2 * var(p_t)$	ϖ_0	$\varpi_0+\varpi_2*var(p_t)$	**PPW**	**Jensen**
Alliance Canadian	-0.0262	-1.8196 *	-0.5396	0.1471	-0.3925	-0.4726	-0.4271
Alliance Global Small Cap A	-0.0393	-3.1813 ***	-0.8093	0.5938	-0.2155	-0.3330	-0.2664
Alliance International A	-0.0364	-5.4382 ***	-0.7496	0.9095	0.1599	0.0534	0.1116
Bailard, Biehl Intl Equity	-0.0097	-1.4891	-0.1998	0.0652	-0.1346	-0.1629	-0.1480
Centerland Kleinwrt Intl EqB	-0.0251	-4.9734 ***	-0.5169	0.7413	0.2244	0.1499	0.1915
Dean Witter WorldWide Invmnt	-0.0199	-6.3501 ***	-0.4098	0.4539	0.0441	-0.0142	0.0169
EuroPacific Growth	-0.0297	-5.0517 ***	-0.6116	1.0580	0.4464	0.3590	0.4075
Fidelity Overseas	-0.0060	-0.8047	-0.1236	0.5092	0.3856	0.3634	0.3773
First Invest Global	-0.0175	-2.5454 **	-0.3604	0.3841	0.0237	-0.0303	0.0004
FT International Equity A	-0.0294	-5.9528 ***	-0.6055	0.7876	0.1821	0.0968	0.1440
G.T. Global New Pacific Gr A	-0.0313	-4.2858 ***	-0.6446	0.9793	0.3347	0.2442	0.2943
IDS International	-0.0329	-4.4688 ***	-0.6775	0.7579	0.0804	-0.0166	0.0381
Invesco Pacific Basin	-0.0408	-6.8023 ***	-0.8402	0.8431	0.0029	-0.1136	-0.0502
Japan	0.0056	0.4035	0.1153	0.0687	0.1840	0.2049	0.1908
Kemper International	-0.0286	-5.2405 ***	-0.5890	0.8122	0.2232	0.1410	0.1867
Keystone International	-0.0137	-3.2261 ***	-0.2821	0.1536	-0.1285	-0.1644	-0.1465
Merrill Lynch Global Holdg A	-0.0112	-3.3428 ***	-0.2307	0.3248	0.0941	0.0613	0.0800
Merrill Lynch Pacific A	-0.0185	-1.5534	-0.3810	0.7988	0.4178	0.3603	0.3928
New Perspective	-0.0191	-3.3037 ***	-0.3933	0.6765	0.2832	0.2262	0.2592
Oppenheimer Global A	-0.0345	-4.2366 ***	-0.7105	1.1288	0.4183	0.3109	0.3723
PaineWebber Atlas Global GrA	-0.0281	-3.8960 ***	-0.5787	0.7549	0.1762	0.0902	0.1386
Princor World	-0.0469	-4.5228 ***	-0.9658	0.9774	0.0116	-0.1231	-0.0493
Prudential Global B	-0.0204	-2.2780 **	-0.4201	0.4039	-0.0162	-0.0776	-0.0432
Putnam Global Growth A	-0.0213	-5.6017 ***	-0.4386	0.7412	0.3026	0.2398	0.2756
RSI Retrmnt Intl Equity	-0.0158	-2.9238 ***	-0.3254	0.3531	0.0277	-0.0178	0.0066
Scudder International	-0.0318	-7.1088 ***	-0.6549	0.9157	0.2608	0.1660	0.2185
Smith Barney Shear Glob OppA	-0.0313	-3.6325 ***	-0.6446	0.3663	-0.2783	-0.3730	-0.3191
T. Rowe Price Intl Stock	-0.0221	-4.5539 ***	-0.4551	0.7933	0.3382	0.2746	0.3098
Templeton Foreign	-0.0219	-4.0042 ***	-0.4510	0.9526	0.5016	0.4360	0.4724
Templeton Growth	-0.0304	-4.1704 ***	-0.6261	0.9230	0.2969	0.2064	0.2566
Templeton Smaller Comp Grth	-0.0388	-4.4024 ***	-0.7990	0.9623	0.1633	0.0495	0.1128
Templeton World	-0.0246	-4.1187 ***	-0.5066	0.6750	0.1684	0.0961	0.1360
United International Growth	-0.0184	-5.2473 ***	-0.3789	0.5372	0.1583	0.1084	0.1335
Vanguard Intl Growth	-0.0212	-3.1448 ***	-0.4366	0.6984	0.2618	0.2004	0.2338
Vanguard/Trustees' Eqty Intl	-0.0175	-4.6920 ***	-0.3604	0.6730	0.3126	0.2632	0.2906

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 6 (cont'd).

Benchmark: Wilshire 5000 Index			Timing	Security Selectivity	Treynor-Mazuy	PPW Measure	Jensen Measure
International Mutual Funds	ϖ_2	t statistics[a]	$\varpi_2 * var(p_t)$	ϖ_0	$\varpi_0+\varpi_2*var(p_t)$	**PPW**	**Jensen**
Alliance Canadian	-0.0109	-2.0483 **	-0.2257	-0.1843	-0.4100	-0.4713	-0.4490
Alliance Global Small Cap A	-0.0051	-1.5084	-0.1056	-0.2986	-0.4042	-0.4301	-0.4228
Alliance International A	-0.0280	-5.3479 ***	-0.5797	1.1002	0.5205	0.3620	0.4192
Bailard, Biehl Intl Equity	-0.0173	-3.7629 ***	-0.3582	0.7482	0.3900	0.2905	0.3280
Centerland Kleinwrt Intl EqB	-0.0242	-5.9691 ***	-0.5011	1.1519	0.6508	0.5122	0.5639
Dean Witter WorldWide Invmnt	-0.0135	-4.9642 ***	-0.2795	0.5728	0.2933	0.2179	0.2451
EuroPacific Growth	-0.0235	-6.9835 ***	-0.4866	1.1881	0.7015	0.5683	0.6164
Fidelity Overseas	-0.0160	-2.1589 **	-0.3313	1.2184	0.8871	0.7915	0.8300
First Invest Global	-0.0104	-1.7580 *	-0.2153	0.5417	0.3264	0.2632	0.2879
FT International Equity A	-0.0282	-7.5190 ***	-0.5839	1.1929	0.6090	0.4485	0.5072
G.T. Global New Pacific Gr A	-0.0297	-6.6078 ***	-0.6149	1.3350	0.7201	0.5509	0.6119
IDS International	-0.0317	-7.7060 ***	-0.6563	1.1704	0.5141	0.3317	0.3995
Invesco Pacific Basin	-0.0353	-5.2962 ***	-0.7309	1.2714	0.5405	0.3399	0.4127
Japan	-0.0125	-1.9707 *	-0.2588	1.1818	0.9230	0.8518	0.8778
Kemper International	-0.0250	-6.7444 ***	-0.5176	1.0965	0.5789	0.4359	0.4880
Keystone International	-0.0169	-3.8272 ***	-0.3499	0.6838	0.3339	0.2389	0.2733
Merrill Lynch Global Holdg A	-0.0066	-2.6808 ***	-0.1367	0.4217	0.2850	0.2481	0.2613
Merrill Lynch Pacific A	-0.0310	-2.8933 ***	-0.6418	1.6708	1.0290	0.8473	0.9176
New Perspective	-0.0088	-4.5339 ***	-0.1822	0.5724	0.3902	0.3390	0.3575
Oppenheimer Global A	-0.0239	-5.6742 ***	-0.4948	1.1725	0.6777	0.5369	0.5911
PaineWebber Atlas Global GrA	-0.0234	-7.3749 ***	-0.4845	0.9656	0.4811	0.3438	0.3952
Princor World	-0.0365	-5.1782 ***	-0.7557	1.0105	0.2548	0.0522	0.1219
Prudential Global B	-0.0183	-2.6340 ***	-0.3789	0.6963	0.3174	0.2119	0.2518
Putnam Global Growth A	-0.0117	-3.6006 ***	-0.2422	0.7310	0.4888	0.4226	0.4469
RSI Retrmnt Intl Equity	-0.0189	-4.4168 ***	-0.3913	0.9012	0.5099	0.3995	0.4404
Scudder International	-0.0267	-8.4078 ***	-0.5528	1.1733	0.6205	0.4664	0.5230
Smith Barney Shear Glob OppA	-0.0236	-8.6212 ***	-0.4886	0.4483	-0.0403	-0.1776	-0.1269
T. Rowe Price Intl Stock	-0.0221	-6.0155 ***	-0.4576	1.2120	0.7544	0.6282	0.6742
Templeton Foreign	-0.0149	-6.3246 ***	-0.3085	0.9871	0.6786	0.5936	0.6239
Templeton Growth	-0.0120	-4.8896 ***	-0.2485	0.5525	0.3040	0.2389	0.2608
Templeton Smaller Comp Grth	-0.0169	-7.3768 ***	-0.3499	0.4925	0.1426	0.0499	0.0806
Templeton World	-0.0057	-2.5109 **	-0.1180	0.2632	0.1452	0.1174	0.1252
United International Growth	-0.0151	-4.9520 ***	-0.3126	0.7859	0.4733	0.3911	0.4180
Vanguard Intl Growth	-0.0230	-5.3324 ***	-0.4762	1.2037	0.7275	0.5962	0.6447
Vanguard/Trustees' Eqty Intl	-0.0152	-4.5267 ***	-0.3147	0.9816	0.6669	0.5805	0.6125

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 7
International Equity Mutual Fund Performance: Simultaneous Hedging Strategy

The sample period is January 1985-March 1994. The model is $\mathbf{a}_t = \beta_0 + \mathbf{p}_t\mathbf{B} + \mathbf{e}_t$ where $\mathbf{a}_t$ are excess returns on mutual funds and $\mathbf{p}_t$ are excess returns on the benchmarks and three forward contracts: the Deutschmark, Japanese Yen and the Canadian Dollar. β_{0i} is the Jensen measure for fund i. The null and alternative hypotheses of the GHM test are $\beta_0 = \mathbf{0}$ and $\beta_0 \geq \mathbf{0}$ respectively. The GHM statistic, KT_{MV} is asymptotically distributed as a weighted mixture of χ^2.

The null hypothesis of the GRS test is $\beta_0=\mathbf{0}$ versus the alternative hypothesis that $\beta_0 \neq \mathbf{0}$. The GRS test statistic F_{MV} has F distribution. The Wald statistics $WALD_{MV}$ is distributed as χ^2.

