

Predictability and Trading Strategies of the U.S.-based International Mutual Funds

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Preliminary Draft: Comments welcome

September 27, 2004

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ABSTRACT

The predictability of the *U.S.*-based international mutual fund returns has received renewed consideration in recent academic studies. This paper extends existing research by exploring the 2,479 daily return observations covering the period from January 4, 1993 through October 31, 2002 for all categories of international equity, bond, and hybrid mutual funds. We split the sample by using the initial sub-sample to investigate return patterns of international mutual funds and develop trading rules based on the predictable return patterns, and test those rules on the holdout sample. The regression results show the presence of statistically significant regularities, especially for international equity mutual funds. Various trading strategies are then presented to show that the returns are economically significant in magnitude, irrespective of load or no load funds, beating significantly a buy-and-hold strategy. The empirical findings are consistent across the funds and indices even in the presence of different current exchange restrictions. The mutual fund pricing has predictable and exploitable component and further regulatory changes and investigation may call for in order to improve the efficiency of the markets.

Keywords: Mutual Funds, Net Asset Value, Return Autocorrelations, Predictability
JEL Classifications: G12, G14

1. Introduction

The *U.S.*-based international open-end mutual funds have become a vital investment vehicle for both individual and institutional investors in the United States. International funds mostly invest in equities of firms located in countries outside of the *U.S.* Also, individual investors and financial institutions (especially banks) invest in international bond funds. The recent integration of international markets made it possible for international funds to grow at an increasing rate, especially after 1990. The total assets of mutual funds are now larger than the assets of any other financial institutions. Assets of mutual funds have increased from \$1 trillion in 1990 to \$6.975 trillion in 2001 and the number of mutual funds has increased by three-fold during this period. Although the assets have decreased to \$6.392 trillion in 2002, mostly due to the bear market in equity shares, they have grown back to \$7.414 trillion in 2003.¹

The price of a mutual fund is determined by its net asset value (*NAV*); where *NAV* is the market value of a mutual fund share (similar to a bid price of stock). After the close of each trading day, mutual fund companies compute *NAV* by taking the closing market value of all underlying securities of a fund plus other assets (cash) and subtracting all liabilities of the fund, and dividing the total net assets of the fund by total number of outstanding shares. Mutual funds determine the values of their portfolios as of 4 PM Eastern Time (ET) when the New York Stock Exchange (NYSE) closes.² However, most of the European and Asian stock markets respectively close 5-7 hours and 12-17 hours before the NYSE closes. This causes the last closing prices of the underlying shares of international funds to be stale. Speculators could take advantage of time differences between overseas and the *U.S.* markets, i.e., by buying international funds at one point in time today (before the NYSE closes) following a rising *U.S.* market and selling them next day. The current *NAV* pricing provides opportunity to short-term speculators to exploit stale pricing that causes international funds to be predictable.

Since the *U.S.* fund investors have chances to invest on prices that observed many hours ago, the exploitable information would exist for those investing in international funds. Investors who properly guess which news will move foreign markets should be able to profit by trading these funds. Such knowledge is in theory not exploitable in the local markets since the opening

¹ Mutual Fund Fact Book 2004, 44th Edition, May 2004, The Investment Company Institute (ICI).

² Mutual funds and retirement plans such as 401(k), 403(b), and 457, and variable annuities are priced as of the close of each day. According to 2004 Mutual Fund Fact Book of ICI, mutual funds accounted for \$2.7 trillion (approximately 22%) of the \$12 trillion US retirement markets at year-end 2003. Pension funds, insurance companies, banks, and brokerage firms hold the remaining 78%.

prices in the home markets should reflect the all-available information. However, trades made in the U.S.-based international funds determine the prices before the news and there would be some trading rules based on the U.S. stock indices as well as other information that allow profits by trading these funds. The internet and modern communications make it more likely that investors in such as *i*-shares, financial futures, and closed-end country funds acquire knowledge of overseas news as well as news in the U.S.³ Investors can transfer from one mutual fund to another free (as in many retirement plans and variable annuities) and transfers between accounts are typically permitted with no charges although fund families may eventually restrict the trading by investors who do it repeatedly. Many mutual funds can be bought and sold through brokerages such as E-trade with no expenses (the mutual funds pay the brokerage houses).

Most stock markets abroad are not as liquid as the U.S. markets and subject to the additional obstacles (such as domestic government restrictions, delays in transaction settlement, inadequate regularities etc.). This could result in a nonsynchronous trading problem that may cause stale pricing in the funds in which the underlying stocks are traded infrequently. These funds may exhibit return autocorrelations because the underlying securities are traded at different times and security prices are only updated on a systematic basis. One of the major questions is whether market indices and other pertinent information can predict the next day's mutual fund returns. The price movements of mutual funds tend to correlate more closely with the direction of the market indices than do individual stocks. Many studies suggest that regionally focused international funds can be predictable. Becker and Finnerty (1993) document that large price changes in Tokyo and London occur overnight due to flow of information after the markets close. Since the investors of international funds rely on the prices that are many hours old, the amount of exploitable information is large for those investing in international funds.

The current paper investigates the predictability of international fund returns on the basis of geographical locations of the underlying shares of the funds and tests whether the time differences affect the magnitude of the predictability. We also explore the day-to-day predictability of international bond and international hybrid funds, which, so far, have not been extensively investigated. Recently, Zitzewitz (2003a) shows degrees of serial correlations in international bond funds by analyzing equal-weighted bond portfolios. We extend his study by

³ According to Mutual Fund Fact Book 2002 by the ICI, 82% of investors used the internet to trade mutual funds in 2001. The internet trading of mutual funds are also discussed in Ciccotello, Edelen, Green and Hodges (2002).

examining the predictability and exploitability of individual international bond and hybrid funds.⁴ We extend the existing literature by investigating all categories of international stock, bond and hybrid mutual funds on individual and the aggregate fund levels. On the aggregate level, equally weighted portfolios are similar to indices and present the advantage of having less residual variance or less idiosyncratic risk. Also, our paper compares the potential exploitation of funds in terms of returns for these funds given different trading strategies and develops an optimal switching strategy for these funds based on the market movements. We offer comprehensive analysis of the predictability of international mutual funds.

We use a unique mutual fund dataset that includes both dividend and capital gains distributions. Both distributions will affect the *NAV* of a mutual fund. When a fund receives dividends or interest incomes from its underlying securities, it distributes the amounts received to its shareholders. On an ex-dividend date, the *NAV* for equity funds should drop by the exact amount of distributions paid to the investors. Recent studies show that the results may be underestimated in absence of distributions data (i.e., any serial correlation estimated from the data is biased downward).⁵ Inclusion of mutual fund distribution data would provide more precise empirical results. Additionally, the time period - almost 10 years of daily data- covered in this study is longer than other recent studies on the predictability of international funds. We approximately divide our sample equally and test the hypotheses using the first sample and then evaluate the trading strategy on a holdout sample. This methodology would reduce the existence of data snooping bias.

The paper uses 2,479 daily return observations from January 4, 1993 to October 31, 2002 for different categories of 117 international stock funds, 21 international bond funds, and 6 international hybrid funds. Empirical results indicate that returns are statistically significant in magnitude and these effects are also shown to be economically significant. Our findings suggest that simple trading strategies warrant potential profits in these funds. The empirical results show that both load and no load funds are subject to similar kind of exploitation by prudent investors and that investors exploit international funds even at the presence of current trading and

⁴ Varela (2002), Boudoukh, Richardson, Subrahmanyam and Whitelaw (2002), and Jares and Lavin (2004) focus on individual funds from Asia-Pacific (especially Japanese funds) and Europe. On the other hand, Chalmers, Edelen and Kadlec (2001), Goetzmann, Ivkovic and Rouwenhorst (2001), Greene and Hodges (2002), and Zitzewitz (2003a) focus on aggregate fund level (equally weighted portfolios).

⁵ The result of the market timing strategy of Green and Hodges (2002) is understated by 1% to 4%. Similar downward bias is reported in Chalmers, Edelen and Kadlec (2001), Jares and Lavin (2004), and Zitzewitz (2003a).

exchange restrictions. Further, the paper offers policy implications for both mutual fund managers as well as investors and provides recommendation for revising the current pricing system. Managers of mutual funds have an interest in keeping their turnover low and their *NAV* reported correctly to discourage any speculative trading and keeping the confidence of investors.

The organization of this paper is as follows. The next section discusses institutional arrangements of mutual fund's *NAV* pricing and fair value pricing. Sections three and four respectively discuss the review of literature and the data and methodology. Section five presents empirical results on return predictability, develops trading strategies, and evaluates these strategies. Further, section five discusses the size and style effects of mutual funds predictability. Section six provides recent widespread evidences of mutual funds' return exploitation and tests a new proposal made by the Security and Exchange Commission. Section seven concludes the paper.

2. Issues Concerning with *NAV* Pricing and Fair Valuation

The Security and Exchange Commission (SEC) regulates and governs the mutual fund industry in the U.S.⁶ According to Rule 22c - 1(b) of the Investment Company Act of 1940, open-end mutual funds must compute the current *NAV* no less frequently than once daily on each trading day. The SEC Rule 22c-1(d) requires fund managers to determine the time (usually 4 PM ET) to calculate fund's *NAV*. The deadline to submit the *NAV* prices to NASDAQ is 5:50 PM ET and NASDAQ distributes the *NAV* data to media and news services. If investors place a trade order after 4 PM ET on Monday, they will receive the share price determined at the close of Tuesday. To calculate *NAV*, mutual funds value each of their underlying assets at their latest sale price and if there is no sale on that day, funds value the security at the most recently quoted bid price.⁷

⁶ The Investment Company Act of 1940 regulates the structure and operations of mutual funds; the Securities Act of 1933 requires federal registration of all public offerings of mutual funds shares; the Securities Exchange Act of 1934 regulates mutual fund principal underwriters and others who sell mutual funds shares and requires them to be registered with the SEC; the Investment Advisers Act of 1940 requires federal registration of all investment advisers of mutual funds.

⁷ Before the inception of the investment company act 1940, *NAV* was calculated at 4 PM on day t but effective for public transactions at 10 AM on day $t + 1$. However insiders within mutual funds could buy and sell funds after 4 PM on day t at day $(t-1)$'s *NAV*. Additionally, insiders could sell funds at a discount to the *NAV*. The backward pricing rule of the Investment Company Act 1940 was introduced in 1940 to eliminate insiders' profit opportunities. Under the provision of the backward pricing rule, mutual funds priced the *NAV* that remained in effect for the next 24 hours. Investors locked-in a low price in a bull market and higher price in a bear market under backward pricing

Nonsynchronous trading and time differences between the U.S. and other foreign markets cause stale pricing problem of computing daily *NAV* of international funds. Stale pricing may provide signal of fund predictability since these funds invest in foreign securities, most of which are not cross-listed in the U.S. markets either as stocks or American Depositary Receipts (ADRs). Although direct purchases of stocks incur brokerage commissions and other transaction costs; the institutional features of mutual fund shares allow investors to trade funds without transaction costs. Because of time lags, it is possible for investors of international funds to take advantage of stale prices. For example, American Century International Fund (Ticker: TWIEX) that consists of securities primarily traded in foreign countries such as Japan, Europe, and Pacific Rim countries, calculates its *NAV* at 4 PM ET on ordinary days. For underlying Japanese stocks it holds, TWIEX takes the closing prices from the Tokyo Stock Exchange (TSE) and converts these prices to their equivalent U.S. dollars. But the TSE closes at 1 AM ET (8.30 hours before the NYSE opens). This *NAV* pricing rule allows the U.S. investors to buy or sell TWIEX at prices determined 14-15 hours earlier. If there is favorable information after the close of the TSE but before the open of the NYSE, investors will trade on that information anticipating it may be reflected in next day's stock prices at the TSE (and hence the *NAV* of TWIEX).

In practice, the US-based international funds tend to invest disproportionately in large multinational firms. Large multinational firms often derive a significant fraction of profits from the U.S. since they have U.S. subsidiaries as well as their products are exported to the U.S. Because the U.S. is dominant in the world economy, even non-export oriented small multinational foreign firms are also affected by the U.S. developments. As such, the Europe and Japan funds are closely related to the U.S. economy. The existence of *NAV* predictability has been known to the mutual fund industry for over decades.⁸ There is no established rule to mitigate stale pricing problem of international funds at this moment. The Investment Company Act of 1940 allows the funds to value their security at a fair value as determined in good faith by the board of directors of mutual funds when a significant event affects the market, there is no

rule. The introduction of the forward pricing provision in 1968 removes demerits of the backward pricing rule. According to the forward pricing rule, mutual funds execute investment orders after the receipt of any sales, redemptions or repurchase orders from investors at the next computed prices of funds' *NAV* (usually 4 PM ET). For details, see Investment Company Act Release No. 5413 (June 25, 1968) and SEC Investment Company Act Release No. 5519 (Oct. 16, 1968)].

⁸ There were attempts by Nomura Securities Foreign Inc. in 1979 and by Putnam Growth Fund and Putnam Foreign Equities fund Inc. in 1980 to make an amendment to Rule 22c-1. But the SEC took no-action in this regard. For details, see Chapter 9 of Pozen (1998).

reliable market quotation for a security, or the underlying stock market is closed. The SEC suggests that mutual funds should use across-the-board (top-down) adjustments for any price adjustment.⁹

The objective of fair value pricing is to protect long-term investors from short-term traders. Fair value pricing mitigates part of stale pricing problem. But there is no uniform fair value method used by mutual fund managers. Rahl (2001) documents that mutual funds follow different fair value methods such as index futures, forward currency contracts, intra-day U.S. returns, security prices in other markets, ADRs, and any of a host of other predictors of the U.S. security prices. It is possible that different funds holding similar securities could come out with different fair value for the same security.¹⁰ There is also inconsistency in defining an illiquid security. For example, some funds treat an illiquid security for which there is only one market maker, some companies defines an illiquid security if the price of the security does not change for the last five business days.¹¹ A problem of fair value method may occur due to after-hour news announcements by any big firm or industry and fair valuing an entire portfolio that does not resemble an index is complex and time-consuming. Some investors argue that *fair value* is unfair and equivalent to *artificial pricing*. Most of the funds are reluctant to use fair value (even if it is necessary) because they avoid to loose investors' confidence or lawsuits.¹²

Solutions to eliminate *NAV* predictability may include both bottom-up and top-down fair value methods. Bottom-up method evaluates each security within a portfolio on a case-by-case basis and updates each stock's closing prices to reflect the relevant market information. In contrast, top-down methodology evaluates the broad asset classes first, then across the industries within classes, and finally across firms within the industries. Bottom-up methodology is more appealing because there might be events that are relevant only to a certain country, sector, industry, firm, or portfolio. Ciampi and Zitzewitz (2001) of Interactive Data Corporation (IDC) and Madhavan (2003) of Investment Technology Group (ITG) Inc. recently support bottom-up

⁹ The SEC's position on fair value pricing is stated in letters by Scheidt (1999, 2001).

¹⁰ Rahl (2001) shows that on an average 13% of mutual funds use some kind of fair value adjustment.

¹¹ A recent SEC survey also reveals that one third of 960 funds surveyed in Fall 2003 did not use fair value between February 2002 and September 2003. Over 50% of the surveyed funds that invested more than half of their portfolios in foreign markets used fair value no more than five times during this period. Refer to 'Fair Value Gets Short Shrift', Ian McDonald and Tom Lauricella, *Wall Street Journal*, March 24, 2004.

¹² 'Heartland Advisors' used *fair value* to price three funds and more than a dozen lawsuits have been filed because the shareholders believed that funds were not accurately priced. The *NAVs* of these funds decreased significantly after fair valuation and investors charged Heartland for insufficient disclosures of fair value in prospectuses. Refer to 'Study: Inconsistent Valuation Practices Plague Industry', Daly, Gavin, July 23, 2001 at www.ignites.com.

fair value method. However, Singal (2004) documents that implementing fair value pricing is difficult because international funds invest in different markets and the correlation between a particular fund and a market is not constant, rather correlation may change continuously. Some international indices suffer from stale pricing because of low trading volume as well as infrequent trading of their underlying securities. Madhavan (2003) claims that the fair value pricing can only be introduced and expedited in the mutual fund industry if public benchmark providers were to produce fair value adjusted indexes.¹³

The fair value pricing became questionable during the Asian financial crisis, especially, after the Hang Seng Index of Hong Kong fell 14% on Tuesday, October 28, 1997 where Hong Kong Market closes 13 hours before the NYSE closes. The FTSE of UK and Nikkei 225 of TSE also declined by 9% and 4% on October 28, 1997. This corresponds with the worst decline in the U.S. markets in a decade. On Monday, October 27, 1997, the DJIA, S&P 500 and NASDAQ decreased by 7.18%, 6.87% and 7.16% respectively.¹⁴ Investors earned one-day return of 8%-10% from most of the US-based Asian mutual funds, which did not use fair value pricing (for example, Hong Kong Fund and U.S. Global China Region Opportunity fund). Hong Kong market actually rebounded on Wednesday as a result of a rebound in the NYSE on Tuesday, October 28, 1997 (the Dow, the S&P and the NASDAQ increased by 4.71%, 5.12% and 4.58% respectively from previous close and approximately 10% from their morning low).¹⁵ Similar situation occurred on January 3, 2001 when the Federal Reserve cut interest rates and the US markets moved up. Investors of international funds invested tens of millions dollars and funds which did not use fair value were diluted (Bullard, 2001). These evidences suggest that

¹³ Many funds are currently using either IDC's or ITG's fair value method. However, the SEC found that Heartland Advisors Inc. mispriced two of its municipal bond funds by following IDC's fair value pricing method. The SEC's lawsuit against Heartland alleged that the firm fraudulently overstated the value of the underlying shares of its two municipal bond funds. This evidence raises the questions of ethics, fairness and correctness of fair value service providers. Refer to 'One Case Shows the Perils of Smoothing', by Karen Damato, *Wall Street Journal*, March 24, 2004).

¹⁴ The US markets mostly declined because of investors' concerns about potential impact on US corporate earnings and the repercussions from the potential economic slowdowns. The fall of DJIA on October 27, 1997 has been treated as the 10th largest decline since 1915. The cross-market trading halt circuit breaker procedure had been used first time on October 27 since its adoption in 1988. At the close of the NYSE on Tuesday, October 28, 1997 funds took different views to price their foreign securities. For example, the T. Rowe Price Fund used neither the Tuesday Hong Kong closing prices nor the NYSE Tuesday closing prices. Instead, the T. Rowe Price used the Wednesday opening prices of Hong Kong. For details, see 'Trading Analysis of October 27 and 28, 1997', A Report by the Division of Market Regulation, U.S. Securities and Exchange Commission, 07/19/1999.

¹⁵ Fidelity valued the portfolios of its Hong Kong and China securities on the basis of Tuesday's NYSE closing prices which increased Fidelity's *NAV* by 2 cents to \$ 10.88 on October 28 as opposed to the investors' belief that the *NAV* would drop. For details, see Jares and Lavin (1999), Pozen (1998) and Singal (2004).

international funds are vulnerable to smart investors. Zitzewitz (2002, 2003a,b) and Jares and Lavin (2004) find significant profitable opportunities even using recent mutual fund data. In particular Jares and Lavin (2004) identify profitable opportunities using data up to December 2001.

3. Literature Review

Many researchers have studied the integration of the U.S. and other global markets in terms of correlations, spillover effects, lead-lag relationship, weekend effect, contagious effects, volatility and other issues.¹⁶ Using different sets of financial data from the U.S. and foreign markets, most of these studies find that there is a spillover effect from the U.S. to the other markets. This transmission process is contemporaneous for markets situated in the U.S. time zone but has a one-day lag for Asian and European markets. Most of these studies conclude that it would be difficult to make abnormal profits from the observed correlations. However, recent studies find that the markets are serially correlated and there exist profitable trading strategies among these markets.

Copeland and Copeland (1998) exploit the lead-lag relationships using a trading rule that involves Hong Kong futures contracts. The proposed trading rule provides excess returns of up to 11.5 basis points over buy-and-hold returns. Bhargava, Bose and Dubofsky (1998) examine the profitability of trading international funds by using five no load international funds from May 31, 1988 through December 31, 1995 and find that international funds can be predictable. They propose a trading strategy that provides an annual return of more than 8% higher than a buy-and-hold strategy. Stanton (1999) shows that employees have an incentive to retire and liquidate their retirement or rollover plans if they find that their retirement annuities are priced on the basis of stale prices. Miller and Prather (2000) investigate the predictability of College Retirements Equity Fund (CREF) annuity accounts and find that returns on the CREF global fund can be predicted from lagged returns on the CREF domestic funds, notably the index fund. They propose a switching trading strategy in between the CREF global fund and Russell 3000 index (because the CREF index fund tracks Russell 3000 index). The results reveal that the switching

¹⁶ Hillard (1979), Jaffe and Westerfield (1985), Eun and Shim (1989), Becker, Finnerty and Gupta (1990), Hamao, Masulis and Ng (1990), King and Wadhvani (1990), Koch and Koch (1993), Lin, Engle and Ito (1994), Craig, Dravid and Richardson (1995), Karolyi and Stulz (1996), Copeland and Copeland (1998), and Longin and Solnik (2001) etc.

strategy dominates the buy-and-hold strategy in terms of higher risk-adjusted returns.

Bhargava and Dubofsky (2001) investigate the possibility of timing the international funds by examining three Vanguard international equity index funds (European, Pacific, and Emerging). They find significant predictability for these funds and propose a trading strategy that earns significantly higher returns than the buy-and-hold returns in absence of transactions costs. Goetzmann, Ivkovic and Rouwenhorst (2001) examine *NAV* predictability from the fact that there is a close relationship between a fund's liquidity and stale prices of its underlying securities. They investigate portfolios of funds for eight Morningstar international fund categories from January 2, 1990 through July 24, 1998 and find higher correlation between fund returns and lagged S&P 500 returns. They propose a trading strategy that outperforms buy-and-hold strategy by approximately 20% per year in absence of transactions costs (i.e. \$1.1 billion worth of wealth is transferred to short-term traders annually). Chalmers, Edelen and Kadlec (2001) document that current *NAV* pricing creates economic distortions, inefficiencies and potential deadweight loss. They show that both domestic and international equity funds can be predicted from S&P 500 index future and bond funds can be predicted from futures contract on 5-year T-note. They propose a wildcard option trading strategy that earns annualized excess returns of 2.8% for domestic equity funds and 10.4% for international equity funds.

Varela (2002) investigates the extent to which the closing foreign market index can be used to predict the US-based Asian funds. He finds predictable components in the underlying local indices and proposes a filter rule that provides significantly higher (6 to 12 times) returns for Japan and New Zealand funds in absence of transactions costs, trading restrictions, and fair value pricing. Greene and Hodges (2002) examine the impacts of fund flows that are correlated with subsequent fund returns through a dilution effect. They investigate 204 Growth, 309 Bond, 211 domestic equity, and 109 international equity funds from February 2, 1998 through March 31, 2000 and find significantly higher average correlation between international funds and lagged S&P returns. They also document positive correlation between returns of international funds and lagged fund flows. They observe no significant dilution effect for domestic equity funds. For international funds, a significant dilution effect is observed that costs long-term investors approximately \$1 billion a year.

Boudoukh, Richardson, Subrahmanyam and Whitelaw (2002) study the *NAV* predictability for 12 international/European funds and 5 Pacific funds from January 1, 1997

through November 30, 2000 and propose a trading strategy that produces on an average 216% returns over 34% buy-and-hold returns by staying less than 20% time in the stock market. Miller, Prather and Mazumder (2002) investigate the possibility of predicting a mutual fund class by using daily returns for 641 mutual funds comprising 20 asset classes. They find that the U.S. equity funds predict the returns of international funds and the instantaneous and cross correlation structure are useful for asset reallocation strategies.

Zitzewitz (2003a) reviews the size and scope of the stale pricing problem using fund portfolios for all categories of Morningstar mutual funds from January 1, 1998 through October 31, 2001. He finds substantial trading opportunities for 44 out of 48 Morningstar's fund categories of which the most significant trading opportunities are observed for international stock, convertibles, high yield bond, emerging market bond, and sector funds. He presents a profitable trading strategy that earns excess returns of 10%-20% for convertible and high-yield bond funds, 15-25% for domestic small-cap equity funds and 40%-70% for international funds. Zitzewitz also estimates that the buy-and-hold investors of international funds lose \$4.1 billion per year. Jares and Lavin (2004) document that the US-based Japan mutual funds can be predicted from the MSCI Japan i-share. They examine 8 Japan funds from March 21, 1996 through December 6, 2001 and find higher correlation between returns of Japan funds and lagged MSCI Japan i-share. They propose a general trading rule that produces positive and higher average returns than the buy-and-hold strategy in absence of transactions costs and trading restrictions. However, Greene and Hodges (2002) use i-shares as a trigger (as opposed to the S&P 500) in their trading strategy and find lower returns but higher risk (table 1, panel C). Zitzewitz (2003a) also reports that most of the i-shares are illiquid (except Japan i-shares) and may not correctly predict international funds.

4. Data and Methodology

Data for this paper come from several sources. Initially a sample of all international mutual funds was sorted using both *Morningstar Principia Pro* and *CDA (Wiesenberger) Investment View* mutual fund databases at the end of the period (October 2002). To be included in this study, the fund must have been in continuous operation during the period from January 4,

1993 through October 31, 2002.¹⁷ Since mutual funds are permitted to change the objectives (if shareholders approve the change), we consult both *Morningstar* and *CDA* to eliminate any international funds that changed objectives during the period of study. The purpose of eliminating these funds is to ensure the homogeneity of funds representing each international fund category and to capture the uniqueness of the return properties of individual international fund in each investment category. Load and no load funds are separated from one another to distinguish the differences (if any) of exploitable patterns. We use the share class, which is inception first for multiple share classes within the same fund family. If the inception date is the same for multiple share classes, we choose the share class alphabetically (usually A-share class).¹⁸

The final observations consist of 2,479 daily returns of 117 international equity funds from the following *Morningstar* categories: Diversified Emerging market fund (4), Diversified Pacific/Asia fund (7), Europe fund (11), Foreign fund (56), Japan fund (4), Pacific/Asia excluding Japan fund (5), Latin America fund (1) and World fund (29). The sample also includes 21 International Bond funds and 6 International Hybrid funds (funds with stock holdings of greater than 20% but less than 70% of the portfolios, where 40% of the stocks and bonds are from foreign markets).¹⁹ Daily *NAV*s and distributions (dividends or capital gains) data for each of the selected funds are obtained from *Dial data*. The original source of *NAV* of *Dial data* is NASD quotes services. To ensure the quality of the data we follow the screening procedure proposed by Busse (1999).²⁰

Daily mutual fund return is calculated by using the following formula:

$$R_{i,t} = \ln \frac{NAV_{i,t}}{NAV_{i,t-1}}, \quad (1)$$

where $R_{i,t}$ is the return on fund i during the period t , $NAV_{i,t}$ is the net asset value of an investment in fund i at time t , $NAV_{i,t-1}$ is the net asset value of fund i at time $t-1$. An equally weighted index

¹⁷ The disappearance of some funds (survivorship bias) may not be a problem in this study. One reason for this belief is that disappearing funds would likely be poor performing funds.

¹⁸ The sample includes funds that are ‘closed to new investors’ - an indication of whether or not a security investment has eligible shares for issue to new investors. The prevailing investors can still use them by switching most of their money and keeping a small fraction of investment in these funds.

¹⁹ Note that there were more actively traded international funds before January 4, 1993 than our actual sample of this study. This is due to the difference between the inception dates and the data beginning dates of funds.

²⁰ Missing *NAV*s and errors in distributions dates account for less than 1% of our *Dial Data* sample. For example, distributions are sometimes recorded one day or two days before or after the actual distributions date (ex-dividend date). We consult *Moody's Dividend Record: Annual Cumulative Issue* to verify and correct the missing *NAV*s.

return is obtained by taking the average of the returns of the individual fund i within each fund category and is given as:

$$R_{c,t} = \frac{\sum_{i=1}^n R_{i,t}}{n}, \quad (2)$$

where $R_{c,t}$ is the average return of category (c) during the period t . This resulted in developing equally weighted daily return indices or portfolio returns for each international fund category.