Benchmarks	12-country Benchmark		World Index		3-region Benchmark	
International Mutual Funds	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]
Alliance Canadian	-0.1690	-0.9596	-0.3345	-1.0681	-0.7138	-2.5554 ••
Alliance Global Small Cap A	-0.2048	-0.7875	0.2049	0.6074	-0.3573	-1.7141 •
Alliance International A	-0.2966	-1.3212	0.1522	0.5645	-0.0779	-0.3570
Bailard, Biehl Intl Equity	-0.6916	-3.3823 •••	-0.2826	-1.1817	-0.2831	-1.3912
Centerland Kleinwrt Intl EqB	-0.3040	-1.6555	0.1465	0.6035	-0.0161	-0.0818
Dean Witter WorldWide Invmnt	-0.4245	-3.6411 •••	0.0571	0.3581	-0.1715	-1.3377
EuroPacific Growth	-0.0230	-0.1605	0.4496	2.0185 ••	0.1571	1.0088
Fidelity Overseas	-0.0662	-0.2618	0.2055	0.6897	0.1349	0.5133
First Invest Global	-0.3036	-1.1931	0.0728	0.2799	-0.1411	-0.5808
FT International Equity A	-0.4494	-2.4367 ••	0.1168	0.4791	-0.0535	-0.2560
G.T. Global New Pacific Gr A	-0.3376	-0.9700	0.2989	0.8221	0.1896	0.5383
IDS International	-0.4029	-1.8037 •	0.0345	0.1409	-0.1026	-0.4556
Invesco Pacific Basin	-0.5020	-1.9112 •	-0.0222	-0.0725	0.0229	0.0683
Japan	-0.1657	-0.5705	-0.0624	-0.1719	0.3431	1.2085
Kemper International	-0.3293	-1.8376 •	0.1872	0.7359	-0.0422	-0.2219
Keystone International	-0.6276	-3.6685 •••	-0.2448	-1.2611	-0.2799	-1.5845
Merrill Lynch Global Holdg A	-0.2366	-2.2814 ••	0.1541	1.1050	-0.0780	-0.8193
Merrill Lynch Pacific A	-0.1307	-0.3280	0.1429	0.4303	0.2358	0.6076
New Perspective	-0.0092	-0.0806	0.3861	2.0611 ••	0.0316	0.2893
Oppenheimer Global A	-0.0512	-0.2234	0.4700	1.5630	0.0973	0.4533
PaineWebber Atlas Global GrA	-0.2554	-1.3594	0.1885	0.8467	-0.0592	-0.3045
Princor World	-0.3806	-1.4858	0.1716	0.6003	-0.1610	-0.6954
Prudential Global B	-0.4323	-2.0293 ••	-0.0748	-0.3308	-0.2596	-1.1902
Putnam Global Growth A	-0.1448	-0.8506	0.3371	1.5084	-0.0340	-0.2371
RSI Retrmnt Intl Equity	-0.4221	-2.5884 ••	-0.0997	-0.5149	-0.1535	-1.0630
Scudder International	-0.2751	-1.7172 •	0.2139	0.9467	-0.0177	-0.1119
Smith Barney Shear Glob OppA	-0.7006	-4.2669 •••	-0.2254	-1.1107	-0.5304	-3.1001 •••
T. Rowe Price Intl Stock	-0.2544	-1.9605 •	0.2623	1.2254	0.0708	0.5224
Templeton Foreign	0.1782	1.4341	0.5487	2.7012 •••	0.2693	1.9748 •
Templeton Growth	-0.0033	-0.0280	0.5172	2.5334 ••	0.1439	0.9484
Templeton Smaller Comp Grth	-0.1382	-0.6812	0.4411	1.6983 •	0.0569	0.2726
Templeton World	-0.0203	-0.1443	0.4031	2.0455 ••	0.0218	0.1545
United International Growth	-0.2000	-1.1797	0.1609	0.7407	0.0072	0.0394
Vanguard Intl Growth	-0.2904	-1.7112 •	0.1457	0.6540	-0.0060	-0.0408
Vanguard/Trustees' Eqty Intl	-0.1046	-0.6954	0.2238	1.1370	0.0986	0.6510
Joint performance test on all funds	Statistic	P value	Statistic	P value	Statistic	P value
GHM Test: KT_{MV} (1 to 35)	26.78	0.6901	46.35	0.0573 •	35.06	0.2978
GRS Test: F_{MV} (35:61,72,70)	1.61	0.0504 •	1.66	0.0360 ••	1.67	0.0340 ••
Wald Test: $WALD_{MV}$ (35)	102.55	0.0000 •••	99.92	0.0000 •••	105.66	0.0000 •••

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 7 (cont'd).

The sample period is January 1985-March 1994. PPWi is the Positive Period Weight Measure for fund i. The null hypothesis is **PPW = 0** versus the alternative hypothesis that **PPW ≠ 0**. The Wald statistic $WALD_{PPW}$ is distributed as χ^2.

Benchmarks	12-country Benchmark		World Index		3-region Benchmark	
International Mutual Funds	**PPW**	z statistics[a]	**PPW**	z statistics[a]	**PPW**	z statistics[a]
Alliance Canadian	-0.1372	-0.8524	-0.3132	-1.0064	-0.7009	-2.5141 ***
Alliance Global Small Cap A	-0.2079	-0.8522	0.2336	0.6964	-0.3404	-1.6680 **
Alliance International A	-0.1994	-0.9924	0.1442	0.5392	-0.0752	-0.3573
Bailard, Biehl Intl Equity	-0.5723	-3.1692 ***	-0.2801	-1.1665	-0.2619	-1.3365 *
Centerland Kleinwrt Intl EqB	-0.2666	-1.6143 *	0.1481	0.6054	-0.0141	-0.0735
Dean Witter WorldWide Invmnt	-0.4023	-3.7293 ***	0.0544	0.3438	-0.1805	-1.4414 *
EuroPacific Growth	0.0203	0.1470	0.4459	2.0023 **	0.1629	1.0771
Fidelity Overseas	-0.0602	-0.2870	0.2141	0.7110	0.1184	0.4732
First Invest Global	-0.3465	-1.5415 *	0.0873	0.3413	-0.1168	-0.4951
FT International Equity A	-0.4323	-2.5992 ***	0.1110	0.4568	-0.0577	-0.2876
G.T. Global New Pacific Gr A	-0.1584	-0.5048	0.2998	0.8244	0.2134	0.6378
IDS International	-0.3701	-1.9301 **	0.0188	0.0775	-0.1371	-0.6447
Invesco Pacific Basin	-0.5035	-2.2037 **	-0.0264	-0.0879	-0.0108	-0.0338
Japan	-0.1695	-0.6417	-0.0692	-0.1915	0.3606	1.3035 *
Kemper International	-0.3502	-2.1902 **	0.1753	0.6874	-0.0338	-0.1859
Keystone International	-0.6382	-3.9985 ***	-0.2630	-1.3428 *	-0.2985	-1.6972 **
Merrill Lynch Global Holdg A	-0.1990	-2.0501 **	0.1559	1.1255	-0.0710	-0.7447
Merrill Lynch Pacific A	-0.1279	-0.4021	0.1544	0.4699	0.1767	0.4889
New Perspective	0.0253	0.2305	0.3829	2.0486 **	0.0284	0.2594
Oppenheimer Global A	-0.0249	-0.1252	0.4652	1.5524 *	0.0908	0.4320
PaineWebber Atlas Global GrA	-0.2306	-1.4366 *	0.1756	0.7949	-0.1005	-0.5463
Princor World	-0.4233	-1.7931 **	0.1450	0.5069	-0.2059	-0.9358
Prudential Global B	-0.3973	-2.2159 **	-0.0673	-0.3006	-0.2906	-1.3912 *
Putnam Global Growth A	-0.0861	-0.5637	0.3356	1.5184 *	-0.0295	-0.2124
RSI Retrmnt Intl Equity	-0.3515	-2.3952 ***	-0.1189	-0.6164	-0.1622	-1.1516
Scudder International	-0.2399	-1.6243 *	0.2114	0.9440	-0.0240	-0.1628
Smith Barney Shear Glob OppA	-0.6774	-4.6117 ***	-0.2268	-1.1250	-0.5361	-3.2852 ***
T. Rowe Price Intl Stock	-0.2282	-2.0301 **	0.2580	1.2023	0.0749	0.5833
Templeton Foreign	0.1827	1.5544 *	0.5448	2.6797 ***	0.2711	1.9794 **
Templeton Growth	-0.0049	-0.0457	0.5137	2.5178 ***	0.1396	0.9055
Templeton Smaller Comp Grth	-0.1484	-0.7381	0.4474	1.7303 **	0.0541	0.2603
Templeton World	-0.0031	-0.0241	0.4095	2.0907 **	0.0371	0.2610
United International Growth	-0.2480	-1.5321 *	0.1402	0.6494	-0.0014	-0.0078
Vanguard Intl Growth	-0.2286	-1.4655 *	0.1333	0.5964	0.0070	0.0491
Vanguard/Trustees' Eqty Intl	-0.0909	-0.6414	0.2189	1.1211	0.1021	0.6896
Joint performance test on all funds	Statistic	P value	Statistic	P value	Statistic	P value
Wald Test: $WALD_{MV}$ (35)	95.24	0.0000 ***	97.75	0.0000 ***	97.97	0.0000 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] PPW coefficients and z statistics are computed using the generalized method of moments.

Table 8
International Equity Mutual Fund Performance: Unitary Hedging Strategy

The sample period is January 1986-March 1994. The model is $\mathbf{a}_t = \beta_0 + \mathbf{p}_t\mathbf{B} + \mathbf{e}_t$ where $\mathbf{a}_t$ are excess returns on mutual funds and $\mathbf{p}_t$ are unitary hedged excess returns on the benchmarks. β_{0i} is the Jensen measure for fund i. The null and alternative hypotheses of the GHM test are $\beta_0 = 0$ and $\beta_0 \geq 0$ respectively. The GHM statistic, KT_{MV} is asymptotically distributed as a weighted mixture of χ^2.

The null hypothesis of the GRS test is $\beta_0=0$ versus the alternative hypothesis that $\beta_0 \neq 0$. The GRS test statistic F_{MV} has F distribution. The Wald statistics $WALD_{MV}$ is distributed as χ^2.