Because the *NAV* of an equity mutual fund excludes the distributions of dividends (capital gains) paid to the shareholders, the distributions are added to the *NAV* in order to estimate the returns of the international equity funds. Distributions (interest payments) of a bond mutual fund are declared on a daily basis but they are paid at the end of each month and the *NAV* is not reduced by the amount of distributions paid. We prorate the accrued interests for the bond fund over the month based on the distributions data provided by *Dial Data*. Then the amount of distributions paid in each month is divided by the number of business days of that month.²¹

The following major US indices are used to predict the international funds' returns: the S&P 500, the Russell 1000, the Russell 2000, the Russell 3000, the Wilshire 5000, the Dow Jones Composite, the Dow Jones industrial and the NASDAQ. We also use the Morgan Stanley Capital International (MSCI) indices for most of the regional and diversified funds because the MSCI indices represent many countries and possibly are the closest to the theoretical market index. The MSCI offers real-time data for the MSCI indices and MSCI free indices. The MSCI free indices are the most appropriate benchmarks for regional or diversified international funds because they exclude shares of companies that are not readily available for foreign investors. We select the MSCI free indices for this paper and the data are obtained from DRI. All indices are in terms of US dollars except Japan indices. The Japanese indices are Nikkei 225, TOPIX 1st and 2nd sections given in Japanese local currency.²² The daily returns for these indices are computed

²¹ It is true that some bond funds follow calendar days to pay distributions. However, it is not clear whether they pay the three-days of accrued weekend interests on Friday or Monday and the prospectuses of sample bond funds do not exactly inform the common practices followed by them to pay distributions. Accordingly, the daily distribution is converted to a constant value and added with the *NAV* to calculate the return series of international bond funds.

²² Fluctuations in currency exchange rates may distort the value of foreign securities and *NAVs*. However, Karolyi and Stulz (1996) find that shocks to the Yen/Dollar foreign exchange rate and Treasury bill returns have no significant influence on the return correlations of the US and Japanese stocks. Copeland and Copeland (1998) show that the exchange rates do not affect or bias their lead-lag results for the US and European or Asian countries. Varela (2002) finds high *R*-squares from regression results even though the currencies are different for *NAVs* and foreign indices. Most of these studies show a little or no effect of exchange rate in mutual fund's *NAV* prediction.

by taking the natural logarithm of the change in daily closing prices.²³ The summary statistics of all of the funds, the U.S., and foreign indices used in this study are presented in Appendix.

To measure the magnitude of serial correlation of the fund returns, we estimate the following autoregressive process:

$$R_{i,t} = \alpha + \beta_1 R_{i,t-1} + \beta_2 R_{i,t-2} + \beta_3 R_{i,t-3} + \varepsilon_{i,t}, \quad (3)$$

where $R_{i,t}$ is the return on fund (portfolio) i during the period t (or period $t-1$ for one lag) and ε is the residual term. We expect β_1 be positive and higher than the other coefficients. Because the fourth order AR process does not present in majority of funds, the AR(3) process is only considered. A standard random walk implies no serial correlation but statistically significant serial correlation indicate existence of profitable trading strategies, i.e., buy a mutual fund after an initial period with a positive return and sell a mutual fund after an initial period with a negative return.

Since *NAV*s are priced at 4 PM ET, investors do not know the price of mutual funds in advance and cannot make trading decisions on today's *NAV*s. In practice, *NAV*s will be available at the earliest at 5 PM ET and this information arrives too late for placing an order before 4 PM ET. Investors may follow a particular market index (or indices) and accordingly form their trading strategies because funds are often highly correlated with a local index. Some researchers use today's US stocks index returns, index futures or local index to predict tomorrow's *NAV*s. This study employs U.S. and local indices as predictors of funds and step-wise regressions to identify the best predictor (index). Step-wise regressions delete variables that are statistically insignificant or identify "best-fitting" market index and avoid potential co-linearity problem. The following regression model is estimated:

$$R_{i,t} = \alpha_1 + \alpha_2 I_{US,t-1} + \alpha_3 I_{F,t-1} + e_{i,t}, \quad (4)$$

where $I_{US,t-1}$ is return of US Index at time $t-1$, $I_{F,t-1}$ is return of foreign index at time $t-1$, and e is the residual term. The null hypothesis is that the US and foreign indices do not predict the returns of international mutual funds.

²³ Following Varela (2002) we skip foreign holidays and match the returns of each market index against the returns of each sample fund.

5. Empirical Results

5.1. Serial Correlation and Predictability

In order to conduct an empirical investigation, we divide the sample into two sub-samples with an approximately equal number of observations: sub sample I (initial sample) contains 1242 daily observations from January 4, 1993 through November 28, 1997 and sub-sample II (holdout sample) contains 1237 daily observations from December 1, 1997 through October 31, 2002. The division allows us to test the hypotheses and develop trading strategies by using one sub-sample and then to evaluate the trading strategies using the holdout sample.

<Insert Table 1 Here>

Table 1 reports the serial correlations of ten fund categories for the first sub-sample. The first order serial correlations are positive, large and statistically significant for all categories of international equity funds as well as for International Hybrid funds.²⁴ Most of the Japanese funds exhibit positive but small serial correlations. This is not surprising because during the same time period small positive correlations for Topix 1st section index and small negative correlations for Nikkei 225 index were observed. The second and the third order AR coefficients are very small in magnitudes for all but Diversified Emerging market funds but statistically significant in some cases. The emerging funds invest in the most illiquid securities and exhibit statistically significant higher order positive serial correlations indicating the existence of stale pricing components in their underlying securities (and in funds).

<Insert Table 2 Here>

The serial correlations are also positive and statistically significant for most of the international bond funds except Alliance Multi-Market Strategy A (AMMSX), American Century International Bond Inv. (BEGBX), Franklin Temp Hard Currency A (ICPHX), PIMCO Foreign Bond Instl (PFORX), and Scudder Global Bond Fund S (SSTGX). We compute the serial correlations of international bond fund in Table 1 by dividing the monthly distributions by the number of trading days. However, we also exclude the distributions data for each bond funds and re-calculate the serial correlations and report the results in Table 2. Although the results are qualitatively similar but the serial correlations are little higher when we adjust the international

²⁴ We mostly report the results for portfolios of sample funds and precede similar analysis for all individual funds. The empirical results for individual funds can be obtained from authors upon request. To reduce the size of the paper, we only report the results for portfolios of funds because the results for most of the individual funds are similar to those obtained for portfolios of funds. However, the results for individual funds are also discussed to some extent.

bond fund distributions data.²⁵ The large serial correlations in fund returns imply that they are predictable if investors could know funds' *NAV* in time to make prediction. Tracking only the funds' *NAV* does not help to form profitable a trading strategy because *NAV* is computed at 4 PM ET and investors are not permitted to place any trade order immediately after observing funds' *NAV*. However, investors may follow an index today that predicts the returns of a particular fund (or fund portfolios) tomorrow.

<Insert Table 3 Here>

Table 3 presents the results of stepwise regressions from equation (4). We use the lagged returns of major U.S. indices as well as foreign indices to predict fund returns. Foreign indices may help predicting international fund return because many of these funds are benchmarked to foreign indices. The results suggest that the S&P 500 emerges as the best predictor for Diversified Emerging market, Europe, and Japan funds. The Russell and the Wilshire 5000 indices significantly predict other categories of international funds. For Latin America fund, the MSCI Latin America index emerges as the best predictor. For international equity funds, the highest slope coefficient (0.6633) is found for Pacific/Asia Ex. Japan funds and the lowest slope coefficient (0.2065) is found for Latin funds. The results suggest that international equity funds with underlying shares located in a time zone that is different from the US markets provide higher predictability.

On individual fund basis, the slope coefficients of lagged U.S. indices in equation (4) are significantly higher for all categories of international equity funds (not reported). The highest slope coefficient (0.6663) is documented for Merrill Lynch Dragon Fund B (MBDRX) and the lowest slope coefficient (0.1408) is found for GAM Global Fund A (GAGLX). The above findings are consistent with Singal (2004) who finds high correlations between lagged S&P 500 returns and today's returns of European, Foreign and Pacific funds during the year of 2000 and 2001. Lagged foreign indices do not appear to predict returns of individual funds except for Morgan Stanley Emerging Market A fund (MGEMX), DFA Japanese Small Company fund (DFJSX), and Merrill Lynch Latin America B fund (MBLTX) for which the MSCI Emerging Market, Topix 2nd Section, and MSCI Latin America indices respectively emerge as the best predictors. We note that no foreign index appears to be significant predictor for portfolios of

²⁵ To check the robustness of empirical testing and results, we re-estimate the serial correlations of all funds using the full sample period as well as the holdout sample period. The results are qualitatively similar. The results can be available from authors.

Diversified Pacific/Asia, Europe, Foreign, World, and international Hybrid funds. Small but significant predictability for portfolios of Diversified Emerging Market, Japan, Latin, and Pacific/Asia excluding Japan funds are found when the MSCI Emerging Market, Topix 2nd Section, MSCI Latin, and MSCI Far East excluding Japan indices respectively are used as independent variables in stepwise regression equation.

Statistically significant but small (economically) amount of predictability is found for international bond funds. The low predictability (coefficient of 0.0507) suggests that international bond funds may not be a profitable trading vehicle to investors who wish to use the U.S. stock indices to form trading strategies. In other words, even though the U.S. indices provide a profitable trading signal for international bond funds, the economic magnitude of the profit is lower than that of international equity funds. This might be due to low variability in prices of bond funds or low correlations between equity and bond markets. The slope coefficients of international hybrid funds are also low (0.1303) but relatively higher than those of international bond funds. However, since interest rates show a low correlation with stock prices, international bond funds may be good places to park money when investors are out of foreign equity funds. For international bond funds, statistically significant negative slope coefficients with lagged T-bill yields are found (the results are not reported but available from authors) and the results are consistent with Zitzewitz (2003a). Overall, the regression results of Table 3 suggest that returns of international equity funds are increased by roughly 0.2 to 0.7 percent tomorrow as a result of 1 percent increase in the corresponding best-fitted index returns today. To check the robustness of step-wise regression results, we compute the cross-correlations between each sample fund and each of the relevant US and foreign market index. Table 4 reports the cross-correlations among sample funds and relevant market indices (both the U.S. and foreign). The cross-correlation results of Table 4 reconfirm the results found for step-wise regressions in Table 3. The empirical results of Tables 3 and 4 provide reasonable information to propose trading strategies.

<Insert Table 4 Here>

The foundation of the trading strategies lies on the fact that fund investors will buy (sell) an international fund when its best predictive index rises (declines). Some studies propose a trading rule that requires investors to keep cash when they sell international funds. However, most mutual funds allow investors to exchange stock funds with money market or index funds

free of costs. Accordingly, we use alternative parking vehicles and propose three trading strategies for sample funds: switching in between international fund and cash (*strategy I*); switching in between international fund and money market fund (*strategy II*); and switching in between international fund and index fund (*strategy III*). The reason for using money market fund in strategy II is that shifting to T-bills requires selling the fund, obtaining cash (after the sale has settled), and then buying T-bills. This procedure takes more than one day. Furthermore, if the funds are in a variable annuity or in many types of retirement accounts, T-bills cannot be purchased at all. *Dial Data*, like most other mutual funds databases, lacks the return data for money market funds. We use the money market fund of the TIAA-CREF's retirement annuity as a proxy for the returns on a money market fund. In strategy III, index fund is used as an alternative-parking place of investment because investors cannot directly invest in an index but they may invest in an index fund that follows a corresponding market index. For a particular international fund category, we use its best-fitted index returns (from Table 3) as a proxy for its index funds' returns. The reason for using best-fitted index return as a proxy for index fund is that some of the sample funds either do not have corresponding index fund within the same fund family or they do not have similar length of index fund returns that corresponds to the return series of sample funds.

5.2. Returns and Risks of Trading Strategies

Table 5, Table 6, and Table 7 report the average daily returns and risks (standard deviations) of a buy-and-hold strategy and the proposed trading strategies I, II and III. The buy-and-hold returns are negative for almost all categories of international funds for both individual and portfolios of funds. The broad market indices declined over the sample period, especially over the holdout sample (from December 1997 to October 2002). Negative buy and-hold returns can be explained by the negative returns (or poor performance) observed in the stock market indices worldwide.²⁶

<Insert Tables 5, 6 and 7 here >

The proposed trading strategies yield higher average daily returns and lower standard deviations (risks) for all categories of international equity fund portfolios. For example, the

²⁶ The US market also declined during the holdout period; for example, S&P 500 declined by approximately 22.1% in 2002, 11.9% in 2001 and 9.1% in 2000; Russell 3000 declined by approximately 21.5% in 2002, 11.5% in 2001 and 7.5% in 2000.

average daily returns and risks of portfolio of Pacific/Asia ex. Japan fund are -0.0226% and 1.5740% for a buy-and-hold investor. The mean daily returns of this fund portfolio are enhanced to 0.2071% , 0.2159% and 0.1726% for trading strategies I, II and III, respectively. This implies an annualized return of 51.78% , 53.97% and 43.15% for trading strategies I, II and III respectively (assuming 250 trading days in a year) for this fund as opposed to a buy-and-hold annualized returns of -5.65% . The mean daily standard deviations (risks) are 1.0674% , 1.0657% and 1.4920% respectively for these trading strategies. The tables also document that the average daily returns are the highest and the average daily risks are the lowest across all categories of international funds for trading strategy II. This is not surprising because money market funds provide steady and less risky positive returns. The second highest average daily returns in general are observed for strategy I since investors avoid the negative fund returns by switching to cash that reduce the risks of trading strategy. However, for strategy III, the mean daily returns are the lowest with relatively higher risks. This is not surprising because investors will obtain negative (or lower) returns from an index fund when the corresponding market index decreases. Moreover, investors also bear the higher risks (as opposed to cash or money market fund) of index funds.

We compute the paired t-test to test the null hypothesis of no significant difference in average daily returns between buy-and-hold and trading strategies. The F-test is also conducted to test the hypothesis of no significant difference in average daily standard deviations between buy-and-hold and trading strategies. The results show statistically significant differences in average daily returns between buy-and-hold and proposed trading strategies for all categories of international funds except international bond funds. The average daily returns from trading strategies I and III are either negative or low for bond funds. However, trading strategy II provides positive significant returns for bond funds. A low but higher return is also observed for international hybrid funds when investors follow the US indices to trade them. The results of F-test indicate statistically significant differences in average daily standard deviations between buy-and-hold and three trading strategies for all categories of international funds. The average daily standard deviations of trading strategies I and II are lower than the standard deviations of buy-and-hold strategy; however, the average daily standard deviations of trading strategy III are higher than those of buy-and-hold strategy. Trading strategies I and II are associated with lower risks because investors keep their money in cash or in less-risky money market funds and an

index fund bears almost similar risks as a market index. The cumulative returns are the highest for strategy II that uses money market fund as an alternative parking investment.²⁷

There are 62 load and 55 no load funds in international stock funds. There are 12 load and 9 no load in the bond fund category and 4 load and 2 no load funds in the hybrid fund category. Overall, out of 144 sample funds, 78 are load funds and 66 are no load funds (of which 65 funds have front-end load that varies in between 2.25% to 5.75%; 12 funds have back-end load that varies in between 1% to 5% and 1 fund has both back and front-end loads). Load fees are usually paid when investors buy (front-end load) and sell (back-end load) funds. The load fees are usually low or exempted for investors who invest a large amount of money in fund complexes. Investors may enjoy unrestricted exchange privileges between load and no load funds within a fund family without transaction costs. Mutual funds also offer breakpoint discounts to investors, which allow investors to purchase load funds (usually for class A-shares with front-end loads) with discounts.²⁸

<Insert Table 8 Here>

Table 8 reports the risks and returns comparison between load and no load funds. We note that sample does not include any ‘load’ fund from Japan fund category and ‘no load’ fund from Diversified Pacific/Asia and Latin fund categories. Table 8 reveals that there are no statistically significant return differences between load and no load funds and the findings are consistent for any of strategies examined (including buy-and-hold strategy). Since no significant return difference is found between load and no load funds, investors can earn equal profits from whether they use load or no load funds.