Benchmarks	11-country Benchmark[a]		World Index		3-region Benchmark	
International Mutual Funds	**Jensen**	t statistics[b]	**Jensen**	t statistics[b]	**Jensen**	t statistics[b]
Alliance Canadian	0.0230	0.1122	-0.1919	-0.4734	-0.3315	-0.9378
Alliance Global Small Cap A	-0.2279	-0.7763	-0.0412	-0.0989	-0.3517	-1.4751
Alliance International A	0.3999	1.4742	0.2450	0.7503	0.3318	1.1840
Bailard, Biehl Intl Equity	0.2023	0.6367	0.0333	0.0968	0.1722	0.5573
Centerland Kleinwrt Intl EqB	0.5366	2.0315 **	0.4210	1.3969	0.5241	1.9468 *
Dean Witter WorldWide Invmnt	0.2856	1.3774	0.2546	1.1207	0.2314	1.0690
EuroPacific Growth	0.7754	3.5728 ***	0.6724	2.3628 **	0.7282	3.0299 ***
Fidelity Overseas	0.6791	1.8577 *	0.5531	1.3622	0.6154	1.6100
First Invest Global	0.6635	2.5436 **	0.5551	1.8409 *	0.5488	1.8564 *
FT International Equity A	0.4396	1.5620	0.3122	0.9667	0.4065	1.3573
G.T. Global New Pacific Gr A	0.8721	2.2144 **	0.7806	1.8620 *	0.9400	2.3871 **
IDS International	0.4371	1.5768	0.3023	0.8908	0.3807	1.1987
Invesco Pacific Basin	0.5748	1.7312 *	0.4188	1.0603	0.5106	1.3413
Japan	0.8543	2.0381 **	0.6115	1.1265	0.7748	1.8910 *
Kemper International	0.4746	1.8550 *	0.3328	1.0899	0.4441	1.7343 *
Keystone International	0.2869	1.0370	0.1477	0.4816	0.2332	0.8075
Merrill Lynch Global Holdg A	0.2726	1.5889	0.3089	1.5950	0.2554	1.4979
Merrill Lynch Pacific A	0.9424	2.0297 **	0.8378	1.7186 *	0.8566	1.8048 *
New Perspective	0.4999	3.5156 ***	0.4873	2.1278 **	0.4263	2.5420 **
Oppenheimer Global A	0.7444	2.6902 ***	0.6221	1.7378 *	0.6292	1.9756 *
PaineWebber Atlas Global GrA	0.3059	1.2354	0.2486	0.8807	0.2608	0.9859
Princor World	0.4063	1.3832	0.2729	0.7225	0.3767	1.2308
Prudential Global B	0.3380	1.3317	0.1986	0.6666	0.1793	0.6210
Putnam Global Growth A	0.3584	1.6791 *	0.3580	1.3584	0.3389	1.6274
RSI Retrmnt Intl Equity	0.4961	1.7888 *	0.2957	0.9464	0.3960	1.4130
Scudder International	0.6077	2.4527 **	0.4517	1.4797	0.5299	1.9771 *
Smith Barney Shear Glob OppA	-0.1833	-0.9319	-0.1728	-0.6482	-0.2106	-0.9343
T. Rowe Price Intl Stock	0.7677	2.7783 ***	0.6106	1.9842 **	0.7126	2.6286 ***
Templeton Foreign	0.8324	4.6948 ***	0.7623	3.0689 ***	0.7829	3.7692 ***
Templeton Growth	0.3176	2.1651 **	0.4778	1.8734 *	0.3785	2.2300 **
Templeton Smaller Comp Grth	0.1549	0.6371	0.2963	0.9344	0.1559	0.6581
Templeton World	0.2305	1.5036	0.3302	1.3547	0.1942	1.2072
United International Growth	0.5074	2.0557 **	0.3837	1.4272	0.4362	1.7044 *
Vanguard Intl Growth	0.6812	2.2587 **	0.4654	1.3793	0.6013	2.0355 **
Vanguard/Trustees' Eqty Intl	0.6644	2.8591 ***	0.5461	2.0720 **	0.5895	2.3738 **
Joint performance test on all funds	Statistic	P value	Statistic	P value	Statistic	P value
GHM Test: KT_{MV} (1 to 35)	53.18	0.0151 **	49.66	0.0330 **	49.99	0.0299 **
GRS Test: F_{MV} (35;53,63,61)	1.86	0.0201 **	1.85	0.0165 **	1.99	0.0090 ***
Wald Test: $WALD_{MV}$ (35)	121.51	0.0000 ***	105.53	0.0000 ***	122.60	0.0000 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] There is no forward contract for the Hong Kong Dollar, leaving only 11 countries in the unitary hedged benchmark.

[b] t statistic computed using heteroscedastic consistent variance.

Table 8 (cont'd).

The sample period is January 1986-March 1994. PPWi is the Positive Period Weight Measure for fund i. The null hypothesis is **PPW = 0** versus the alternative hypothesis that **PPW ≠ 0**. The Wald statistic $WALD_{PPW}$ is distributed as χ^2.

Benchmarks	11-country Benchmark[a]		World Index		3-region Benchmark	
International Mutual Funds	**PPW**	z statistics[b]	**PPW**	z statistics[b]	**PPW**	z statistics[b]
Alliance Canadian	0.0162	0.0810	-0.1971	-0.4849	-0.3351	-0.9467
Alliance Global Small Cap A	-0.2125	-0.7358	-0.0498	-0.1198	-0.3623	-1.5259 *
Alliance International A	0.3766	1.3983 *	0.2337	0.7182	0.3099	1.1136
Bailard, Biehl Intl Equity	0.2085	0.6665	0.0319	0.0928	0.1744	0.5666
Centerland Kleinwrt Intl EqB	0.5246	2.0132 **	0.4134	1.3774 *	0.5189	1.9441 **
Dean Witter WorldWide Invmnt	0.2864	1.3866 *	0.2503	1.1045	0.2318	1.0731
EuroPacific Growth	0.7548	3.4708 ***	0.6625	2.3373 ***	0.7168	2.9931 ***
Fidelity Overseas	0.6535	1.8407 **	0.5504	1.3570 *	0.6224	1.6318 *
First Invest Global	0.6524	2.5569 ***	0.5472	1.8212 **	0.5576	1.9031 **
FT International Equity A	0.4266	1.5393 *	0.3037	0.9448	0.3991	1.3451 *
G.T. Global New Pacific Gr A	0.8666	2.2254 **	0.7695	1.8364 **	0.9305	2.3622 ***
IDS International	0.4212	1.5633 *	0.2912	0.8593	0.3668	1.1656
Invesco Pacific Basin	0.5727	1.7909 **	0.4103	1.0432	0.5025	1.3346 *
Japan	0.8282	1.9636 **	0.6168	1.1359	0.7604	1.8630 **
Kemper International	0.4660	1.8435 **	0.3247	1.0670	0.4393	1.7261 **
Keystone International	0.2758	1.0061	0.1477	0.4839	0.2378	0.8264
Merrill Lynch Global Holdg A	0.2599	1.5383 *	0.3071	1.5853 *	0.2576	1.5037 *
Merrill Lynch Pacific A	0.9219	2.0717 **	0.8303	1.7064 **	0.8459	1.8025 **
New Perspective	0.4854	3.3950 ***	0.4813	2.1038 **	0.4280	2.5482 ***
Oppenheimer Global A	0.7249	2.7270 ***	0.6075	1.7025 **	0.6279	1.9638 **
PaineWebber Atlas Global GrA	0.2946	1.2074	0.2400	0.8487	0.2521	0.9599
Princor World	0.4242	1.4691 *	0.2593	0.6877	0.3530	1.1599
Prudential Global B	0.3134	1.2689	0.1952	0.6531	0.1869	0.6497
Putnam Global Growth A	0.3537	1.7003 **	0.3515	1.3406 *	0.3336	1.6132 *
RSI Retrmnt Intl Equity	0.4736	1.7295 **	0.2923	0.9373	0.3920	1.4042 *
Scudder International	0.5809	2.3836 ***	0.4409	1.4518 *	0.5206	1.9583 **
Smith Barney Shear Glob OppA	-0.2036	-1.0571	-0.1825	-0.6839	-0.2224	-0.9932
T. Rowe Price Intl Stock	0.7546	2.7503 ***	0.6039	1.9703 **	0.7094	2.6278 ***
Templeton Foreign	0.8330	4.7477 ***	0.7560	3.0521 ***	0.7845	3.7743 ***
Templeton Growth	0.3420	2.3763 ***	0.4711	1.8551 **	0.3778	2.2289 **
Templeton Smaller Comp Grth	0.1800	0.7595	0.2874	0.9113	0.1491	0.6329
Templeton World	0.2409	1.6124 *	0.3264	1.3444 *	0.1941	1.2041
United International Growth	0.5025	2.0676 **	0.3836	1.4278 *	0.4418	1.7302 **
Vanguard Intl Growth	0.6737	2.2167 **	0.4589	1.3626 *	0.5940	2.0217 **
Vanguard/Trustees' Eqty Intl	0.6565	2.8196 ***	0.5417	2.0633 **	0.5855	2.3729 ***
Joint performance test on all funds	Statistic	P value	Statistic	P value	Statistic	P value
Wald Test: $WALD_{MV}$ (35)	146.24	0.0000 ***	105.39	0.0000 ***	121.33	0.0000 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] There is no forward contract for the Hong Kong Dollar, leaving only 11 countries in the unitary hedged benchma

[b] PPW coefficients and z statistics are computed using the generalized method of moments.

Table 9
International Equity Mutual Fund Performance Persistence

The sample period is January 1985-March 1994. The model is $a_{pt} = \beta_0 + p_tB + e_t$ where a_{pt} is excess return on a portfolio of mutual funds weighted by α_i, the normalized first sub-period Jensen measures. β_0 is the estimated performance persistence parameter.

Benchmarks	Persistence Parameter	t statistics[a]
12-country Benchmark	0.0981	0.8362
Wilshire 5000	0.1399	0.4346
World Index	0.1743	0.5519
3-region Benchmark	0.2455	1.8562 *

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

Table 10
Tests of the Mean-variance Efficiency of the World Bond Index

The sample period is January 1989-March 1994. The mean-variance model is $\mathbf{a}_t = \beta_0 + \mathbf{p}_t\mathbf{B} + \mathbf{e}_t$ where $\mathbf{a}_t$ are excess returns on country bond indices and $\mathbf{p}_t$ are excess returns on the Salomon Brothers world bond index. β_{0i} is the regression intercept and PPW_i is positive period weight measure for country i. The null and alternative hypotheses of the GRS test are $\beta_0=0$ and $\beta_0 \neq 0$ respectively. The GRS statistic F_{MV} has an F distribution and the Wald test statistics, $WALD_{MV}$ and $WALD_{PPW}$ are distributed as χ^2.

The quadratic model is $\mathbf{a}_t = \varpi_0 + \mathbf{p}_t\varpi_1 + \mathbf{p}_t^2\varpi_2 + \mathbf{e}_t$ where ϖ_{2i} is country i's regression coefficient on the squared world bond index. The null and alternative hypotheses of the Wald test are $\varpi_2=0$ and $\varpi_2 \neq 0$ respectively. The Wald test statistic $WALD_{QUAD}$ is distributed as χ^2.

Benchmarks	**Salomon Brothers World Bond Index**					
Countries	β_0	t statistics[a]	PPW	z statistics[b]	ϖ_2	t statistics[a]
Australia	0.3667	0.8983	0.3570	0.8766	-0.0933	-1.1453
Belgium	0.0349	0.1303	0.0231	0.0863	-0.0595	-1.1895
Canada	0.1073	0.3337	0.1076	0.3342	0.0157	0.2781
France	0.0297	0.1199	0.0215	0.0870	-0.0265	-0.5571
Germany	-0.2213	-0.9090	-0.2327	-0.9589	-0.0625	-1.3590
Italy	-0.0243	-0.0663	-0.0319	-0.0873	-0.0018	-0.0325
Japan	-0.0655	-0.2359	-0.0566	-0.2043	0.0147	0.3035
The Netherlands	-0.1817	-0.7666	-0.1934	-0.8165	-0.0659	-1.3943
Switzerland	-0.3610	-1.2762	-0.3705	-1.3154	-0.0656	-1.4297
United Kingdom	-0.2865	-0.8883	-0.2867	-0.8930	0.0275	0.5004
United States	0.2063	1.4759	0.2079	1.4842	0.0190	0.6792
Joint tests on all countries	Statistic	P value	Statistic	P value	Statistic	P value
GRS Test: F_{MV} (11,51)	1.17	0.3305				
$WALD_{MV}$, $WALD_{PPW}$, $WALD_{QUAD}$ (11	15.53	0.1597	15.54	0.1589	8.51	0.6666

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

[b] z statistic computed using the GMM estimated variance.

Table 11
International Bond Mutual Fund Performance: Mean-variance Tests

The sample period is January 1989-March 1994. The model is $\mathbf{a}_t = \beta_0 + \mathbf{p}_t\mathbf{B} + \mathbf{e}_t$ where $\mathbf{a}_t$ are excess returns on mutual funds and $\mathbf{p}_t$ are excess returns on the benchmarks. β_{0i} is the Jensen measure for fund i. The null and alternative hypotheses of the GHM test are $\beta_0 = \mathbf{0}$ and $\beta_0 \geq \mathbf{0}$ respectively. The GHM statistic, KTMV is asymptotically distributed as a weighted mixture of χ^2. The null hypothesis of the GRS test is $\beta_0=\mathbf{0}$ versus the alternative hypothesis that $\beta_0 \neq \mathbf{0}$. The GRS test statistic F_{MV} has an F distribution. The Wald statistics $WALD_{MV}$ is distributed as χ^2.

Benchmarks	SB World Bond Index		SB Broad Index	
International Mutual Funds	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]
Capital World Bond	-0.0070	-0.0705	-0.0877	-0.6193
Fidelity Global Bond	0.0454	0.2415	-0.1030	-0.4785
Franklin Global Govt Income	0.0274	0.1314	-0.0826	-0.3943
G.T. Global Govt Income A	0.1066	0.4838	-0.1131	-0.5432
G.T. Global Strategic Inc A	0.0520	0.1600	-0.2848	-0.8997
Hancock Freedom Global Inc B	-0.1569	-1.0931	-0.2396	-1.4492
Keystone Amer World Bond A	-0.1217	-1.1277	-0.2093	-1.2853
Lord Abbett Global Income	0.0303	0.2691	-0.0993	-0.6154
Merrill Lynch Global Bond A	0.1106	0.7199	0.0621	0.3223
MFS World Governments A	0.0197	0.1170	-0.0117	-0.0535
PaineWebber Global Income B	0.0013	0.0091	-0.0361	-0.2104
Putnam Global Govtl Income A	0.0797	0.4855	-0.0153	-0.0783
Scudder International Bond	0.2557	1.7976 *	0.2326	1.0714
Smith Barney Shear Glob Bd B	-0.0525	-0.5662	-0.1358	-1.0111
T. Rowe Price Intl Bond	-0.1366	-1.0291	-0.0629	-0.2290
Templeton Income	0.0299	0.1778	-0.0781	-0.4680
TNE Global Government A	-0.1823	-2.0503 **	-0.2408	-1.4789
Van Eck World Income	-0.0573	-0.2929	-0.1058	-0.4380
Joint performance test on all funds	Statistic	P value	Statistic	P value
GHM Test: KT_{MV} (1 to 18)	10.01	0.8788	5.73	0.9935
GRS Test: F_{MV} (18;44,43,44)	1.62	0.0972 *	1.90	0.0419 **
Wald Test: $WALD_{MV}$ (18)	39.63	0.0023 ***	46.35	0.0003 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 12
Determinants of International Bond Fund Returns

The sample period is January 1989-March 1994. The model is $a_t = \beta_0 + p_t B + e_t$ where a_t are excess returns on mutual funds and p_t are excess returns on the Non-U.S. Government bond index, the U.S. Government bond index and residuals from regressing the LB Corporate bond index on the U.S. Government bond index.

Benchmarks	Non-U.S. Gov't Bonds		U.S. Gov't Bonds		U.S. Corporate Bond Residual	
International Mutual Funds	β_1	t statistics[a]	β_2	t statistics[a]	β_3	t statistics[a]
Capital World Bond	0.4117	14.1922 ***	0.4825	6.9569 ***	0.9716	4.0921 ***
Fidelity Global Bond	0.2635	4.8126 ***	0.6244	3.1131 ***	1.0975	1.9576 *
Franklin Global Govt Income	0.2301	2.9494 ***	0.4010	2.3785 **	1.6707	3.2952 ***
G.T. Global Govt Income A	0.1747	2.9389 ***	0.9502	5.4346 ***	0.4770	1.0773
G.T. Global Strategic Inc A	0.2860	4.0442 ***	1.4425	5.1094 ***	0.7229	0.8884
Hancock Freedom Global Inc B	0.3121	5.6687 ***	0.4493	3.6963 ***	0.6656	2.3273 **
Keystone Amer World Bond A	0.4444	12.7253 ***	0.5747	7.1513 ***	0.5471	2.0419 **
Lord Abbett Global Income	0.3901	11.0133 ***	0.7374	10.5761 ***	0.0960	0.4973
Merrill Lynch Global Bond A	0.4816	6.4484 ***	0.4274	3.2565 ***	0.5500	1.5060
MFS World Governments A	0.4901	7.8407 ***	0.4313	2.8250 ***	0.0603	0.1600
PaineWebber Global Income B	0.3602	5.6423 ***	0.3070	2.0810 **	0.5737	1.6606
Putnam Global Govtl Income A	0.3429	5.8435 ***	0.5910	3.6714 ***	0.0564	0.1449
Scudder International Bond	0.6149	12.4997 ***	0.4011	3.1535 ***	0.6189	1.7663 *
Smith Barney Shear Glob Bd B	0.3717	12.5292 ***	0.5430	6.8838 ***	0.3279	1.5425
T. Rowe Price Intl Bond	0.8831	20.4240 ***	0.1884	1.8711 *	0.8466	3.3772 ***
Templeton Income	0.2823	4.9367 ***	0.4550	3.5767 ***	1.2532	2.9010 ***
TNE Global Government A	0.4584	12.5729 ***	0.4993	5.6863 ***	0.1308	0.6705
Van Eck World Income	0.4717	8.1702 ***	0.4036	2.2111 **	0.7492	1.6524

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 13
International Bond Mutual Fund Performance: PPW Measures

The sample period is January 1989-March 1994. PPWi is the Positive Period Weight Measure for fund i. The null hypothesis is **PPW = 0** versus **PPW ≠ 0**. The Wald statistic $WALD_{PPW}$ is distributed as χ^2.

Benchmarks	SB World Bond Index		SB Broad Index	
International Mutual Funds	**PPW**	z statistics[a]	**PPW**	z statistics[a]
Capital World Bond	-0.0060	-0.0608	-0.0940	-0.6678
Fidelity Global Bond	0.0457	0.2442	-0.1452	-0.6582
Franklin Global Govt Income	0.0302	0.1449	-0.0987	-0.4689
G.T. Global Govt Income A	0.1128	0.5132	-0.1207	-0.5730
G.T. Global Strategic Inc A	0.0630	0.1948	-0.3241	-1.0034
Hancock Freedom Global Inc B	-0.1592	-1.1098	-0.2448	-1.4904 *
Keystone Amer World Bond A	-0.1181	-1.0991	-0.2084	-1.2936 *
Lord Abbett Global Income	0.0279	0.2491	-0.0945	-0.5900
Merrill Lynch Global Bond A	0.1087	0.7007	0.0595	0.3113
MFS World Governments A	0.0199	0.1178	-0.0148	-0.0675
PaineWebber Global Income B	0.0006	0.0040	-0.0444	-0.2586
Putnam Global Govtl Income A	0.0819	0.5002	-0.0280	-0.1431
Scudder International Bond	0.2615	1.8386 **	0.2277	1.0485
Smith Barney Shear Glob Bd B	-0.0472	-0.5101	-0.1369	-1.0163
T. Rowe Price Intl Bond	-0.1385	-1.0361	-0.0620	-0.2255
Templeton Income	0.0376	0.2238	-0.0833	-0.4877
TNE Global Government A	-0.1853	-2.0825 **	-0.2457	-1.5181 *
Van Eck World Income	-0.0552	-0.2837	-0.1098	-0.4516
Joint performance test on all funds	Statistic	P value	Statistic	P value
Wald Test: $WALD_{MV}$ (18)	38.60	0.0000 ***	44.12	0.0006 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] PPW coefficients and z statistics are computed using the generalized method of moments

Table 14
International Bond Mutual Funds: Comparison of Performance Measures

The sample period is January 1989-March 1994. The Treynor-Mazuy model is $a_t = \varpi_0 + p_t\varpi_1 + p_t^2\varpi_2 + e_t$ where a_t are excess returns on bond funds and p_t is excess returns on the world bond index. $\varpi_{2,i}$ is fund i's regression coefficient fo the squared excess returns on the world bond index. The Jensen measure model is $a_t = \beta_0 + p_tB + e_t$.