To investigate what the sentiment (i.e., value versus growth stocks) in the U.S. we select S&P Barra growth and S&P Barra value indices. The S&P Barra growth index consists of those companies from the S&P 500 index with the highest price-to-book and price-earnings ratios. The

²⁷ We also compute the number of trades (roundtrip) required for each fund and portfolios of funds (not reported). Sample funds that follow Russell 2000 index as trading signal require 282 trades during the holdout sample period of 1237 days (on average, one roundtrip trade per 4.39 days). The number of roundtrip trades required for either individual or portfolios of funds is provided in parentheses after the market index that is used as trading signal: S&P 500 (318 for all funds and 301 for Japan funds); Russell 1000 (317 for all funds and 300 for Japan funds); Russell 3000 (313 for all fund and 297 for Japan funds); Wilshire 5000 (314); Dow Composite (311); Dow Industrial (314); NASDAQ (299), MSCI Latin (276); MSCI Emerging Market (249); and Topix 2nd Section (228).

²⁸ The SEC recently adopts a rule that requires mutual fund to describe in its prospectus any arrangements that result in breakpoints in sales loads and to provide a brief summary of shareholder eligibility requirements. The rule is effective from July 23, 2004. Refer to ‘Final Rule: Disclosure of Breakpoint Discounts by Mutual Funds’, Securities and Exchange Commission, 17 CFR Parts 239 and 274, Release Nos. 33-8427; 34-49817; IC-26464; File No. S7-28-03; RIN 3235-AI95.

S&P Barra value index is heavily concentrated in the energy, utility and financial services industries and the growth index is heavily concentrated in noncyclicals and technology industries. Using the classification of Morningstar, the sample international equity funds are divided into value, growth and blend categories; each category is also divided according to its market capitalization.²⁹ Table 9 presents the cross-autocorrelations between the returns of international equity funds and the S&P Barra value and growth indices. The cross-autocorrelations results suggest that both the S&P Barra value and growth index have high cross-autocorrelations with international equity funds (the correlations between the S&P Barra growth and value indices during the sample period is approximately 0.80). The results show that the returns of large value, large blend and medium blend funds are more correlated with the S&P Barra value index. The returns of small value, large growth and small growth funds also exhibit relatively higher correlations with the lagged returns of the S&P Barra value index. On the other hand, the returns of medium value and medium growth funds exhibit higher correlations with the S&P Barra growth index.

<Insert Table 9 Here>

Table 9 also presents the annual returns from the proposed trading strategies I, II and III when the S&P Barra Growth and Value indices are used as trading signals. The returns of trading strategies dominate the returns of buy-and-hold strategy. Surprisingly, the S&P Barra growth index emerges as a profitable trading signal for most of the international equity funds even though the S&P Barra value index exhibited higher cross-autocorrelations with most of the sample funds during the initial sample period. To explain this result, we compute the cross-autocorrelations between style and size portfolios of sample funds and the S& Barra value and growth indices during the holdout sample period. The cross-autocorrelations results show that both the growth and blend funds have relatively higher correlations with the S&P Barra growth

²⁹ Morningstar categorizes international equity funds different from domestic equity funds since earnings are reported in different ways around the world. Morningstar uses price-to-cash flow (instead of price-to-earnings) ratio for international equity funds. The price-to-cash and the price-to-book ratios of international equity funds are viewed in relation to the MSCI EAFE index. International equity funds with a combined relative price-to-cash and price-to-book ratios of less than 1.75 are considered as Value funds. Blend funds have a combined relative price-to-cash and price-to-book ratios in between 1.75 and 2.25 and growth funds have a combined ratio of more than 2.25. Large funds have their market capitalization above \$5 billion, medium funds have the capitalization between \$5 to \$1 billion and small funds have the capitalization of less than \$1 billion. International bond and hybrid funds are usually not categorized into growth, value or blend funds; rather Morningstar uses interest rate sensitivity and credit quality to categorize international bond and hybrid funds.

index during the holdout sample period.³⁰ This might partially explain the higher annual returns earned from the trading strategies using the returns of S&P growth index as trading signal. But the value funds also provide higher trading strategy returns using the S&P growth index as signal. It may be due to the fact that the world market is more integrated during the holdout sample period (1997-2002) as opposed to the initial sample period (1993-1997).³¹

5.3. Market Timing and Constrained Trading Strategies

A mutual fund that trades often disrupts the fund's stated portfolio management strategies, increases expenses (transaction costs), results in unwanted taxable capital gains, loses opportunity for fund managers and reduces the investment returns of long-term shareholders. It eventually dilutes the gains long-term investors otherwise would have made. It is true that fund managers would like to attract investors in their funds and prudent investors choose not to lock-in for a long time in a fund. Incentive mechanism should be made and explained in mutual fund prospectuses to address this issue. We collect the prospectuses and the Statements of Additional Information (SAI) for sample funds at the end of sample period to find out any incentive mechanism that exists. Switching in between different categories of mutual funds within the same family is allowed by almost all sample funds and usually do not incur transaction costs such as redemption fees and back-end load.³²

Redemption fees are standard now a day (except for money market funds); however some funds exempt fees if investors make a minimum (dollar) initial purchases and hold funds for long period. Most of the international funds impose redemption fees, typically 1 to 2 percent of the shareholder's assets. Zitzewitz (2003a) shows that redemption fees work as a moderate deterrent

³⁰ The cross-autocorrelations between different funds and the S&P Barra value and growth indices during the holdout sample period (from December 1, 1997 through December 31, 2001) are as follow: large value funds (0.3877 with S&P value index and 0.3720 with S&P growth index); medium value funds (0.3118 with S&P value index and 0.2698 with S&P growth index); small value funds (0.2974 with S&P value index and 0.2930 with S&P growth index); large growth funds (0.3330 with S&P value index and 0.3607 with S&P growth index); medium growth funds (0.3262 with S&P value index and 0.3612 with S&P growth index); small growth funds (0.3284 with S&P value index and 0.3807 with S&P growth index); large blend funds (0.3742 with S&P value index and 0.3872 with S&P growth index); medium blend funds (0.3421 with S&P value index and 0.3509 with S&P growth index).

³¹ Sample funds that follow the S&P Barra Value index as trading signal require 249 roundtrip trades during the holdout sample period of 1026 days (on average, one roundtrip trade per 4.12 days). Sample funds that follow the S&P Barra Growth index require 260 roundtrip trips (i.e. one trade per 3.95 days). However, Japan funds, require 240 and 244 roundtrip trades when they follow the S&P Barra Value and Growth index respectively.

³² Redemption fee is a switching fee for short-term investors and the time limit and size of fee varies among funds and it discourages short-term investors from making excessive trades and profit. Back-end load is a sales commission paid by investors when they withdraw money from fund investment.

to market timers; however, given the industry practice, investors still can generate profits large enough to compensate for such redemption fees. Most fund prospectuses state that redemption fees are not applied to retirement plans. Sample funds in case of exchange privileges do not follow a uniform rule. Some funds also limit the transactions by maximum dollar amount but investors get the opportunity to trade at least 2 to 24 times per year without paying redemption fees. Many fund prospectuses disclose the current rules and procedures to combat market timers; however their rules and policies are subjective as the prospectuses do not explicitly state them.

<Insert Table 10 Here>

Empirical findings suggest that investors can profitably trade all categories of international funds by following the previously proposed trading strategies. We impose two trading constraints that are consistent with the prospectuses of sample funds. They are: (i) trade only when the corresponding index returns increase or decreases by a certain amount in a given day, and (ii) exchange restrictions. The constrained trading rule can be summarized as buying (selling) an international fund if the corresponding best-fitted index returns increase (decrease) by at least 1.5% from its previous days' close. We name new strategies as the conservative *trading strategy IV* (switching in between international fund and cash), conservative *trading strategy V* (switching in between international fund and money market fund) and conservative *trading strategy VI* (switching in between international fund and index fund). The results of the conservative trading strategies are reported in Table 10 using 15 days round-trip restrictions (i.e., investors cannot sell the funds within 15 days of initial purchase to avoid redemption fees). According to Table 10, all of the conservative trading strategies generate statistically and economically significant profit opportunities. Based on t-tests and F-tests we find significant return and risk differences between buy-and-hold and the conservative trading strategies for majority of fund portfolios. We check robustness of the results by using 30, 60, 90 and 120 days' exchange restrictions (not reported). Although they are qualitatively similar to those found in Table 10, the higher the holding period restrictions the lower the profitable opportunities from trading mutual funds. We also compute the number of trades (roundtrip) required for the conservative trading strategies. For example, sample funds that follow Russell 2000 index as trading signal require 69 trades during the holdout sample period of 1237 days (i.e. one roundtrip

trade per 17.93 days).³³

6. Discussion

Recent Scandals in the Mutual Fund Industry and Testing the Policy Implication

The recent widespread mutual fund scandals suggest that part of the mutual fund industry operates on a double standard. It has been reported that fund managers manipulate the trading system by offering illegal after-hour (late trading) and market timing trading opportunities to favored clients in exchange for payments and other inducements. A series of recent allegation, investigation and lawsuit against the trading practices of some funds diminish the reputation of fund industry. The SEC adopted a fair disclosure rule (known as ‘Regulation FD’) in 2000 that requires the public to have access to any information at the same time as institutional investors and analysts have. However, mutual funds are exempted from Regulation FD and some funds took the advantages by disclosing portfolio information to selective market timers. Zitzewitz (2003b) shows that late trading incurs an annual loss of 5 basis points (or \$400 million) to long-term shareholders of international stock funds.³⁴

According to 2003 Mutual Fund Fact Book, 85-90 percent of mutual fund purchases are made through intermediaries. Transactions through intermediaries often involve the uses of ‘omnibus accounts’ (single accounts that combine the accounts of hundreds of long-term individual investors and institutions such as retirement plans). Late trading is completely illegal. However, market timing, while legal, may violate representations made by a fund that does not permit frequent trading. The ICI recently recommended the following three proposals to combat mutual fund trading abuses: (i) a firm 4.00 PM ET deadline for all trades to be reported to mutual funds; (ii) a mandatory, industry-wide minimum 2 percent redemption fee on the sale of all mutual funds for a minimum of 5 days following purchases (except money market funds and funds specifically designed for timers); and (iii) all mutual funds amend their codes of ethics to

³³ The number of roundtrip trades required for funds (or portfolios of funds) is provided in parentheses after the name of the market index that is used as trading signal: S&P 500 (68 for all funds and 66 for Japan funds); Russell 1000 (68 for all funds and 66 for Japan funds); Russell 3000 (68 for all fund and 66 for Japan funds); Wilshire 5000 (70); Dow Composite (63); Dow Industrial (65); NASDAQ (66); MSCI Latin (64); MSCI Emerging Market (65); and Topix Second Section (61).

³⁴ According to a survey by the SEC, roughly a half of responded fund groups admit that they have market timing arrangements with certain shareholders and 30% of the funds disclosed portfolio information to certain shareholders. Refer to ‘Proposed Rule: Disclosure Regarding Market Timing and Selective Disclosure of Portfolio Holdings,’ SEC, December 11, 2003.

include oversight of all trading activities in mutual funds offered by a company (abolition of all third-party soft-dollar arrangements and prohibition of the practice of directed brokerage).³⁵ The House approved a bill (*The Mutual Funds Integrity and Fee Transparency Act, H.R. 2420*) similar to the recommendations proposed by the ICI on November 19, 2003. The SEC has either proposed or adopted twelve new regulatory initiatives directly related to mutual fund scandal since September 2003.³⁶ The proposed regulations will help promoting fair value pricing but it is difficult to take appropriate measure (especially for retirement plans because Employee Retirement Income Security Act does not provide regulatory guidance on market timing transactions). The fair value pricing may eliminate part of the stale pricing problem; however, implementing the fair value pricing is costly and somewhat subjective. Investors would still be able to profit from the mutual fund pricing errors, if they knew in details the fair value methodology and timing employed.

<Insert Table 11 Here>

We examine the effects of a restriction that requires a minimum of five-day holding after initial purchases to avoid two percent redemption fee using the following trading strategies: ***trading strategy VII*** (switching in between international funds and cash); ***trading strategy VIII*** (switching in between international funds and money market funds); and ***trading strategy IX*** (switching in between international funds and index funds). Table 11 presents the comparison of returns and risks between buy-and-hold and the proposed trading strategies. The results show that the proposed trading strategies still provide higher mean returns and lower standard deviations (risks) than those of a buy-and-hold strategy for all categories of sample funds (especially for equity funds). Our findings suggest that short-term investors may benefit from the trading strategy even after the SEC's proposed rule is implemented. We also compute the number of trades (roundtrip) required for the trading strategies. For example, funds that follow Russell 2000 index as trading signal require 136 trades during the holdout sample period of 1237 days (i.e. one roundtrip trade per 9.10 days).³⁷

³⁵ 'ICI Urges Specific Changes to Combat Trading Abuses'. The ICI, November 3, 2003.

³⁶ These include better fund governance; code of ethics of investment advisors; enhanced disclosures of mutual fund fees; improved disclosures of fund prospectuses; transactions costs to shareholders; and enhanced disclosure regarding market timing, pricing and portfolio holdings.

³⁷ The number of roundtrip trades required for funds or portfolios of funds is provided in parentheses after the name of the market index that is used as trading signal: S&P 500 (143 for all funds and 132 for Japan funds); Russell 1000 (141 for all funds and 132 for Japan funds); Russell 3000 (142 for all fund and 131 for Japan funds); Wilshire 5000

The next- day (t+1) Pricing Rule on International Mutual Funds

The 24-hours real-time trading for all securities in the world will eliminate the stale pricing problem of the US-based international mutual funds and consequently there will be no need for fair valuing underlying securities of mutual funds. While mutual funds compute the *NAV*s once a day, the Exchange Traded Funds (ETF) update their *NAV*s throughout the day (usually in every 15 seconds). Investors buy the ETFs not from the fund companies but from the secondary markets (AMEX, NASDAQ, or NYSE) and the price of an ETF share is determined by the supply and demand of underlying shares. Like individual stocks, the ETFs are continuously traded and priced throughout the trading day. The intraday pricing mechanism of the ETFs will eliminate the stale pricing problems as the market forces determine the prices. However, it would be difficult to adopt this pricing mechanism soon given nature of institution and requirement of legal and structural changes in the mutual fund industry.

There are debates among policy makers whether ex-ante (i.e., fair valuing funds' *NAV*) or ex-post (i.e., restricting number of round trip trades and imposing redemption fees) solve problems related to stale pricing components of international funds. Instead, we suggest that international mutual funds could price their *NAV*s at 4 PM ET on the next day (t+1) following the day (t) in which the trade order was placed.³⁸ Under the next-day (or t+1) pricing, *NAV*s calculated on transactions occurring after the orders are placed (cancelled). The next-day pricing rule represents the values the fund will receive when it trades in response to an inflow and outflow of money and should reflect the latest information released after the order was initiated. The next day pricing along with fair-value pricing will eliminate the basic and inherent problems of computing mutual funds' *NAV* and greatly reduce the stale pricing as well as pricing error problems of the U.S. based international open-end mutual funds. The t+1 pricing may eliminate the dilution effects and protect the interests of remaining shareholders of funds and reduce the risks associated with panic selling by most of the investors. For example, under the current pricing system, if most investors sell funds as the US market declines today, then the remaining

(140); Dow Composite (143); Dow Industrial (144); NASDAQ (144), MSCI Latin (133); MSCI Emerging Market (125); and Topix Second Section (119).

³⁸ Varela (2002) and Bhargava et al. (1998) suggest to compute fund prices taking next-day opening (morning) prices. It would be a partial solution because it works only if an international fund invests in a single foreign market or markets with similar time zone. However most international funds have underlying shares invested in different countries or different time zones.

shareholders of the fund will suffer tomorrow.³⁹ Under this pricing rule, funds may also limit the number of exchanges to eliminate current market timing practices. In such a situation, the current proposal of imposing industry-wide 2% redemption fee may not be needed.

One can argue that the t+1 pricing may impose some costs on investors because investors will have more price uncertainty as they have to wait for an additional day to get the price of their funds. Since prices must be known before money can move, there may be another day for issuing checks or wire transfers of their money. Also, in case of emergency cash, investors will have to wait for one extra day. The liquidity problem can be solved, if funds permit strictly limited number and limited amount of same-day withdrawal provisions and the rest will be paid after the *NAV*s are determined next day. The t+1 pricing may be a problem in case of differential holidays in the U.S. and foreign markets. *Fair value pricing* and *delay in pricing* could be simultaneously used to compute funds' *NAV* in case of differential holidays. Delaying price is an effective way to solve the stale pricing problem. The t+1 pricing will also reduce the opportunities of insider trading because with one-day lag, insider trading in mutual fund will, in general, no longer be profitable. Finally, funds must strictly regulate the insiders who have inside information about the order flows. Inside information about the order flows of the fund will provide investors' knowledge about the trading patterns of fund on next-day and traders accordingly may exploit this knowledge. In sum, the t+1 pricing will eliminate most of the potential problems from stale pricing and abusive late trading practices.

7. Conclusion

This paper examines all categories of international equity, bond and hybrid mutual funds to investigate whether these funds exhibit predictable return patterns and presents evidence of mutual fund predictability. The results indicate statistically significant regularities, especially for international equity funds by following major U.S. indices. Potential returns based on different strategies show that the returns are economically significant in magnitude and beat a buy-and-hold strategy. Our results also show that load and no load funds as well as exchange restrictions are subject to similar kind of exploitation given the same strategies. Informed investors will be able to exploit stale pricing of the international mutual funds and earn higher returns without

³⁹ When investors of the US-based international funds sells their funds today, fund managers will have to raise money tomorrow by selling the underlying shares of the funds. If the market declines tomorrow for any bad news, the price of underlying shares will decline further.

having higher risks because of their predictability and low costs of trading. We recommend that international mutual funds should follow an industry wide next-day pricing rule.

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Table 1: Serial Correlations in Mutual Fund Returns

This table presents the results of serial correlations (equation 3) in sample fund returns. Column one lists the portfolios of sample fund categories. Columns two through four present AR (1), AR (2) and AR (3) coefficients respectively. The significance of AR coefficients at 1%, 5% and 10% level are represented by ***, ** and * respectively. The sample period is from January 4, 1993 through November 28, 1997.

Portfolios of Fund Categories	AR(1)	AR(2)	AR(3)
Diversified Emerging Market Fund	0.3184***	0.1089***	0.1129***
Diversified Pacific/Asia Fund	0.0719***	0.0532**	-0.0174
Europe Fund	0.0656***	0.0202	-0.0083
Japan Fund	0.0685**	-0.0322	0.0307
Pacific/Asia Ex. Japan Fund	0.1211***	0.0299	0.1175***
Foreign Fund	0.1584***	0.0437	0.0344
Latin America Fund	0.1864***	0.0198	0.0578**
World Fund	0.1717***	0.0382	0.0334
International Bond Fund	0.2268***	0.0720**	-0.0378
International Hybrid Fund	0.2416***	0.0111	0.0308

Note: To conserve space, we did not report the results for individual sample funds. But the results of individual funds for this and subsequent tables can be available from authors.

Table 2: Serial Correlations in International Bond Fund Returns (with and without Distributions Data)

This table presents the results of serial correlations (equation 3) in sample international bond fund returns with and without distributions data. Column one lists the name and ticker symbol of sample bond mutual funds. Columns two through four present the AR (1), AR (2) and AR (3) coefficients respectively when distributions are included. Columns five through seven present the AR (1), AR (2) and AR (3) coefficients respectively when distributions are excluded. The significance of AR coefficients at 1%, 5% and 10% level are represented by ***, ** and * respectively. The sample period is from January 4, 1993 through November 28, 1997.

Fund Name and Ticker	Distribution included			Distributions excluded		
	AR(1)	AR(2)	AR(3)	AR(1)	AR(2)	AR(3)
Alliance Multi-Market Strategy A (AMMSX)	-0.1275***	0.2473***	-0.1336***	-0.1275***	0.2470***	-0.1335***
Alliance North Amer Govt Inc A (ANAGX)	0.0659**	0.1942***	-0.0449	0.0659**	0.1943***	-0.0449
American Century Intl Bond Inv (BEGBX)	-0.0015	-0.0080	-0.0388	-0.0008	-0.0096	-0.0396
American Fds Cap World Bond A (CWBFX)	0.1001***	0.0129	-0.0376	0.1007***	0.0121	-0.0370
AXP Global Bond A (IGBFX)	0.1430***	0.0382	-0.0274	0.1433***	0.0384	-0.0277
BlackRock Intl Bond Svc (CIFIX)	0.0013	-0.0031	-0.0084	-0.0027	-0.0056	-0.0207
Consulting Group Intl Fixed Inv (TIFUX)	0.0152	0.0187	-0.0417	0.0139	0.0175	-0.0416
Credit Suisse Global F/I Ret (CGFIX)	0.0397	0.0150	-0.0025	0.0161	0.0156	-0.0007
DFA Five Year Global Fix-Inc (DFGBX)	0.0529*	0.0286	0.0455	0.0580**	0.0257	0.0146
Federated International Bond A (FTIIX)	0.0166	-0.0030	-0.0180	0.0181	-0.0032	-0.0185
Franklin Temp Hard Currency A (ICPHX)	-0.0038	-0.0033	-0.0500*	-0.0042	-0.0034	-0.0481*
Goldman Sachs Global Inc A (GSGIX)	0.0716**	0.0309	-0.0681**	0.0710**	0.0195	-0.0688**
Lord Abbett Global Income A (LAGIX)	0.1028***	0.0660**	-0.0317	0.1016***	0.0656**	-0.0304
Merrill Lynch Global Bond B (MBGOX)	0.1406***	-0.0012	-0.0414	0.1407***	-0.0013	-0.0413
Morgan Stan Ins GI FI A (MSGFX)	0.0796***	0.0318	-0.0046	0.0876***	0.0294	-0.0043
PIMCO Foreign Bond Instl (PFORX)	-0.0114	0.0144	0.0160	-0.0124	0.0144	0.0168
Putnam Global Govtl Income A (PGGIX)	0.0865***	-0.0098	-0.0300	0.0864***	-0.0086	-0.0300
Scudder Global Bond Fund S (SSTGX)	-0.0143	0.0440	0.0631**	-0.0143	0.0438	0.0629**
Smith Barney Global Govt Bd A (SBGLX)	0.0726**	0.0011	-0.0173	0.0696**	0.0016	-0.0152
T. Rowe Price Intl Bond Fund (RPIBX)	0.0702**	0.0090	-0.0253	0.0700**	0.0083	-0.0271
Templeton Global Bond A (TPINX)	0.1286***	0.0023	0.0044	0.1287***	0.0022	0.0040
Portfolio	0.2268***	0.0720**	-0.0378	0.2253***	0.0698**	-0.0383

Table 3: Stepwise Regression Results Predicting Next Day Fund Returns

This table presents the results of stepwise regression (equation 4). Column one lists the sample fund categories. Column two presents the highest slope coefficients of stepwise regressions. The t-statistics of slope coefficients are significant at 1% (***) level. The sample is from January 4, 1993 through November 28, 1997.

Portfolios of Fund Categories	Coefficient of Best predictor
Diversified Emerging Market Fund	0.3122*** (S&P 500)
Diversified Pacific/Asia Fund	0.4912*** (Wilshire 5000)
Europe Fund	0.3283*** (S&P 500)
Japan Fund	0.3474*** (S&P 500)
Pacific/Asia Ex. Japan Fund	0.6633*** (Wilshire 5000)
Foreign Fund	0.3644*** (Russell 3000)
Latin America Fund	0.2065*** (MSCI Latin Index)
World Fund	0.2912*** (Russell 3000)
International Bond Fund	0.0507*** (S&P 500)
International Hybrid Fund	0.1303*** (Russell 1000)

Table 4: Cross- autocorrelations among Mutual Funds and the US and Foreign Market Indices

This table presents cross auto-correlations among sample fund portfolios and the US and relevant Foreign market indices. Column one lists portfolio of each sample fund category. Columns two through nine present cross-autocorrelations between portfolios of sample funds and the US market indices. For portfolios of Diversified Emerging Market, Europe, Foreign, Latin, World and International Hybrid funds, column ten shows cross-autocorrelations between portfolio and the relevant MSCI market indices. For portfolio of Diversified Pacific/Asia funds, columns ten through thirteen list cross-autocorrelations between portfolio and the relevant MSCI market indices. For portfolio of Pacific/Asia Ex. Japan funds, columns ten and eleven list cross-autocorrelations between portfolio and the relevant MSCI market indices. For portfolio of Japan funds, columns ten through twelve show cross-autocorrelations between portfolio and the relevant Japanese indices. For portfolio of International Bond funds, columns ten and eleven present cross-autocorrelations between portfolio and 10-Year and 30 Year Treasury bill yield respectively. Cross-autocorrelations are significant at 1% (***) , 5% (**) or 10% (*) level. The sample is from January 4, 1993 through November 28, 1997.

A. Diversified Emerging Market Fund

	S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial	Dow Composite	NASDAQ	MSCI Emerging Market
Portfolio	0.3292***	0.3269***	0.2576***	0.3291***	0.3278***	0.3237***	0.3087***	0.2758***	0.2860***

B. Diversified Pacific/Asia Fund

	S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial Composite	Dow NASDAQ	MSCI Far East	MSCI Pacific Japan	MSCI Pacific Ex. Japan
Portfolio	0.3757***	0.3762***	0.3469***	0.3827***	0.3855***	0.3619***	0.3286***	0.0300	0.0340	0.1105***
										0.1262***

C. Europe Fund

	S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial	Dow Composite	NASDAQ	MSCI Europe
Portfolio	0.4224***	0.4196***	0.3326***	0.4216***	0.4214***	0.3995***	0.3929***	0.3682***	0.0908***

D. Japan Fund

	S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial Composite	Dow NASDAQ	Topix 1 st Section	Topix 2 nd Section	Nikkei 225
Portfolio	0.2183***	0.2203***	0.1850***	0.2213***	0.2192***	0.1996***	0.2061***	0.1989***	0.1043***	0.1629***
										0.0905***

Table 4 Continued

E. Pacific/Asia Ex. Japan Fund

S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial	Dow Composite	NASDAQ	MSCI Far East Ex. Japan	MSCI Pacific Ex. Japan	
Portfolio	0.3775***	0.3741***	0.3215***	0.3779***	0.3794***	0.3671***	0.3530***	0.3076***	0.1425***	0.1301***

F. Foreign Fund

S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial	Dow Composite	NASDAQ	MSCI EAFE	
Portfolio	0.4914***	0.4901***	0.3939***	0.4926***	0.4913***	0.4634***	0.4597***	0.4235***	0.0750***

G. Latin America Fund

S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial	Dow Composite	NASDAQ	MSCI Latin
Portfolio	0.1062***	0.1074***	0.0518***	0.1041***	0.1078***	0.0936***	0.0920***	0.2378***

H. World Fund

S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial	Dow Composite	NASDAQ	MSCI World
Portfolio	0.3812***	0.3891***	0.3249***	0.3904***	0.3489***	0.3429***	0.3750***	0.2451***

I. International Bond Fund

S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial	Dow Composite	NASDAQ	10 Year T-Bond	30 Year T-Bond	
Portfolio	0.1666***	0.1631***	0.0912***	0.1618***	0.1602***	0.1491***	0.1557***	0.0963***	-0.3336***	-0.3260***

J. International Hybrid Fund

S&P 500	Russell 1000	Russell 2000	Russell 3000	Wilshire 5000	Dow Industrial	Dow Composite	NASDAQ	MSCI World	
Portfolio	0.2858***	0.2947***	0.2414***	0.2948***	0.2908***	0.2583***	0.2640***	0.2656***	0.1878***

Table 5: Returns and Risks of Buy-and-hold Strategy and Trading Strategy I (switching in between international fund and cash)