Benchmark: World Bond Index			Timing	Security Selectivity	Treynor-Mazuy	PPW Measure	Jensen Measure
International Mutual Funds	ϖ_2	t statistics[a]	$\varpi_2 * var(p_t)$	ϖ_0	$\varpi_0+\varpi_2*var(p_t)$	**PPW**	**Jensen**
Capital World Bond	0.0066	0.4190	0.0237	-0.0301	-0.0064	-0.0060	-0.0070
Fidelity Global Bond	0.0072	0.2914	0.0259	0.0201	0.0460	0.0457	0.0454
Franklin Global Govt Income	0.0126	0.3606	0.0453	-0.0169	0.0284	0.0302	0.0274
G.T. Global Govt Income A	0.0517	1.6316	0.1857	-0.0745	0.1112	0.1128	0.1066
G.T. Global Strategic Inc A	0.0959	2.0054 **	0.3444	-0.2836	0.0608	0.0630	0.0520
Hancock Freedom Global Inc B	-0.0011	-0.0399	-0.0040	-0.1532	-0.1572	-0.1592	-0.1569
Keystone Amer World Bond A	0.0279	1.6153	0.1002	-0.2193	-0.1191	-0.1181	-0.1217
Lord Abbett Global Income	0.0000	-0.0014	0.0000	0.0304	0.0304	0.0279	0.0303
Merrill Lynch Global Bond A	-0.0092	-0.2886	-0.0330	0.1430	0.1100	0.1087	0.1106
MFS World Governments A	0.0256	0.6524	0.0919	-0.0700	0.0219	0.0199	0.0197
PaineWebber Global Income B	0.0052	0.1811	0.0187	-0.0170	0.0017	0.0006	0.0013
Putnam Global Govtl Income A	0.0287	1.1508	0.1031	-0.0209	0.0822	0.0819	0.0797
Scudder International Bond	0.0624	3.1461 ***	0.2241	0.0372	0.2613	0.2615	0.2557
Smith Barney Shear Glob Bd B	0.0497	2.6160 **	0.1785	-0.2266	-0.0481	-0.0472	-0.0525
T. Rowe Price Intl Bond	-0.0137	-0.4489	-0.0492	-0.0887	-0.1379	-0.1385	-0.1366
Templeton Income	0.0707	2.2341 **	0.2539	-0.2174	0.0365	0.0376	0.0299
TNE Global Government A	-0.0193	-1.2483	-0.0693	-0.1148	-0.1841	-0.1853	-0.1823
Van Eck World Income	0.0650	2.2755 **	0.2335	-0.2850	-0.0515	-0.0552	-0.0573
Joint test on all funds	Statistic	P value					
Wald Test: $WALD_{MV}$ (18)	61.47	0.0000 ***					

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 15

International Bond Mutual Fund Performance: Simultaneous Hedging Strategy

The sample period is January 1989-March 1994. The model is $\mathbf{a_t = \beta_0 + p_t B + e_t}$ where $\mathbf{a_t}$ are excess returns on mutual funds and $\mathbf{p_t}$ are excess returns on the world bond index and currency forward contracts. β_{0i} is the Jensen measure for fund i. The null and alternative hypotheses of the GHM test are $\beta_0 = 0$ and $\beta_0 \geq 0$ respectively. The GHM statistic, KT_{MV}, is asymptotically distributed as a weighted mixture of χ^2. **B** is an n x k matrix with elements β_{1i}, β_{2i}, β_{3i} and β_{4i} for fund i. The null hypothesis of the GRS test is $\beta_0=0$ versus the alternative that $\beta_0 \neq 0$. The GRS test statistic F_{MV} has an F distribution. The Wald statistics $WALD_{MV}$ is distributed as χ^2. PPWi is the Positive Period Weight Measure for fund i. The null hypothesis is **PPW = 0** versus the alternative that **PPW ≠ 0**. The Wald statistic $WALD_{PPW}$ is distributed as χ^2.

Benchmarks	SB World Bond Index						Deutschemark		Japanese Yen		Canadian Dollars	
International Mutual Funds	**Jensen**	t statistics[a]	**PPW**	z statistics[a]	β_1	t statistics[a]	β_2	t statistics[a]	β_3	t statistics[a]	β_4	t statistics[a]
Capital World Bond	-0.0347	-0.4533	-0.0331	-0.4351	1.0413	11.0767 ***	-0.1504	-4.3149 ***	-0.0422	-1.0499	0.2701	3.1522 ***
Fidelity Global Bond	-0.0012	-0.0076	-0.0031	-0.0203	1.0819	5.0737 ***	-0.1933	-2.3013 **	-0.1745	-2.2597 **	0.4216	3.2385 ***
Franklin Global Govt Income	-0.0225	-0.1499	-0.0166	-0.1117	0.9231	5.8549 ***	-0.2116	-3.3362 ***	-0.1704	-2.4183 **	0.5891	3.4721 ***
G.T. Global Govt Income A	0.0231	0.1580	0.0232	0.1577	1.5177	6.6144 ***	-0.3902	-4.0987 ***	-0.2610	-2.6869 ***	0.3841	2.2551 **
G.T. Global Strategic Inc A	-0.0616	-0.2521	-0.0626	-0.2571	2.2566	6.4297 ***	-0.4784	-3.4482 ***	-0.4584	-3.5019 ***	0.2808	1.5119
Hancock Freedom Global Inc B	-0.1848	-1.6221	-0.1854	-1.6138 *	0.9153	6.4378 ***	-0.0901	-1.4912	-0.1411	-2.4170 **	0.3744	3.8307 ***
Keystone Amer World Bond A	-0.1527	-1.6184	-0.1500	-1.5912 *	1.2102	11.6087 ***	-0.1594	-3.7093 ***	-0.0745	-1.7936 *	0.1078	1.1499
Lord Abbett Global Income	0.0033	0.0468	0.0018	0.0255	1.2238	14.8303 ***	-0.0339	-0.7770	-0.2337	-6.5559 ***	0.2171	4.1186 ***
Merrill Lynch Global Bond A	0.0916	0.7008	0.0941	0.7184	1.0592	9.2325 ***	-0.0508	-0.8147	-0.1057	-1.6570	0.3941	3.6349 ***
MFS World Governments A	0.0123	0.0868	0.0177	0.1242	0.9874	5.1776 ***	0.0427	0.5577	-0.1292	-1.7741 *	0.4314	3.1112 ***
PaineWebber Global Income B	-0.0104	-0.0819	-0.0059	-0.0467	0.7289	4.5382 ***	-0.0346	-0.5683	-0.0489	-0.7643	0.4294	4.4312 ***
Putnam Global Govtl Income A	0.0485	0.3483	0.0507	0.3660	1.1126	6.0032 ***	-0.0802	-0.9858	-0.1998	-2.9390 ***	0.2789	2.0168 **
Scudder International Bond	0.2505	1.7890 *	0.2580	1.8472 **	1.1092	6.7702 ***	0.0057	0.0845	-0.0559	-0.8035	0.2024	1.8091 *
Smith Barney Shear Glob Bd B	-0.0713	-0.8805	-0.0669	-0.8366	0.9844	8.6539 ***	-0.0665	-1.5153	-0.0928	-2.2301 **	0.1111	1.4640
T. Rowe Price Intl Bond	-0.1152	-0.9445	-0.1107	-0.9054	1.1085	7.3462 ***	0.0977	1.9316 *	0.0870	1.1777	0.1856	1.9899 *
Templeton Income	-0.0016	-0.0125	0.0075	0.0602	0.8479	6.1516 ***	-0.1315	-2.3743 **	-0.1031	-2.0675 **	0.5171	3.2279 ***
TNE Global Government A	-0.1974	-2.4866 **	-0.2001	-2.5334 ***	1.0408	10.2274 ***	-0.0692	-1.5392	-0.0415	-0.9392	0.2005	3.3145 ***
Van Eck World Income	-0.0530	-0.3245	-0.0448	-0.2752	0.8424	3.7077 ***	0.1857	2.4509 **	-0.2398	-2.8660 ***	0.4010	2.3812 **

Joint performance test on all funds	Statistic	P value	Statistic	P value
GHM Test: KT_{MV} (1 to 18)	7.53	0.9610		
GRS Test: F_{MV} (18;41)	1.58	0.1115		
Wald Test: $WALD_{MV}$ (18)	43.62	0.0007 ***	42.54	0.0009 ***

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 16
International Bond Mutual Fund Performance:Unitary Hedged World Bond Index

The sample period is January 1989-March 1994. The model is $a_t = \beta_0 + p_t B + e_t$ where a_t are excess returns on mutual funds and p_t are excess return on the unitary hedged world bond index. β_{0i} is the Jensen measure for fund i. The null and alternative hypotheses of the GHM test are $\beta_0 = 0$ and $\beta_0 \geq 0$ respectively. The GHM statistic, KT_{MV}, is asymptotically distributed as a weighted mixture of χ^2. The null hypothesis of the GRS test is $\beta_0 = 0$ versus the alternative hypothesis that $\beta_0 \neq 0$. The GRS test statistic F_{MV} has an F distribution. The Wald statistics $WALD_{MV}$ is distributed as χ^2. PPWi is the Positive Period Weight Measure for fund i. The null hypothesis is **PPW = 0** versus the alternative hypothesis that **PPW ≠ 0**. The Wald statistic WALDPPW is distributed as χ^2. The Treynor-Mazuy model is $a_t = \varpi_0 + p_t\varpi_1 + p_t^2\varpi_2 + e_t$

Benchmark: SB U.S.S World Bond	Jensen Measure		PPW Measure			Treynor-Mazuy	Security Selectivity	Timing Ability	Timing Coefficient	
International Mutual Funds	**Jensen**	t statistics[a]	**PPW**	z statistics[a]		$\varpi_0+\varpi_2*var(p_t)$	ϖ_0	$\varpi_2 * var(p_t)$	ϖ_2	t statistics[a]
Capital World Bond	-0.0130	-0.0855	-0.0073	-0.0484		-0.0179	-0.1485	0.1306	0.1198	1.2768
Fidelity Global Bond	-0.0225	-0.1109	-0.0346	-0.1671		-0.0156	0.1704	-0.1860	-0.1706	-1.0462
Franklin Global Govt Income	-0.0370	-0.1918	-0.0456	-0.2371		-0.0306	0.1424	-0.1730	-0.1587	-1.3565
G.T. Global Govt Income A	-0.0443	-0.2561	-0.0494	-0.2775		-0.0431	-0.0096	-0.0335	-0.0307	-0.1916
G.T. Global Strategic Inc A	-0.1476	-0.5295	-0.1628	-0.5689		-0.1398	0.0716	-0.2114	-0.1939	-0.7347
Hancock Freedom Global Inc B	-0.1685	-1.0232	-0.1714	-1.0434		-0.1680	-0.1527	-0.0153	-0.0140	-0.1203
Keystone Amer World Bond A	-0.1257	-0.7358	-0.1162	-0.6875		-0.1330	-0.3306	0.1976	0.1812	1.5476
Lord Abbett Global Income	0.0121	0.0728	0.0140	0.0855		0.0085	-0.0882	0.0967	0.0887	0.7986
Merrill Lynch Global Bond A	0.1105	0.5639	0.1133	0.5884		0.1074	0.0234	0.0840	0.0770	0.6229
MFS World Governments A	0.0469	0.2094	0.0531	0.2370		0.0398	-0.1509	0.1907	0.1749	0.9313
PaineWebber Global Income B	0.0132	0.0725	0.0179	0.0985		0.0082	-0.1281	0.1363	0.1250	1.0040
Putnam Global Govtl Income A	0.0535	0.2797	0.0529	0.2760		0.0525	0.0237	0.0288	0.0264	0.1627
Scudder International Bond	0.3048	1.3026	0.3175	1.3626	*	0.2939	-0.0025	0.2964	0.2718	1.5648
Smith Barney Shear Glob Bd B	-0.0571	-0.3987	-0.0500	-0.3525		-0.0639	-0.2476	0.1837	0.1685	1.4373
T. Rowe Price Intl Bond	-0.0072	-0.0246	0.0142	0.0496		-0.0233	-0.4606	0.4373	0.4010	2.1900 **
Templeton Income	0.0038	0.0230	0.0013	0.0079		0.0045	0.0239	-0.0194	-0.0178	-0.1513
TNE Global Government A	-0.1716	-1.0289	-0.1681	-1.0255		-0.1753	-0.2739	0.0986	0.0904	0.8748
Van Eck World Income	0.0211	0.0839	0.0255	0.1005		0.0139	-0.1791	0.1930	0.1770	0.8651
Joint performance test on all funds	Statistic	P value	Statistic	P value						
GHM Test: KT_{MV} (1 to 18)	6.94	0.9817								
GRS Test: F_{MV} (18;44)	1.29	0.2400								
Wald Test: $WALD_{MV}$ (18)	35.06	0.0093 ***	35.24	0.0088 ***						

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 17
International Bond Mutual Fund Performance Persistence

The sample period is January 1989-March 1994. The model is $a_{pt} = \beta_0 + p_tB + \varepsilon_t$ where a_{pt} is excess return on a portfolio of mutual funds weighted by α_i, the normalized first sub-period Jensen measures. β_0 is the performance persistence parameter.