This table presents the returns and risks of buy-and-hold strategy and trading strategy I. Column one lists the portfolios of each fund category. Columns two and three show mean daily returns and standard deviations (SD) of returns for buy-and-hold strategy. Columns four and five present cumulative returns and annualized returns for buy-and-hold strategy. Columns six and seven show mean daily returns and standard deviations of return for trading strategy I. Columns eight and nine respectively present cumulative returns and annual returns for trading strategy I. The significance level of t-statistics (to test the differences in mean returns between buy-and-hold and trading strategies) and F-statistics (to test differences in mean variances between buy-and-hold and trading strategies) are presented at 1% (***) , 5% (**) and 10% (*) level respectively. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Categories	Returns and Risks of Buy-and-hold Strategy			Returns and Risks of Trading Strategy I				
	Mean Daily Return	Mean Daily SD	Cumulative Returns	Annual Returns	Mean Daily Return	Mean Daily SD	Cumulative Returns	Annual Returns
Diversified Emerging Market Fund	-0.0345%	1.2831%	\$ 0.5891	-8.6161%	0.1511%***	0.8526%***	\$ 6.1887	37.7668%
Diversified Pacific/Asia Fund	-0.0310%	1.3295%	\$ 0.6106	-7.7578%	0.1602%***	0.8928%***	\$ 6.9332	40.0619%
Europe Fund	-0.0421%	1.1558%	\$ 0.5468	-10.5243%	0.1281%***	0.7634%***	\$ 4.7411	32.0205%
Japan Fund	-0.0246%	1.4668%	\$ 0.6608	-6.1567%	0.1161%***	1.4668%***	\$ 3.6852	29.0159%
Pacific/Asia Ex. Japan Fund	-0.0226%	1.5740%	\$ 0.6483	-5.6460%	0.2071%***	1.0674%***	\$ 12.0901	51.7812%
Foreign Fund	-0.0380%	1.0174%	\$ 0.5863	-9.4932%	0.1485%***	0.6699%***	\$ 6.1455	37.1128%
Latin Fund	-0.0358%	1.7505%	\$ 0.5306	-8.9602%	0.1285%***	1.1016%***	\$ 4.6207	32.1298%
World Fund	-0.0413%	1.0276%	\$ 0.5622	-10.3146%	0.0997%***	0.6724%***	\$ 3.3724	24.9312%
International Bond Fund	-0.0064%	0.2792%	\$ 0.9191	-1.6084%	-0.0035%	0.1880%***	\$ 0.9545	-0.8748%
International Hybrid Fund	-0.0209%	0.6328%	\$ 0.7534	-5.2197%	0.0383%***	0.4214%***	\$ 1.5988	9.5816%

Table 6: Returns and Risks of Buy-and-hold Strategy and Trading Strategy II (switching in between international fund and money market fund)

This table presents the returns and risks of buy-and-hold strategy and trading strategy II. Column one lists the portfolios of each fund category. Columns two and three show mean daily returns and standard deviations (SD) of returns for buy-and-hold strategy. Columns four and five present cumulative returns and annualized returns for buy-and-hold strategy. Columns six and seven show mean daily returns and standard deviations of return for trading strategy II. Columns eight and nine respectively present cumulative returns and annual returns for trading strategy II. The significance level of t-statistics (to test the differences in mean returns between buy-and-hold and trading strategies) and F-statistics (to test differences in mean variances between buy-and-hold and trading strategies) are presented at 1% (***), 5% (**), and 10% (*) level respectively. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Categories	Returns and Risks of Buy-and-hold Strategy				Returns and Risks of Trading Strategy II			
	Mean Daily Return	Mean Daily SD	Cumulative Returns	Annual Returns	Mean Daily Return	Mean Daily SD	Cumulative Returns	Annual Returns
Diversified Emerging Market Fund	-0.0345%	1.2831%	\$ 0.5891	-8.6161%	0.1601%***	0.8511%***	\$ 6.9130	40.0156%
Diversified Pacific/Asia Fund	-0.0310%	1.3295%	\$ 0.6106	-7.7578%	0.1690%***	0.8913%***	\$ 7.2823	42.2541%
Europe Fund	-0.0421%	1.1558%	\$ 0.5468	-10.5243%	0.1371%***	0.7620%***	\$ 5.2572	34.2694%
Japan Fund	-0.0246%	1.4668%	\$ 0.6608	-6.1567%	0.1249%***	1.0255%***	\$ 4.0638	31.2347%
Pacific/Asia Ex. Japan Fund	-0.0226%	1.5740%	\$ 0.6483	-5.6460%	0.2159%***	1.0657%***	\$ 13.4293	53.9734%
Foreign Fund	-0.0380%	1.0174%	\$ 0.5863	-9.4932%	0.1573%***	0.6681%***	\$ 6.8014	39.3317%
Latin Fund	-0.0358%	1.7505%	\$ 0.5306	-8.9602%	0.1374%***	1.1007%***	\$ 5.0745	34.3491%
World Fund	-0.0413%	1.0276%	\$ 0.5622	-10.3146%	0.1086%***	0.6712%***	\$ 3.7243	27.1501%
International Bond Fund	-0.0064%	0.2792%	\$ 0.9191	-1.6084%	0.0055%**	0.1887%***	\$ 1.0680	1.3741%
International Hybrid Fund	-0.0209%	0.6328%	\$ 0.7534	-5.2197%	0.0471%***	0.4208%***	\$ 1.7717	11.7847%

Table 7: Returns and Risks of Buy-and-hold Strategy and Trading Strategy III (switching between international fund and index fund)

This table presents the returns and risks of buy-and-hold strategy and trading strategy III. Column one lists the portfolios of each fund category. Columns two and three show mean daily returns and standard deviations (SD) of returns for buy-and-hold strategy. Columns four and five present cumulative returns and annualized returns for buy-and-hold strategy. Columns six and seven show mean daily returns and standard deviations of return for trading strategy III. Columns eight and nine respectively present cumulative returns and annual returns for trading strategy III. The significance level of t-statistics (to test the differences in mean returns between buy-and-hold and trading strategies) and F-statistics (to test differences in mean variances between buy-and-hold and trading strategies) are presented at 1% (***) , 5% (**), 10% (*) level respectively. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Categories	Returns and Risks of Buy-and-hold Strategy					Returns and Risks of Trading Strategy III				
	Mean Daily Return	Mean Daily SD	Cumulative Returns	Annual Returns	Mean Daily Return	Mean Daily SD	Cumulative Returns	Annual Returns		
Diversified Emerging Market Fund	-0.0345%	1.2831%	\$ 0.5891	-8.6161%	0.1378%***	1.3478%**	\$ 4.9103	34.4618%		
Diversified Pacific/Asia Fund	-0.0310%	1.3295%	\$ 0.6106	-7.7578%	0.1259%***	1.3714%	\$ 4.2177	31.4812%		
Europe Fund	-0.0421%	1.1558%	\$ 0.5468	-10.5243%	0.1155%***	1.2932%***	\$ 3.7618	28.8823%		
Japan Fund	-0.0246%	1.4668%	\$ 0.6608	-6.1567%	0.1015%***	1.4461%	\$ 2.9055	25.3745%		
Pacific/Asia Ex. Japan Fund	-0.0226%	1.5740%	\$ 0.6483	-5.6460%	0.1726%***	1.4920%**	\$ 7.3548	43.1509%		
Foreign Fund	-0.0380%	1.0174%	\$ 0.5863	-9.4932%	0.1230%***	1.2513%***	\$ 4.1538	30.7563%		
Latin Fund	-0.0358%	1.7505%	\$ 0.5306	-8.9602%	-0.0278%	1.7944%	\$ 0.5804	-6.9458%		
World Fund	-0.0413%	1.0276%	\$ 0.5622	-10.3146%	0.0745%***	1.2518%***	\$ 2.2795	18.6188%		
International Bond Fund	-0.0064%	0.2792%	\$ 0.9191	-1.6084%	-0.0169%	1.0587%***	\$ 0.7573	-4.2142%		
International Hybrid Fund	-0.0209%	0.6328%	\$ 0.7534	-5.2197%	0.0204%*	1.1336%***	\$ 1.1884	5.0996%		

Table 8: Returns and Risks Comparison between Load and No Load Mutual Funds

This table presents the differences in daily mean returns and risks and cumulative returns between load and no load funds. Column one lists the fund category with the number of load and no load funds in each category. Columns two through four present the average daily returns for load fund and no load fund and T-test (for mean differences between load and no load funds) respectively. Columns five through seven list average daily standard deviations for load fund and no load fund and F-test (for variance differences between load and no load funds) respectively. The level of significance is provided in parentheses. Columns eight and nine present the cumulative returns for load fund and no load fund respectively. There are four panels in this table. Panel A, B, C and D present the differences in daily mean returns, standard deviation and cumulative returns for buy-and-hold strategy, trading strategy I, trading strategy II and trading strategy III respectively. The sample is from December 1, 1997 to October 31, 2002.

Panel A: Buy-and-hold Strategy (Load vs. No Load Funds)

Fund Category (# of Load / # of No Load)		Average Daily Returns			Average Daily Standard Deviation			Cumulative Returns	
		Load	No Load	T-test	Load	No Load	F-test	Load	No Load
Diversified Emerging Market	(2/2)	-0.0318%	-0.0371%	0.3514 (0.7253)	1.2529%	1.3646%	0.8848 (0.0158)	\$ 0.6116	\$ 0.5626
Diversified Pacific/Asia Europe	(7/0) (6/5)	-0.0310%	N/A	N/A	1.3295%	N/A	N/A	\$ 0.6106	N/A
		-0.0390%	-0.0458%	0.3436 (0.6872)	1.2837%	1.0751%	1.4256 (0.0000)	\$ 0.5574	\$ 0.5278
Japan Pacific/Asia Ex. Japan	(0/4) (3/2)	N/A	-0.0246%	N/A	N/A	1.4668%	N/A	N/A	\$ 0.6608
		-0.0289%	-0.0131%	-0.8757 (0.3814)	1.6357%	1.5549%	1.1067 (0.0374)	\$ 0.5922	\$ 0.7314
Foreign	(22/34)	-0.0440%	-0.0341%	-1.6866 (0.0919)	1.0204%	1.0204%	0.9939 (0.4572)	\$ 0.5441	\$ 0.6146
Latin World	(1/0) (21/8)	-0.0358%	N/A	N/A	1.7505%	N/A	N/A	\$ 0.5306	N/A
		-0.0354%	-0.0566%	0.9321 (0.3515)	0.9914%	1.3070%	0.5753 (0.0000)	\$ 0.6070	\$ 0.4468
International Bond	(12/9)	-0.0097%	-0.0021%	-2.3198 (0.0205)	0.2809%	0.2903%	0.9368 (0.1256)	\$ 0.8825	\$ 0.9697
International Hybrid	(4/2)	-0.0172%	-0.0282%	0.5929 (0.5533)	0.7084%	0.6927%	1.0457 (0.2160)	\$ 0.7833	\$ 0.6848

Table 8 Continued

Panel B: Trading Strategy I (Load vs. No Load Funds)

Fund Category (# of Load / # of No Load)	Average Daily Returns		Average Daily Standard Deviation		Cumulative Returns	
	Load	No Load	Load	No Load	Load	No Load
Diversified Emerging Market	0.1446%	0.1576%	0.8455%	0.8988%	\$ 5.7136	\$ 6.6741
Diversified Pacific/Asia Europe	0.1602%	N/A	0.8928%	N/A	\$ 6.9332	N/A
Japan	0.1447%	0.1098%	0.8518%	0.7319%	\$ 5.7172	\$ 3.7578
Pacific/Asia Ex. Japan	N/A	0.1161%	N/A	1.4668%	N/A	\$ 3.6852
Foreign	0.2055%	0.2102%	1.1002%	1.0660%	\$ 11.7611	\$ 12.5211
Latin World	0.1483%	0.1497%	0.6699%	0.6781%	\$ 6.0806	\$ 6.1839
International Bond	0.1285%	N/A	1.1016%	N/A	\$ 4.6207	N/A
International Hybrid	0.0993%	0.1040%	0.6538%	0.8795%	\$ 3.3242	\$ 3.4478
	-0.0049%	-0.0016%	0.1903%	0.1935%	\$ 0.9383	\$ 0.9763
	0.0372%	0.0422%	0.4723%	0.4506%	\$ 1.5612	\$ 1.6641

Panel C: Trading Strategy II (Load vs. No Load Funds)

Fund Category (# of Load / # of No Load)	Average Daily Returns		Average Daily Standard Deviation		Cumulative Returns	
	Load	No Load	Load	No Load	Load	No Load
Diversified Emerging Market	0.1536%	0.1666%	0.8440%	0.8973%	\$ 6.3832	\$ 7.4562
Diversified Pacific/Asia Europe	0.1690%	N/A	0.8913%	N/A	\$ 7.2823	N/A
Japan	0.1536%	0.1187%	0.8504%	0.7307%	\$ 6.3872	\$ 4.1981
Pacific/Asia Ex. Japan	N/A	0.1249%	N/A	1.0255%	N/A	\$ 4.0638
Foreign	0.2142%	0.2190%	1.0987%	1.0643%	\$ 13.1025	\$ 13.9492
	0.1571%	0.1585%	0.6680%	0.6763%	\$ 6.7831	\$ 6.8983

Table 8 Continued

Panel C: Trading Strategy II (Load vs. No Load Funds)

Fund Category (# of Load / # of No Load)	Average Daily Returns		Average Daily Standard Deviation		Cumulative Returns	
	Load	No Load	Load	No Load	Load	No Load
Latin (1/0)	0.1374%	N/A	1.1007%	N/A	\$ 5.0745	N/A
World (21/8)	0.1081%	0.1128%	0.6525%	0.8786%	\$ 3.7083	\$ 3.8461
International Bond (12/9)	0.0041%	0.0074%	0.1910%	0.1940%	\$ 1.0494	\$ 1.0931
International Hybrid (4/2)	0.0459%	0.0510%	0.4718%	0.4500%	\$ 1.7402	\$ 1.8549
					(0.6709)	(0.0482)

Panel D: Trading Strategy III (Load vs. No Load Funds)

Fund Category (# of Load / # of No Load)	Average Daily Returns		Average Daily Standard Deviation		Cumulative Returns	
	Load	No Load	Load	No Load	Load	No Load
Diversified Emerging Market (2/2)	0.1313%	0.1443%	1.3432%	1.3776%	\$ 4.5333	\$ 5.2954
Diversified Pacific/Asia Europe (7/0) (6/5)	0.1259%	N/A	1.3714%	N/A	\$ 4.2177	N/A
Japan Pacific/Asia Ex. Japan (0/4) (3/2)	N/A	0.1015%	N/A	1.4461%	N/A	\$ 2.9055
Foreign (22/34)	0.1707%	0.1754%	1.5156%	1.4911%	\$ 7.1546	\$ 7.6169
Latin World (1/0) (21/8)	0.1222%	0.1236%	1.2512%	1.2556%	\$ 4.1099	\$ 4.1797
International Bond (12/9)	-0.0278%	N/A	1.7944%	N/A	\$ 0.5804	N/A
International Hybrid (4/2)	0.0732%	0.0779%	1.2416%	1.3740%	\$ 2.2469	\$ 2.3304
	-0.0182%	-0.0150%	1.0591%	1.0597%	\$ 0.7445	\$ 0.7746
	0.0187%	0.0238%	1.1534%	1.1447%	\$ 1.1604	\$ 1.2369
					(0.4917)	(0.3960)

Table 9: Comparison between Buy-and-hold Strategy and Trading Strategy Returns for Different Sizes and Styles of International Funds

This table splits the sample mutual funds into portfolios of different sizes and styles of international mutual funds defined by Morningstar. The table presents the cross-autocorrelations among different sizes and styles of mutual funds and S&P Barra value and S&P Barra growth Indices. This table also compares the annual returns of trading strategies with the annual returns of buy-and-hold strategy under two trading signals: S&P Barra value Index and S&P Barra growth Index. Column one lists the portfolios of sizes and styles of fund. Columns two and three present the cross-autocorrelations between portfolios of sizes and style of fund and S&P Barra value index and S&P Barra growth index respectively. Column four presents the buy-and-hold annual returns for portfolios of sizes and styles of fund. The significance of cross-autocorrelations are reported for 1% (**) and 5% (*) significance level. To compute cross-autocorrelations, the sample is used from January 4, 1993 through November 28, 1997. Columns five through seven present the annual returns of trading strategy I, II and III respectively when the lagged returns of S&P Barra value index are used as trading signals. Columns eight through ten present the annual returns of trading strategy I, II and III respectively when the lagged returns of S&P Barra growth index are used as trading signals. To compute annual returns of buy-and-hold strategy and trading strategies I, II and III, the sample is used from December 1, 1997 though December 31, 2001 (DRI provides the S&P Barra indices up to December 31, 2001).