Benchmarks	Persistence Parameter	t statistics[a]
SB Broad Index	-0.1676	-0.5970
SB World Bond Index	-0.2232	-0.7356

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.
[a] t statistic computed using heteroscedastic consistent variance.

Table 18
Tests of the Mean-variance Efficiency of the Balanced Benchmarks

The sample period is January 1989-March 1994. The model is $\mathbf{a_t = \beta_0 + p_t B + e_t}$ where $\mathbf{a_t}$ are excess returns on country equity and bond indices and $\mathbf{p_t}$ are excess returns on the 3 balanced benchmarks: the value weighted world balance index, the 2-asset and the 4-asset benchmarks . β_{0i} is the regression intercept and PPW_i is positive period weight measure for country i. The null and alternative hypotheses of the GRS test are $\beta_0=0$ and $\beta_0 \neq 0$ respectively. The GRS statistic F_{MV} has an F distribution and the Wald test statistics, $WALD_{MV}$ and $WALD_{PPW}$ are distributed as χ^2.

Benchmarks	**Value Weighted World Index**				**2-asset Benchmark: MSCI World Equity and SB World Bond**				**4-asset Benchmark: Equity 3-region and SB World Bond**			
Countries	β_0	t statistics[a]	PPW	z statistics[b]	β_0	t statistics [a]	PPW	z statistics[b]	β_0	t statistics [a]	PPW	z statistics[b]
Australia Equity	0.2377	0.3728	0.2385	0.3745	0.4690	0.7395	0.4746	0.7523	-0.0584	-0.0876	-0.0926	-0.1402
Belgium Equity	0.2152	0.4817	0.2146	0.4808	0.1298	0.2929	0.1213	0.2770	-0.2103	-0.5360	-0.2240	-0.5812
Canada Equity	-0.1355	-0.3359	-0.1377	-0.3412	0.0499	0.1251	0.0521	0.1314	-0.3901	-1.0426	-0.4373	-1.1673
France Equity	0.3413	0.7293	0.3360	0.7192	0.3099	0.6531	0.2961	0.6327	-0.1531	-0.3876	-0.1638	-0.4155
Germany Equity	0.4568	0.6904	0.4485	0.6798	0.3000	0.4550	0.2685	0.4119	-0.1804	-0.3764	-0.1852	-0.3856
Hong Kong Equity	1.8413	2.0468 **	1.8515	2.0521 **	2.1125	2.2244 **	2.1258	2.2309 **	1.4512	1.6771 *	1.4061	1.6246
Italy Equity	-0.0085	-0.0101	-0.0059	-0.0070	0.1517	0.1783	0.1502	0.1755	0.1079	0.1211	0.1738	0.1924
Japan Equity	-0.8061	-1.3974	-0.8027	-1.3887	-0.7394	-1.3769	-0.7468	-1.3929	na	na	na	na
The Netherlands Equity	0.7613	2.2566 **	0.7586	2.2508 **	0.6472	1.8804 *	0.6373	1.8648 *	0.2603	1.0237	0.2391	0.9515
Switzerland Equity	0.9089	2.0618 **	0.9091	2.0637 **	0.7891	1.8299 *	0.7728	1.7963 *	0.4102	1.0646	0.3845	1.0141
United Kingdom Equity	0.3361	0.7541	0.3322	0.7466	0.3535	0.7681	0.3434	0.7509	-0.2846	-0.9494	-0.2578	-0.8727
United States Equity	0.5304	1.5085	0.5269	1.5020	0.6926	2.1880 **	0.7093	2.2477 **	na	na	na	na
Australia Bond	0.4496	1.1196	0.4493	1.1195	0.3948	0.9714	0.3925	0.9724	0.2204	0.4860	0.1819	0.3997
Belgium Bond	0.4376	1.1304	0.4364	1.1275	-0.0045	-0.0177	-0.0175	-0.0688	-0.0155	-0.0658	-0.0019	-0.0081
Canada Bond	0.2187	0.7115	0.2148	0.6960	0.1482	0.4769	0.1533	0.4922	-0.0355	-0.1144	-0.0736	-0.2389
France Bond	0.4637	1.1970	0.4622	1.1932	-0.0036	-0.0148	-0.0134	-0.0559	-0.0124	-0.0572	0.0105	0.0487
Germany Bond	0.2504	0.6030	0.2494	0.6009	-0.2735	-1.1936	-0.2834	-1.2458	-0.2310	-1.0608	-0.2061	-0.9608
Italy Bond	0.3571	0.7828	0.3527	0.7710	-0.0431	-0.1200	-0.0532	-0.1493	0.0644	0.1800	0.1090	0.3125
Japan Bond	0.3293	0.8829	0.3382	0.9082	-0.0510	-0.1854	-0.0480	-0.1759	0.1795	0.7000	0.1859	0.7372
The Netherlands Bond	0.2869	0.7011	0.2862	0.6997	-0.2344	-1.0603	-0.2450	-1.1130	-0.2087	-1.0226	-0.1871	-0.9302
Switzerland Bond	0.0921	0.2137	0.0933	0.2164	-0.4267	-1.6295	-0.4356	-1.6767 *	-0.2845	-1.0308	-0.2542	-0.9374
United Kingdom Bond	0.1635	0.3875	0.1629	0.3867	-0.2460	-0.7795	-0.2553	-0.8163	-0.3696	-1.3712	-0.3427	-1.2983
United States Bond	0.3235	2.1870 **	0.3224	2.1826 **	0.2137	1.5595	0.2186	1.5983	0.1161	1.0000	0.0952	0.8461
Joint tests on all countries	Statistic	P value					Statistic	P value			Statistic	P value
GRS Test: F_{MV} (23,39)	1.81	0.0507 *			GRS Test: F_{MV} (23,38)		1.56	0.1097	GRS Test: F_{MV} (21,38)		1.34	0.2104

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

[b] z statistic computed using the GMM estimated variance.

Table 19
International Mutual Fund Performance: Mean-variance Tests

The sample period is January 1989-March 1994. The model is $a_t = \beta_0 + p_t B + e_t$ where a_t are excess returns on mutual funds and p_t are excess returns on the benchmarks. β_{0i} is the Jensen measure for fund i. The null and alternative hypotheses of the GHM test ar $\beta_0 = 0$ and $\beta_0 \geq 0$ respectively. The GHM statistic, KT_{MV} is asymptotically distributed as a weighted mixture of χ^2.

The null hypothesis of the GRS test is $\beta_0=0$ versus the alternative hypothesis that $\beta_0 \neq 0$. The GRS test statistic F_{MV} has an F distribution. The Wald statistics $WALD_{MV}$ is distributed as χ^2.

Balanced Benchmarks:	Balanced U.S. Index		Balanced World Index		2-asset Benchmark		4-asset Benchmark	
International Mutual Funds	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]
Alliance Canadian	-0.9077	-2.3149 **	-0.4443	-0.9389	-0.1752	-0.3756	-0.6852	-1.6512
Alliance Global Small Cap A	-0.7289	-1.7953 *	-0.0462	-0.0870	0.3608	0.8451	-0.4068	-1.2493
Alliance International A	-0.3789	-0.7001	-0.0539	-0.1599	0.1443	0.5038	-0.0883	-0.3634
Bailard, Biehl Intl Equity	-0.6917	-1.2425	-0.4644	-1.5518	-0.3125	-1.1226	-0.4596	-1.8731 *
Centerland Kleinwrt Intl EqB	-0.2805	-0.5656	0.0454	0.1585	0.2590	1.1210	-0.0239	-0.1141
Dean Witter WorldWide Invmnt	-0.1934	-0.4882	0.1556	0.7332	0.2531	1.3328	-0.0738	-0.4314
EuroPacific Growth	0.2696	0.7481	0.5695	2.5152 **	0.7056	3.5132 ***	0.3929	2.9981 ***
Fidelity Overseas	-0.1302	-0.2435	0.0922	0.2805	0.1404	0.4321	-0.0576	-0.2391
First Invest Global	-0.2530	-0.5001	0.1434	0.4845	0.2953	1.0935	-0.0837	-0.3552
FT International Equity A	-0.3239	-0.6367	-0.0253	-0.0876	0.1114	0.4126	-0.1485	-0.6268
G.T. Global New Pacific Gr A	0.1459	0.2457	0.4328	0.9140	0.7081	1.6023	0.3893	0.9011
IDS International	-0.2128	-0.4444	0.0711	0.2630	0.1551	0.5861	-0.0814	-0.4839
Invesco Pacific Basin	-0.4870	-0.7422	-0.1697	-0.4445	0.0586	0.1748	-0.0719	-0.1905
Japan	-0.2526	-0.2666	-0.2666	-0.4602	-0.2029	-0.3798	0.4022	1.2348
Kemper International	-0.2111	-0.4643	0.0720	0.2292	0.2393	0.8337	-0.0756	-0.3174
Keystone International	-0.6054	-1.2790	-0.3211	-1.6326	-0.2866	-1.4350	-0.4425	-2.1907 **
Merrill Lynch Global Holdg A	-0.0892	-0.2826	0.3157	1.4370	0.4407	2.2656 **	0.0358	0.2541
Merrill Lynch Pacific A	0.1225	0.1927	0.1671	0.4091	0.0926	0.2237	0.3604	0.9630
New Perspective	0.0952	0.3657	0.5252	2.1438 **	0.6485	2.8844 ***	0.1495	1.3249
Oppenheimer Global A	0.2274	0.4467	0.5923	1.6018	0.7195	2.0849 **	0.2914	1.2014
PaineWebber Atlas Global GrA	-0.3476	-0.8575	-0.0159	-0.0581	0.1030	0.3922	-0.2337	-1.0165
Princor World	-0.0425	-0.0951	0.3034	0.9208	0.4482	1.4672	0.0168	0.0889
Prudential Global B	-0.3240	-0.7626	-0.0309	-0.1249	0.0507	0.2078	-0.2124	-0.8911
Putnam Global Growth A	-0.1109	-0.3056	0.3042	1.0176	0.4363	1.6290	-0.0364	-0.2096

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 19 (cont'd).