Portfolios of Sizes and Styles of Funds	Correlations with lagged S&P Barra Value Index	Correlations with lagged S&P Barra Growth Index	Buy-and-hold Annual Returns	Trading Strategy Annual Returns (S&P Barra Value Index as signal)		Trading Strategy Annual Returns (S&P Barra Growth Index as Signal)	
				Strategy I	Strategy II	Strategy I	Strategy II
Large Value	0.4306**	0.4077**	-6.4234%	28.0838%	30.6356%	31.3057%	33.8085%
Medium Value	0.2403**	0.2438**	-3.9789%	37.0007%	39.5524%	34.4174%	36.9202%
Small Value	0.3139**	0.3095**	-9.3042%	13.9798%	16.5316%	17.3603%	19.8631%
Large Growth	0.4290**	0.4234**	-6.6153%	28.5363%	31.0881%	35.3038%	37.8066%
Medium Growth	0.3323**	0.3382**	-3.1962%	31.8673%	34.4191%	38.7175%	41.2203%
Small Growth	0.3859**	0.3810**	-0.1703%	32.7889%	35.3407%	43.6591%	46.1619%
Large Blend	0.4628**	0.4436**	-6.6699%	29.2232%	31.7750%	35.7981%	38.3009%
Medium Blend	0.4523**	0.4204**	1.0927%	35.2174%	37.7692%	41.2298%	43.7326%

Table 10: Returns and Risks of Buy-and-hold and Conservative Trading Strategy with Exchange Restrictions

This table presents the returns and risks of buy-and-hold and conservative trading strategies IV, V and VI. The conservative trading strategy is based on the fact that trades are executed when the US market Index increases or decreases by at least 1.5% from its previous close and investors cannot trade/exchange within 15 days' of initial purchase of funds. Column one lists the portfolios of fund categories. Columns two and three show mean daily returns and standard deviations of returns for buy-and-hold strategy. Columns four and five present mean daily returns and standard deviations of returns for conservative trading strategy IV (switching between international fund and cash); columns six and seven provide mean daily returns and standard deviations of returns for conservative trading strategy V (switching between international fund and money market fund); and columns eight and nine exhibit mean daily returns and standard deviations of returns for conservative trading strategy VI (switching between international fund and index fund). The significance level of t-statistics (to test the differences in mean returns between buy-and-hold and trading strategies) and F-statistics (to test differences in mean variances between buy-and-hold and trading strategies) are presented at 1% (**), 5% (*) and 10% (*) level respectively. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Categories	Buy-and-hold Strategy			Trading Strategy IV			Trading Strategy V			Trading Strategy VI		
	Mean Daily Return	Mean Daily SD	Mean Daily Return	Mean Daily SD	Mean Daily Return	Mean Daily SD	Mean Daily Return	Mean Daily SD	Mean Daily Return	Mean Daily SD		
Diversified Emerging Market Fund	-0.0345%	1.2831%	0.0626%***	0.8499%***	0.0715%***	0.8493%***	0.0499%***	1.3130%				
Diversified Pacific/Asia Fund	-0.0310%	1.3295%	0.0631%***	0.9694%***	0.0722%***	0.9689%***	0.0606%***	1.3967%**				
Europe Fund	-0.0421%	1.1558%	0.0506%***	0.7750%***	0.0595%***	0.7745%***	0.0386%***	1.2659%***				
Japan Fund	-0.0246%	1.4668%	0.0191%	1.0438%***	0.0278%*	1.0437%***	0.0276%	1.4356%				
Pacific/Asia Ex. Japan Fund	-0.0226%	1.5740%	0.0628%**	0.9986%***	0.0719%***	0.9981%***	0.0601%**	1.4171%***				
Foreign Fund	-0.0380%	1.0174%	0.0531%***	0.6870%***	0.0620%***	0.6864%***	0.0347%***	1.2095%***				
Latin Fund	-0.0358%	1.7505%	0.0280%***	1.6063%***	0.0333%***	1.6063***	-0.0331%	1.7582%				
World Fund	-0.0413%	1.0276%	0.0348%***	0.7020%***	0.0438%***	0.7016%***	0.0167%***	1.2179%***				
International Bond Fund	-0.0064%	0.2792%	-0.0033%	0.1896%***	0.0057%**	0.1903%***	-0.0161%	1.0179%***				
International Hybrid Fund	-0.0209%	0.6328%	0.0064%**	0.4899%***	0.0155%***	0.4900%***	-0.0032%	1.1148%***				

Table 11: Returns and Risks of Buy-and-hold and a Trading strategy that requires a Minimum of five-day Holding after Initial Purchases

This table presents the returns and risks of buy-and-hold and a trading strategy that requires investors to buy-and-hold fund at least for five days after initial purchases and then sells it on the day when there is a sale signal. Column one lists the portfolios of sample funds. Columns two and three show mean daily returns and standard deviations (SD) for buy-and-hold strategy. Columns four and five present mean daily returns and standard deviations of returns for trading strategy VII (switching between international fund and cash); columns six and seven provide mean daily returns and standard deviations of returns for trading strategy VIII (switching between international fund and money market fund); and columns eight and nine exhibit mean daily returns and standard deviations of returns for trading strategy IX (switching between international fund and index fund). The significance level of t-statistics (to test the differences in mean returns between buy-and-hold and trading strategies) and F-statistics (to test differences in mean variances between buy-and-hold and trading strategies) are presented at 1% (***), 5% (**), and 10% (*) level respectively. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Categories	Buy-and-hold			Trading Strategy VII			Trading Strategy VIII			Trading Strategy IX		
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	
	Daily Return	Daily SD	Daily Return	Daily SD	Daily Return	Daily SD	Daily Return	Daily SD	Daily Return	Daily SD	Daily Return	Daily SD
Diversified Emerging Market Fund	-0.0345%	1.2831%	0.0701%***	1.0889%***	0.0740%***	1.0887%***	0.0251%**	1.3405%*	0.0617%**	1.2965%	0.0144%**	1.2931%***
Diversified Pacific/Asia Fund	-0.0310%	1.3295%	0.0613%***	1.0900%***	0.0652%***	1.0898%***	0.0617%**	1.2965%	0.0144%**	1.2931%***	0.0144%**	1.2931%***
Europe Fund	-0.0421%	1.1558%	0.0533%***	0.9744%***	0.0572%***	0.9743%***	0.0144%**	1.2931%***	0.0144%**	1.2931%***	0.0144%**	1.2931%***
Japan Fund	-0.0246%	1.4668%	0.0369%***	1.2613%***	0.0407%***	1.2612%***	0.0988%***	1.4681%	0.0988%***	1.4681%	0.0988%***	1.4681%
Pacific/Asia Ex. Japan Fund	-0.0226%	1.5740%	0.1022%***	1.3412%***	0.1062%***	1.3410%***	0.0567%**	1.4551%***	0.0567%**	1.4551%***	0.0567%**	1.4551%***
Foreign Fund	-0.0380%	1.0174%	0.0600%***	0.8556%***	0.0640%***	0.8553%***	0.0299%***	1.2381%***	0.0299%***	1.2381%***	0.0299%***	1.2381%***
Latin Fund	-0.0358%	1.7505%	0.0898%***	1.3795%***	0.0944%***	1.3792%***	-0.0259%	1.7984%	-0.0259%	1.7984%	-0.0259%	1.7984%
World Fund	-0.0413%	1.0276%	0.0350%***	0.8608%***	0.0390%***	0.8607%***	0.0069%***	1.2347%***	0.0069%***	1.2347%***	0.0069%***	1.2347%***
International Bond Fund	-0.0064%	0.2792%	-0.0029%	0.2415%***	0.0010%*	0.2417%***	-0.0152%	0.8140%***	-0.0152%	0.8140%***	-0.0152%	0.8140%***
International Hybrid Fund	-0.0209%	0.6328%	0.0217%***	0.5493%***	0.0257%***	0.5493%***	0.0091%	1.1010%***	0.0091%	1.1010%***	0.0091%	1.1010%***

Appendix: Summary Statistics of Sample Mutual Funds and Market Indices

This table presents the summary statistics of sample mutual funds and the US and foreign indices. Column one lists the names and ticker symbols of funds or indices. Columns two through five represent the minimum, maximum, mean and standard deviation (SD) of returns. Panel A shows the summary statistics for sample mutual funds and Panel B shows the summary statistics for the US and Foreign market indices. The sample period is from January 4, 1993 through October 31, 2002.

Panel A: Sample Mutual Funds

A. Diversified Emerging Market Fund

Fund Name and Ticker		Minimum	Maximum	Mean	SD
Merrill Lynch Dev Cap Market A	(MADCX)	-0.1073	0.0453	-0.00005	0.0107
Montgomery Emerging Mkts R	(MNEMX)	-0.0988	0.0483	-0.00011	0.0110
Morgan Stan Ins Emerging Mkt A	(MGEMX)	-0.1131	0.0453	-0.00001	0.0120
Templeton Developing Mkts A	(TEDMX)	-0.1580	0.1033	0.00003	0.0104
Portfolio		-0.1036	0.0424	-0.00004	0.0103

B. Diversified Pacific/Asia Fund

Fund Name and Ticker		Minimum	Maximum	Mean	SD
Fidelity Pacific Basin	(FPBFX)	-0.1147	0.0959	0.00004	0.0116
GAM Pacific Basin A	(GAPCX)	-0.1243	0.0895	-0.00024	0.0118
J. Hancock Pacific Basin Eq A	(JHWPX)	-0.0964	0.0651	-0.00002	0.0113
Merrill Lynch Pacific A	(MAPCX)	-0.1933	0.0750	-0.00006	0.0119
Morgan Stanley Pacific Growth B	(TGRBX)	-0.0898	0.0709	-0.00014	0.0117
Prudential Pacific Growth B	(PRPBX)	-0.1213	0.0468	-0.00021	0.0102
Templeton Pacific Growth A	(FKPGX)	-0.0808	0.0733	-0.00026	0.0108
Portfolio		-0.1383	0.0864	-0.00014	0.0112

C. Europe Fund

Fund Name and Ticker		Minimum	Maximum	Mean	SD
Alliance New Europe A	(ANEAX)	-0.1103	0.0621	0.00008	0.0118
DFA Continental Small Compny	(DFCSX)	-0.1724	0.0402	-0.00009	0.0097
DFA United Kingdom Small Co	(DFUKX)	-0.1933	0.0653	-0.00010	0.0097
Fidelity Europe	(FIEUX)	-0.1213	0.0575	0.00008	0.0109
INVESCO European Inv	(FEURX)	-0.2059	0.0643	-0.00012	0.0134
Merrill Lynch Euro Fund B	(MBEFX)	-0.2222	0.0574	-0.00006	0.0128
Morgan Stanley European Growth B	(EUGBX)	-0.1652	0.0532	0.00009	0.0124
Pioneer Europe A	(PEURX)	-0.0773	0.0516	0.00011	0.0110
Putnam Europe Growth A	(PEUGX)	-0.0800	0.0492	0.00018	0.0108
T. Rowe Price European Stock	(PRESX)	-0.0989	0.0626	0.00013	0.0109
Vanguard Euro Stock Index Fund	(VEURX)	-0.0560	0.0697	0.00023	0.0108
Portfolio		-0.0507	0.0468	0.00005	0.0091

D. Japan Fund

Fund Name and Ticker		Minimum	Maximum	Mean	SD
DFA Japanese Small Company	(DFJSX)	-0.0698	0.1081	-0.00037	0.0144
The Japan Fund-Adv S	(SJPNX)	-0.1027	0.0936	-0.00017	0.0144
T. Rowe Price Japan Fund	(PRJPX)	-0.1338	0.1016	-0.00023	0.0148
Vanguard Pacific Stk Index Fd	(VPACX)	-0.0593	0.1272	-0.00010	0.0133
Portfolio		-0.0617	0.1076	-0.00022	0.0130

Appendix Continued

E. Pacific/Asia Ex. Japan Fund

Fund Name and Ticker		Minimum	Maximum	Mean	SD
Eaton Vance Grtr China Gr A	(EVCGX)	-0.1395	0.1225	-0.00009	0.0149
Liberty Newport Tiger T Fd***	(CNTTX)	-0.1167	0.1542	-0.00023	0.0123
Merrill Lynch Dragon Fund B	(MBDRX)	-0.2158	0.1090	-0.00021	0.0145
Morgan Stan Ins Asian Eq A	(MSAEX)	-0.1283	0.0620	-0.00022	0.0139
T. Rowe Price New Asia Fd	(PRASX)	-0.1383	0.0861	-0.00004	0.0136
Portfolio		-0.1490	0.0933	-0.00016	0.0139