Balanced Benchmarks:	Balanced U.S. Index		Balanced World Index		2-asset Benchmark		4-asset Benchmark	
International Mutual Funds	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]	**Jensen**	t statistics[a]
RSI Retrmnt Intl Equity	-0.3561	-0.6801	-0.1352	-0.6080	-0.0461	-0.2272	-0.0940	-0.6761
Scudder International	-0.0243	-0.0514	0.2578	0.9496	0.3676	1.5077	0.1182	0.7272
Smith Barney Shear Glob OppA	-0.4978	-1.5799	-0.1404	-0.8572	-0.0440	-0.2976	-0.3261	-2.7249 ***
T. Rowe Price Intl Stock	0.0031	0.0060	0.2969	1.1156	0.4148	1.6775 *	0.1421	0.9417
Templeton Foreign	0.3042	0.8770	0.6023	2.3095 **	0.7283	2.9843 ***	0.3382	2.6408 **
Templeton Growth	0.0770	0.2987	0.5688	1.9191 *	0.7574	3.0062 ***	0.1759	1.1647
Templeton Smaller Comp Grth	0.0184	0.0594	0.5100	1.3329	0.7894	2.4824 **	0.2249	0.9115
Templeton World	-0.0946	-0.3560	0.4267	1.3855	0.6131	2.3250 **	0.0272	0.1466
United International Growth	-0.0781	-0.1610	0.2753	0.8519	0.3983	1.2725	0.0269	0.1031
Vanguard Intl Growth	-0.1257	-0.2336	0.1132	0.4269	0.1880	0.7410	0.0188	0.1168
Vanguard/Trustees' Eqty Intl	-0.1922	-0.3904	0.0615	0.2555	0.1309	0.5797	-0.0342	-0.2043
Capital World Bond	0.0984	0.5256	0.1891	1.2941	0.0188	0.2097	-0.0449	-0.4547
Fidelity Global Bond	0.0852	0.3711	0.1966	0.9987	0.0712	0.4006	-0.0518	-0.2643
Franklin Global Govt Income	0.0027	0.0132	0.1190	0.6306	0.0794	0.4244	-0.0686	-0.3771
G.T. Global Govt Income A	0.1144	0.4757	0.2659	1.2020	0.1388	0.6507	-0.0173	-0.0772
G.T. Global Strategic Inc A	0.0982	0.2623	0.3075	0.9229	0.0918	0.2913	-0.0926	-0.2714
Hancock Freedom Global Inc B	-0.0810	-0.4134	0.0035	0.0210	-0.1388	-0.9962	-0.2329	-1.7527 *
Keystone Amer World Bond A	0.0194	0.0882	0.1062	0.6178	-0.1008	-0.9847	-0.1287	-1.0773
Lord Abbett Global Income	0.1498	0.6923	0.2677	1.4438	0.0398	0.3610	-0.0579	-0.5610
Merrill Lynch Global Bond A	0.2453	1.0617	0.3373	1.6798 *	0.1264	0.8449	0.0231	0.1596
MFS World Governments A	0.1843	0.7300	0.2649	1.1554	0.0196	0.1173	-0.0727	-0.4480
PaineWebber Global Income B	0.1062	0.5349	0.1668	0.9679	0.0128	0.0887	-0.0661	-0.4738
Putnam Global Govtl Income A	0.1733	0.7594	0.2799	1.4044	0.0918	0.5602	-0.0106	-0.0644
Scudder International Bond	0.4446	1.6536	0.5293	2.4186 **	0.2744	2.0382 **	0.2135	1.4557
Smith Barney Shear Glob Bd B	0.0694	0.3749	0.1522	0.9704	-0.0441	-0.4842	-0.0906	-0.9840
T. Rowe Price Intl Bond	0.1839	0.5786	0.2237	0.8426	-0.1300	-0.9809	-0.1272	-1.1854
Templeton Income	0.0512	0.2673	0.1630	0.9686	0.0617	0.3980	-0.0346	-0.2153
TNE Global Government A	-0.0147	-0.0693	0.0548	0.3097	-0.1764	-1.9935 *	-0.2174	-2.4338 **
Van Eck World Income	0.0937	0.3388	0.1687	0.6995	-0.0555	-0.2862	-0.1357	-0.6562
Joint performance test on all funds	Statistic	P value	Statistic	P value	Statistic	P value	Statistic	P value
GHM Test: KT_{MV} (1 to 53)	46.75	0.6460	50.65	0.4183	51.45	0.3956	39.73	0.7961
GRS Test: F_{MV} (53;9,9,8,6)	1.02	0.5352	1.14	0.4470	1.44	0.3054	1.22	0.4396

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] t statistic computed using heteroscedastic consistent variance.

Table 20
International Mutual Fund Performance: PPW Measures

The sample period is January 1989-March 1994. PPWi is the Positive Period Weight Measure for fund i. The null hypothesis is **PPW = 0** versus the alternative hypothesis that **PPW ≠ 0**. The Wald statistic $WALD_{PPW}$ is distributed as χ^2.

Balanced Benchmarks:	Balanced U.S. Index		Balanced World Index		2-asset Benchmark		4-asset Benchmark	
International Mutual Funds	**PPW**	z statistics[a]	**PPW**	z statistics[a]	**PPW**	z statistics[a]	**PPW**	z statistics[a]
Alliance Canadian	-0.9193	-2.3233 **	-0.4434	-0.9389	-0.1582	-0.3407	-0.7212	-1.7356 **
Alliance Global Small Cap A	-0.7455	-1.8452 **	-0.0475	-0.0897	0.3822	0.9034	-0.4139	-1.2636
Alliance International A	-0.4188	-0.7786	-0.0559	-0.1662	0.1488	0.5243	-0.0793	-0.3342
Bailard, Biehl Intl Equity	-0.7169	-1.2912 *	-0.4647	-1.5487 *	-0.3216	-1.1603	-0.4716	-1.9353 **
Centerland Kleinwrt Intl EqB	-0.3083	-0.6214	0.0440	0.1535	0.2535	1.0992	-0.0301	-0.1432
Dean Witter WorldWide Invmnt	-0.2032	-0.5170	0.1563	0.7336	0.2538	1.3395 *	-0.0702	-0.4121
EuroPacific Growth	0.2485	0.6920	0.5678	2.5070 ***	0.7032	3.4971 ***	0.3815	2.9507 ***
Fidelity Overseas	-0.1653	-0.3120	0.0908	0.2761	0.1212	0.3782	-0.0608	-0.2518
First Invest Global	-0.2796	-0.5579	0.1372	0.4654	0.3006	1.1169	-0.0936	-0.4024
FT International Equity A	-0.3503	-0.6931	-0.0259	-0.0897	0.0935	0.3513	-0.1565	-0.6522
G.T. Global New Pacific Gr A	0.0993	0.1685	0.4289	0.9021	0.7126	1.6178 *	0.3542	0.8218
IDS International	-0.2343	-0.4939	0.0693	0.2561	0.1427	0.5451	-0.0782	-0.4727
Invesco Pacific Basin	-0.5242	-0.8044	-0.1693	-0.4425	0.0522	0.1539	-0.1108	-0.2945
Japan	-0.2868	-0.3061	-0.2677	-0.4618	-0.2023	-0.3785	0.4204	1.3242 *
Kemper International	-0.2381	-0.5252	0.0718	0.2281	0.2397	0.8424	-0.0670	-0.2803
Keystone International	-0.6156	-1.3137 *	-0.3168	-1.6057 *	-0.2844	-1.4312 *	-0.4357	-2.1610 **
Merrill Lynch Global Holdg A	-0.0946	-0.3018	0.3153	1.4340 *	0.4460	2.2986 **	0.0466	0.3344
Merrill Lynch Pacific A	0.1128	0.1802	0.1676	0.4119	0.0962	0.2339	0.3962	1.0869
New Perspective	0.0851	0.3274	0.5231	2.1371 **	0.6476	2.8849 ***	0.1413	1.2615
Oppenheimer Global A	0.2248	0.4403	0.5877	1.5902 *	0.7209	2.0935 **	0.3133	1.3189 *
PaineWebber Atlas Global GrA	-0.3669	-0.9126	-0.0169	-0.0616	0.0969	0.3716	-0.2515	-1.1040
Princor World	-0.0817	-0.1861	0.3040	0.9226	0.4473	1.4774 *	-0.0004	-0.0024
Prudential Global B	-0.3351	-0.7948	-0.0277	-0.1112	0.0519	0.2130	-0.2057	-0.8654
Putnam Global Growth A	-0.1286	-0.3570	0.3026	1.0161	0.4368	1.6564 **	-0.0187	-0.1118

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] PPW coefficients and z statistics are computed using the generalized method of moments.

Table 20 (cont'd).

Balanced Benchmarks:	Balanced U.S. Index		Balanced World Index		2-asset Benchmark		4-asset Benchmark	
International Mutual Funds	PPW	z statistics[a]	PPW	z statistics[a]	PPW	z statistics[a]	PPW	z statistics[a]
RSI Retrmnt Intl Equity	-0.3674	-0.7082	-0.1359	-0.6102	-0.0572	-0.2828	-0.0920	-0.6643
Scudder International	-0.0541	-0.1153	0.2551	0.9422	0.3689	1.5223 *	0.1156	0.7230
Smith Barney Shear Glob OppA	-0.5119	-1.6322 *	-0.1421	-0.8696	-0.0405	-0.2767	-0.3286	-2.7440 ***
T. Rowe Price Intl Stock	-0.0216	-0.0427	0.2957	1.1112	0.4090	1.6719 **	0.1485	0.9777
Templeton Foreign	0.2932	0.8450	0.6009	2.3060 **	0.7213	2.9545 ***	0.3302	2.6468 ***
Templeton Growth	0.0652	0.2544	0.5686	1.9242 **	0.7630	3.0362 ***	0.1643	1.1100
Templeton Smaller Comp Grth	-0.0099	-0.0321	0.5109	1.3391 *	0.8049	2.5379 ***	0.2116	0.8664
Templeton World	-0.1094	-0.4165	0.4270	1.3918 *	0.6209	2.3607 ***	0.0105	0.0573
United International Growth	-0.1065	-0.2218	0.2778	0.8565	0.3913	1.2623	0.0197	0.0767
Vanguard Intl Growth	-0.1505	-0.2818	0.1116	0.4208	0.1802	0.7097	0.0183	0.1153
Vanguard/Trustees' Eqty Intl	-0.2137	-0.4348	0.0592	0.2466	0.1236	0.5503	-0.0299	-0.1798
Capital World Bond	0.1029	0.5541	0.1894	1.2972 *	0.0187	0.2085	-0.0500	-0.4963
Fidelity Global Bond	0.0767	0.3307	0.1958	0.9900	0.0717	0.4070	-0.0657	-0.3276
Franklin Global Govt Income	-0.0034	-0.0164	0.1191	0.6298	0.0828	0.4427	-0.0710	-0.3899
G.T. Global Govt Income A	0.1086	0.4529	0.2655	1.1958	0.1447	0.6818	-0.0401	-0.1760
G.T. Global Strategic Inc A	0.0823	0.2186	0.3070	0.9170	0.1050	0.3366	-0.1128	-0.3232
Hancock Freedom Global Inc B	-0.0828	-0.4251	0.0010	0.0063	-0.1378	-0.9917	-0.2501	-1.8527 **
Keystone Amer World Bond A	0.0260	0.1194	0.1070	0.6221	-0.0970	-0.9561	-0.1269	-1.0428
Lord Abbett Global Income	0.1498	0.6983	0.2660	1.4343 *	0.0392	0.3576	-0.0724	-0.7032
Merrill Lynch Global Bond A	0.2466	1.0772	0.3366	1.6825 **	0.1241	0.8217	0.0160	0.1080
MFS World Governments A	0.1924	0.7660	0.2638	1.1502	0.0196	0.1166	-0.0676	-0.4094
PaineWebber Global Income B	0.1113	0.5613	0.1660	0.9657	0.0119	0.0822	-0.0685	-0.4817
Putnam Global Govtl Income A	0.1756	0.7713	0.2791	1.4009 *	0.0974	0.5998	-0.0151	-0.0884
Scudder International Bond	0.4561	1.7032 **	0.5288	2.4195 ***	0.2803	2.0835 **	0.2274	1.5318 *
Smith Barney Shear Glob Bd B	0.0717	0.3884	0.1520	0.9687	-0.0374	-0.4142	-0.0844	-0.8993
T. Rowe Price Intl Bond	0.1967	0.6247	0.2250	0.8496	-0.1346	-1.0100	-0.1150	-1.0819
Templeton Income	0.0551	0.2877	0.1621	0.9605	0.0722	0.4668	-0.0324	-0.2016
TNE Global Government A	-0.0155	-0.0737	0.0548	0.3100	-0.1801	-2.0401 **	-0.2317	-2.5431 ***
Van Eck World Income	0.1093	0.3945	0.1651	0.6827	-0.0517	-0.2693	-0.1258	-0.6003

Significance levels: *** indicates 1%, ** indicates 5%, * indicates 10%.

[a] PPW coefficients and z statistics are computed using the generalized method of moments.

APPENDICES

Appendix A Data Description.

Mutual Fund Monthly Total Returns (Morningstar)

The monthly total return data on mutual funds are obtained from *Morningstar OnDisc* database. Total return is computed by taking the change in monthly net asset value, reinvesting all income and capital-gains distributions during that month, and dividing by the starting net asset value. Reinvestments are made on the reinvestment date. The total returns are not adjusted for sales charges (such as front-end and deferred charges and redemption fees). The total returns are net of management administrative, and 12b-1 fees and other costs automatically taken out of fund assets.

Wilshire 5000 Equity Index (Ibbotson & Associates)

The Wilshire 5000 Equity Index is comprised of over 6000 capitalization-weighted security returns and is designed to measure the performance of all U.S. common equity securities with readily available price data. The Wilshire 5000 is about 86% NYSE, 3% AMEX and 11% OTC. The returns are computed by Wilshire Associates.

U.S. 30-day Treasury Bills (Ibbotson & Associates)

Updates are from *The Wall Street Journal*. A one-bond portfolio is constructed with the shortest-term bill of not less than one month to maturity. A one-month holding period return is measured for each month. Total return is calculated as the change in beginning and ending flat prices.

Morgan Stanley Capital International Indices (MSCI) (Ibbotson & Associates)

The monthly total returns are computed with gross dividend reinvested. The MSCI regional and national indices are based on approximately 1,500 companies listed on stock exchanges in twenty-two countries. The combined market capitalization of companies in these indices represents approximately 60% of the aggregate market value of the covered stock exchanges. The monthly returns for the regional indices are reported in U.S. dollars. The monthly returns for the national indices are reported in local currency. Exchange rates for converting currencies are taken at 4:00 pm Central European Time each day. The regional indices used in this study are the MSCI World Index, the MSCI World x US Index, the MSCI World x Japan Index, the MSCI EAFE Index, the MSCI Europe Index and the MSCI Pacific Index. The national indices used in this study are Australia, Belgium, Canada, France, West Germany, Hong Kong, Italy,

Japan, the Netherlands, Switzerland, the United Kingdom and the United States. The total return MSCI Japan Index in U.S. dollars is computed as the weighted difference between the MSCI World Index and the MSCI World x Japan Index. The MSCI World x Japan and US Index is computed as the weighted difference between the MSCI World Index and the MSCI Japan and MSCI U.S. Indices. The market value weights are computed using the FTA market capitalization values.

FT-Actuaries World Indices (Ibbotson & Associates)

These indices are compiled jointly by The Financial Times Limited, Goldman Sachs & Co., County NatWest/Wood Mackenzie & Co. and the Institute of Actuaries and the Faculty of Actuaries. The monthly total returns are calculated with the gross dividend reinvested. The FT-Actuaries World Indices aims for at least 70% coverage of the aggregate market value of all domestic exchange-listed companies. Markets, companies and securities are only included where direct holdings of capital by foreign nationals is permissible. The monthly returns and market capitalization values for the regional indices are reported in U.S. dollars. The monthly returns and market capitalization values for the national indices are reported in local currency.

Exchange Rates (Ibbotson & Associates)

From 1960 through 1987, exchange rate data are obtained from OECD *Main Economic Indicators Historical Statistics*. From 1988 on, exchange rate data are provided by *The Wall Street Journal* reported at 3 pm New York time.

Salomon Brothers SB Broad™ Index™ (Ibbotson & Associates)

The total returns on this index is reported in Salomon Brothers' *Mortgage Research, Mortgage Pass-Through Security Total Rate of Return Index*. The bonds comprising this series include Salomon Brothers High-Grade Corporate bonds and 7, 10 and 30 year Treasury bonds.

Salomon Brothers Currency-Hedged World Government Bonds (Ibbotson & Associates)

The currency-hedged indices are constructed by using rolling one-month forward exchange contracts as hedging instruments. The face value is the principal amount plus the interest that has already accrued and the interest that is expected to accrue during the one-month investment period. This will leave the intra-month changes in bond prices unhedged. However, the residual

currency exposure resulting from over- or under-hedging is limited only to changes in bond prices, multiplied by changes in currency values.

Salomon Brothers World Government Bonds (Ibbotson & Associates)

Total return represents the one month percentage change in the bond. Maturities of bonds in this index is at least one year. Regional index returns are stated in U.S. dollars. Country index returns are stated in local currencies.

Lehman Brothers Global Bond Indexes™ (Ibbotson & Associates)

All issues in the Global Bond Index have a minimum of one year to maturity. The index does not include securities that have floating rates, convertibles, warrants or linked bonds. All country components are weighted according to market capitalization excluding Japan. The Japanese bond index is weighted according to the market capitalization of the largest and most actively traded Japanese government bonds. All regional indexes are expressed in U.S. dollar currency.

Forward Contract Rates (Ibbotson & Associates)

Rates are reported on the last business day of each month. The data source from 1986-1993 is J.P. Morgan with rates reported at 5:00pm London

close. The data source from 1994 to present is the WM Companies with rates reported at 4:00pm London close.

Appendix B Mean-variance Test with Short Sale Constraint on Mutual Funds

Here I extend the results of Gibbons, Ross and Shanken (GRS 1989) to the case where a subset of the assets, the mutual funds, is subject to a short sale constraint. The maximized squared Sharpe ratio of the passive investment set, $\{p_t\}$, remains the same and is $\mu_p' V_p^{-1} \mu_p$. The maximized squared Sharpe ratio of the combined investment set, $\{a_t, p_t\}$, becomes

$$[\mu_p' V_p^{-1} \mu_p + (\beta_0 + \lambda_a)' \Sigma^{-1} \beta_0]' \\ [\mu_p' V_p^{-1} \mu_p + (\beta_0 + \lambda_a)' \Sigma^{-1} (\beta_0 + \lambda_a)]^{-1} \\ [\mu_p' V_p^{-1} \mu_p + (\beta_0 + \lambda_a)' \Sigma^{-1} \beta_0] \qquad \text{(A1)}$$

where $\beta_0 = \mu_a - V_{pa}' V^{-1}$, $\Sigma = V_a - V_{pa}' V^{-1} V_{pa}$ and λ_a is the vector of slack variables associated with the no-short-sale constraint. The difference between the maximized squared Sharpe ratio between the two investment sets is

$$[(\beta_0 + \lambda_a)' \Sigma^{-1} \beta_0]^2 + [(\mu_p' V_p^{-1} \mu_p)(\beta_0 + \lambda_a)' \Sigma^{-1} (\beta_0 - \lambda_a)] \qquad \text{(A2)}$$

Since the slack variables are restricted to be non-positive, the difference will be greater than zero if β_0 is greater than λ_a. The null hypothesis that the difference is equal to zero will hold when $\beta_0 = 0$ and $\lambda_a = 0$ or when $\beta_0 = -\lambda_a$. Therefore the GRS test rejects the null hypothesis too often.

Appendix C Optimal Portfolio Weights.

The optimal portfolio weights for the combined investment set is computed by solving the following minimization problem:

$$\begin{aligned} &\mathbf{w} = \underset{\{\mathbf{w}\}}{\text{Argmin}}\ \mathbf{w}'\mathbf{V}\mathbf{w} \\ &\textbf{subject to} \\ &\mathbf{w}'\mu = \mathbf{c} \end{aligned} \tag{A3}$$

The solutions are:

$$\begin{aligned} w_p &= \frac{w'Vw}{w'\mu} V_p^{-1}[\mu_p - V_{pa}\Sigma^{-1}\beta_0] \\ w_a &= \frac{w'Vw}{w'\mu}\Sigma^{-1}\beta_0 \end{aligned} \tag{A4}$$

Since the first term, $(w'Vw)/(w'\mu)$, is a positive constant, the null and alternative hypotheses can be written in terms of the conditional moments of $\mathbf{a}_t$ and $\mathbf{p}_t$.

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