F. Foreign Fund

Fund Name and Ticker		Minimum	Maximum	Mean	SD
ING International Growth I	(AEIGX)	-0.2361	0.0467	-0.00019	0.0122
AIM International Equity A	(AIIEX)	-0.0870	0.0461	0.00014	0.0097
American AAdvant Intl Eq Ins	(AAIEX)	-0.0894	0.0454	0.00012	0.0087
American Cent Intl Gr Inv	(TWIEX)	-0.1528	0.0591	0.00005	0.0110
American Funds EuroPacific A	(AEPGX)	-0.1125	0.0401	0.00013	0.0087
AXP International Fund A	(INIFX)	-0.1795	0.1069	-0.00019	0.0116
Babson-Stewart Ivory Intl	(BAINX)	-0.0547	0.0467	-0.00004	0.0090
Bernstein Tax-Mgd Intl Value	(SNIVX)	-0.1079	0.0462	0.00007	0.0089
BlackRock Intl Equity Instl	(PNINX)	-0.1625	0.0465	-0.00011	0.0100
Calvert World Value Intl EqA	(CWVGX)	-0.0822	0.0568	-0.00005	0.0092
CDC Nvest Intl Equity A	(NEFIX)	-0.0678	0.0446	-0.00007	0.0098
Columbia International Stock	(CMISX)	-0.1662	0.0428	0.00001	0.0098
Consulting Grp Cap Mkt Intl Equity	(TIEUX)	-0.1514	0.0438	-0.00005	0.0101
Credit Suisse Instl Intl Ins	(RBIEX)	-0.3495	0.0425	-0.00025	0.0125
Dreyfus Premier Intl Gr A	(DRGLX)	-0.3259	0.0414	-0.00033	0.0128
Eclipse EAFE Index Fd NI	(NIEAX)	-0.3108	0.0401	-0.00015	0.0115
Enterprise Intl Growth A	(ENIGX)	-0.1458	0.0664	-0.00010	0.0104
Excelsior International Fd	(UMINX)	-0.0650	0.0546	-0.00002	0.0093
Federated Intl Equity A	(FTITX)	-0.1083	0.0377	-0.00007	0.0106
Fidelity Adv Overseas Fund T	(FAERX)	-0.0963	0.0524	0.00007	0.0098
Fidelity Canada Fund	(FICDX)	-0.0823	0.0619	0.00008	0.0098
Fidelity Diversified Intl Fund	(FDIVX)	-0.0524	0.0349	0.00028	0.0080
Fidelity Intl Growth & Inc	(FIGRX)	-0.1185	0.0403	0.00010	0.0089
Fidelity Overseas Fund	(FOSFX)	-0.1177	0.0515	0.00005	0.0100
Fifth Third Intl GDP Inst	(KNINX)	-0.0738	0.0429	-0.00002	0.0094
GAM International Fund A	(GAMNX)	-0.1024	0.0499	-0.00005	0.0104
Goldman Sachs Intl Eqty A	(GSIFX)	-0.1114	0.0531	-0.00007	0.0100
Harbor International Fund	(HAINX)	-0.1205	0.0451	0.00019	0.0096
Ivy International Fund A	(IVINX)	-0.2850	0.0493	-0.00006	0.0111
Liberty Acorn Intl Fund Z	(ACINX)	-0.1485	0.0498	0.00014	0.0084
Liberty Newport Intl Equity A	(CONAX)	-0.2063	0.0349	-0.00009	0.0097
Morgan Stan Ins Active Int All A	(MSACX)	-0.1536	0.0359	-0.00010	0.0094
Morgan Stan Ins Intl Equity A***	(MSIQX)	-0.1800	0.0402	0.00016	0.0096
Munder International Equity Y	(MUIYX)	-0.1176	0.0471	-0.00007	0.0098
Oakmark International Fund	(OAKIX)	-0.2346	0.0632	0.00010	0.0101
Phoenix-Aberdeen Intl Port. A	(PHITX)	-0.1567	0.0468	-0.00012	0.0111
Preferred International Value Fund	(PFIEX)	-0.1974	0.0393	0.00009	0.0095
Principal International A	(PRWLX)	-0.1167	0.0390	0.00000	0.0092
Schroder Intl Equity Inv	(SCIEX)	-0.5463	0.0404	-0.00042	0.0158
Scudder Intl Fund S	(SCINX)	-0.1112	0.0426	-0.00003	0.0100

Appendix Continued

F. Foreign Fund

Fund Name and Ticker		Minimum	Maximum	Mean	SD
SEI International Equity A	(SEITX)	-0.1108	0.0559	-0.00008	0.0098
Sit International Growth Fund	(SNGRX)	-0.1131	0.0568	-0.00007	0.0104
Smith Barney Intl All Cap Gr A	(SBIEX)	-0.2109	0.0445	-0.00009	0.0106
Strong International Stock	(STISX)	-0.0847	0.0461	-0.00013	0.0110
T. Rowe Price Foreign Equity	(PRFEX)	-0.0927	0.0554	0.00003	0.0098
T. Rowe Price Intl Discovery***	(PRIDX)	-0.2062	0.0454	0.00011	0.0093
T. Rowe Price Intl Stock Fund	(PRITX)	-0.0926	0.0548	0.00000	0.0099
Templeton Foreign A	(TEMFX)	-0.1204	0.0421	0.00006	0.0079
Templeton Foreign Smaller Co A	(FINEX)	-0.1179	0.0484	0.00008	0.0075
USAA International Fund	(USIFX)	-0.0513	0.0400	0.00010	0.0085
Vanguard International Value Fund	(VTRIX)	-0.1997	0.0471	-0.00010	0.0102
Vanguard Intl Growth Fund	(VWIGX)	-0.0785	0.0602	0.00011	0.0096
Vontobel International Equity	(VNEPX)	-0.1950	0.0474	-0.00002	0.0103
Waddell & Reed Adv Intl Gr A	(UNCGX)	-0.2680	0.0565	-0.00011	0.0123
WM Intl Growth A	(SRIGX)	-0.0680	0.0449	-0.00008	0.0093
Wright Intl Blue Chip Equity Stand Portfolio	(WIBCX)	-0.1590	0.0930	-0.00003	0.0102

G. Latin America Fund

Fund Name and Ticker		Minimum	Maximum	Mean	SD
Merrill Lynch Latin Amer B	(MBLTX)	-0.1466	0.1005	-0.00003	0.0157

H. World Fund

Fund Name and Ticker		Minimum	Maximum	Mean	SD
Alliance Global Small Cap A	(GSCAX)	-0.2155	0.0491	-0.00021	0.0120
American Fds New Prospective A	(ANWPX)	-0.1357	0.0411	0.00015	0.0090
American Fund Small Cap World A	(SMCWX)	-0.1860	0.0589	-0.00003	0.0107
American Heritage Fund	(AHERX)	-0.4055	0.3365	-0.00107	0.0427
AXP Global Growth A	(IGLGX)	-0.1739	0.0478	-0.00009	0.0107
Dreyfus Founders Wldwide Gr F***	(FWWGX)	-0.2759	0.0456	-0.00021	0.0120
Elfun International Equity Fund	(EGLBX)	-0.1612	0.0885	-0.00003	0.0109
Fidelity Worldwide Fund	(FWWFX)	-0.1574	0.0454	0.00008	0.0092
First Invest Global A	(FIISX)	-0.1394	0.0455	-0.00004	0.0096
GAM Global Fund A	(GAGLX)	-0.2231	0.0428	0.00006	0.0112
J. Hancock Global Fund B	(FGLOX)	-0.1120	0.0485	-0.00026	0.0104
Ivy Fund Global A	(MCGLX)	-0.0997	0.0475	-0.00015	0.0096
Janus Worldwide Fund***	(JAWWX)	-0.1182	0.0475	0.00020	0.0106
Lord Abbett Global Equity A	(LAGEX)	-0.1103	0.0467	-0.00009	0.0093
MFS Global Equity Fund B	(MWEBX)	-0.0955	0.0415	0.00007	0.0083
Oppenheimer Global Fund A	(OPPAX)	-0.2103	0.0607	0.00010	0.0114
Oppenheimer Global Gr & Inc Fd A	(OPGIX)	-0.1455	0.0546	0.00013	0.0111
Oppenheimer Quest Glob Val A	(QVGLX)	-0.2175	0.0501	0.00003	0.0094
Phoenix-Aberdeen Wldwde Opp A	(NWWOX)	-0.1961	0.0441	-0.00010	0.0113
Prudential Global Growth Fund B	(PRGLX)	-0.1819	0.0919	-0.00001	0.0115
Putnam Global Growth Fund A	(PEQUX)	-0.2136	0.0539	-0.00009	0.0124
Scudder Global Discovery Fd S***	(SGSCX)	-0.0874	0.0493	0.00016	0.0101
Scudder Global Fund S	(SCOBX)	-0.1734	0.0374	-0.00004	0.0089
Templeton Capital Accumulator	(TECAX)	-0.6978	0.0385	-0.00010	0.0161
Templeton Global Opportunities A	(TEGOX)	-0.1210	0.0632	-0.00002	0.0087

Appendix Continued

H. World Fund

Fund Name and Ticker	Minimum	Maximum	Mean	SD
Templeton Global Small Co Gr A (TEMGX)	-0.0883	0.326	-0.00005	0.0073
Templeton Growth A (TEPLX)	-0.1480	0.0362	0.00004	0.0086
Templeton World A (TEMWX)	-0.1289	0.0380	-0.00001	0.0091
USAA World Growth Fund (USAWX)	-0.0518	0.0420	0.00007	0.0087
Portfolio	-0.0587	0.0400	-0.00005	0.0082

I. International Bond Fund

Fund Name and Ticker	Minimum	Maximum	Mean	SD
Alliance Multi-Market Strategy A (AMMSX)	-0.0644	0.0383	-0.00015	0.0030
Alliance North Amer Govt Inc A (ANAGX)	-0.0903	0.0724	-0.00014	0.0075
American Century Intl Bond Inv (BEGBX)	-0.0477	0.0282	0.00006	0.0060
American Fds Cap World Bond A (CWBFX)	-0.0357	0.0218	0.00002	0.0036
AXP Global Bond A (IGBFX)	-0.0194	0.0147	0.00002	0.0033
BlackRock Intl Bond Svc (CIFIX)	-0.0952	0.0267	0.00000	0.0040
Consulting Group Intl Fixed Inv (TIFUX)	-0.0530	0.0251	-0.00003	0.0050
Credit Suisse Global F/I Ret (CGFIX)	-0.0430	0.0167	-0.00001	0.0034
DFA Five Year Global Fix-Inc (DFGBX)	-0.0797	0.0178	0.00003	0.0032
Federated International Bond A (FTIIX)	-0.0726	0.0329	-0.00002	0.0055
Franklin Temp Hard Currency A (ICPHX)	-0.0849	0.0321	-0.00014	0.0056
Goldman Sachs Global Inc A (GSGIX)	-0.0532	0.0090	0.00000	0.0027
Lord Abbett Global Income A (LAGIX)	-0.0152	0.0163	-0.00012	0.0033
Merrill Lynch Global Bond B (MBGOX)	-0.0263	0.0226	-0.00007	0.0036
Morgan Stan Ins GI FI A (MSGFX)	-0.0488	0.0488	0.00006	0.0041
PIMCO Foreign Bond Instl (PFORX)	-0.1303	0.0151	0.00002	0.0041
Putnam Global Govtl Income A (PGGIX)	-0.0215	0.0201	-0.00010	0.0037
Scudder Global Bond Fund S (SSTGX)	-0.0139	0.0135	-0.00008	0.0024
Smith Barney Global Govt Bd A (SBGLX)	-0.0794	0.0101	-0.00003	0.0032
T. Rowe Price Intl Bond Fund (RPIBX)	-0.0357	0.0256	-0.00004	0.0049
Templeton Global Bond A (TPINX)	-0.0169	0.0153	-0.00005	0.0032
Portfolio	-0.0114	0.0109	-0.00004	0.0025

J. International Hybrid Fund

Fund Name and Ticker	Minimum	Maximum	Mean	SD
American Funds Cap Inc Builder A (CAIBX)	-0.0521	0.0390	0.00011	0.0051
UBS (Brinson) Global Balanced Y (BPGLX)	-0.0986	0.0323	-0.00001	0.0063
First Eagle SoGen Global Fund A (SGENX)	-0.1893	0.0190	0.00011	0.0068
Fremont Global Fund (FMAFX)	-0.1344	0.0285	-0.00009	0.0072
Merrill Lynch Global Allocation A (MALOX)	-0.1350	0.0316	-0.00001	0.0072
MFS Global Total Return Fund A (MFWTX)	-0.0942	0.3082	0.00006	0.0060
Portfolio	-0.0643	0.0710	0.00003	0.0050

Appendix Continued

Panel B: Sample US and Foreign Indices

Market Index	Minimum	Maximum	Mean	SD
S&P 500	-0.0711	0.0557	0.00029	0.0110
Russell 1000	-0.0696	0.0547	0.00028	0.0111
Russell 2000	-0.0753	0.0568	0.00021	0.0112
Russell 3000	-0.0687	0.0537	0.00027	0.0109
Wilshire 5000	-0.0695	0.0523	0.00027	0.0108
Dow Industrial	-0.0746	0.0615	0.00038	0.0108
Dow Composite	-0.0815	0.0535	0.00027	0.0099
NASDAQ	-0.0718	0.0460	0.00075	0.0090
MSCI Emerging Market Free	-0.1141	0.0477	-0.00004	0.0107
MSCI Europe Free	-0.0568	0.0519	0.00023	0.0105
MSCI Far East Free	-0.0562	0.1130	-0.00013	0.0136
MSCI Pacific Free	-0.0590	0.1086	-0.00010	0.0128
MSCI Far East Free ex. Japan	-0.1278	0.1028	-0.00008	0.0143
MSCI Pacific Free ex. Japan	-0.1214	0.0945	0.00003	0.0122
MSCI Europe, Australia, and Far East (EAFE) Free	-0.0468	0.0446	0.00010	0.0094
MSCI Latin America Free	-0.1448	0.1352	0.00002	0.0170
MSCI World Free	-0.0498	0.0460	0.00019	0.0085
Japan Topix 1 st Section	-0.1280	0.1689	-0.00018	0.0133
Japan Topix 2 nd Section	-0.1010	0.0579	-0.00004	0.0099
Nikkei 225	-0.0723	0.0766	-0.00029	0.0148
10-Year Treasury Bond	-0.0910	0.1045	-0.00021	0.0114
30-Year Treasury Bond	-0.0674	0.0630	-0.00015	0.0085