2005

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Working Paper

January 2005

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ABSTRACT

The weekend effect is described as the tendency for Monday security returns to be low (or negative) compared to other days of the week. The weekend effect may not be exploited by trading individual stocks because of transactions costs. However, the institutional characteristics of the US-based international open-end mutual funds may allow investors to exploit the weekend effect because mutual funds lack much of the transactions costs associated with individual stocks. This paper extends the study of Compton and Kunkel (1999), Varela (2002), and Miller, Prather and Mazumder (2003) by examining the weekend predictability and profitable trading opportunities for international mutual funds. The rationale behind the weekend predictability and profitability of international funds lies on the fact that the Net Asset Values (NAVs) of international funds are computed from stale prices of the underlying assets of these funds. The sample of international funds is divided into two sub-samples and the initial sub-sample is used to test the weekend effect and develop trading strategies. Returns of trading strategies are then evaluated out-of-sample and compared with the returns of a buy-and-hold strategy. Empirical findings suggest that smart investors may earn higher risk-adjusted returns by following daily dynamic trading strategies. Results also document that trading strategies based on the weekend effect produce higher risk-adjusted returns. Finally market timing models are also tested for trading strategy returns and Treynor-Mazuy and Henriksson-Merton timing measures are positive and statistically significant. Moreover, the trading rules of this study may be useful in future if fair value pricing or other institutional regularities eliminate any profitable trading opportunity based on the US market signals.

Keywords: Mutual Funds, Weekend effect, Trading Rule, Market Efficiency

JEL Classifications: G12, G14

1. Introduction

There are ample evidences of the day-of-the-week or weekend effect on stock returns. This effect is described as the tendency for Monday security returns to be low or negative. This evidence is also observed before or after holidays. Though it has been reported that the weekend affect is diminished recently, however, the weekend effect is theoretically interesting because of its deviations from market efficiency and practically appealing if smart investors can exploit it to earn excess returns. Several studies report that the autocorrelations are the greatest over the weekend than other pairs of the days. Assuming this effect still exists (and it may not) it would suggest a profitable trading strategy, namely investing in the US market on Fridays when the market appeared likely to close high and being out of the market on other days or being in the market on all days except Mondays. Because of spreads and commissions the trading strategy may not be profitable for individual stocks. However, if implemented through mutual fund (or retirement fund and annuities plan) that permit switching from one fund to another with no charge, higher returns may be possible. Compton and Kunkel (1999) show that higher risk-adjusted returns can be earned by switching within TIAA-CREF's retirement annuity accounts. Miller, Prather and Mazumder (2003) investigate the day-of-the-week effects among mutual funds and implement trading strategies that produce higher risk-adjusted returns.

This paper investigates the predictability of the day-of-the-week returns for the US-based international open-end mutual funds. Recent studies on international stocks markets report low Monday returns abroad. Since the underlying securities of international funds are benchmarked to foreign indices, we examine the day-of-the-week predictability of foreign indices and propose several trading strategies for international funds to utilize the daily seasonal effect. The intuition behind the day-of-the-week (or weekend) predictability and profitable trading opportunities can be explained as follow: if a major stock index in Japan exhibit positive Friday and negative Monday returns then the US-based Japan mutual funds are expected to exhibit positive Friday and negative Monday returns because the underlying shares of the US-based Japan mutual funds follow major Japanese index and NAVs of the Japan funds are calculated at 4 PM ET based on the last closing prices of their underlying shares. The US investors can form a simple trading strategy - sell the US-based Japan funds on Friday and shift investment to a money market fund to avoid negative Monday returns from Japan funds. The US-investors may also use a complex trading strategy by shifting their investment out of risky Japan funds and into money market

funds on days(s) of the week when the major Japanese indices historically exhibit negative returns. Investors require no transactions costs to exchange one mutual fund for other fund(s) within fund families. Although some fund families and variable annuities impose restrictions on frequent exchanges, however the trading strategies can be implemented within retirement accounts without transactions costs.

This study extends the current literature on international mutual fund predictability in several ways. We focus mainly on investigating the day-of-the-week price changes in international mutual funds. To our knowledge, the variability of daily autocorrelation with the day-of-the-week has not yet been investigated for international funds. This is the first study to examine the weekend predictability of international funds using the foreign indices. If there are effects in most foreign markets similar to the effects in the US markets, they should show up in the form of the predictability of returns of international funds as a function of foreign indices varying with the day-of-the-week, with the predictability probably being greatest over the weekend. Our paper extends Compton and Kunkel (1999), Varela (2002) and Miller, Prather and Mazumder (2003) by examining the weekend trading opportunities for international funds using foreign indices. This paper also investigates the weekend predictability and profitable trading opportunities for the US-based international hybrid mutual funds since the predictability of hybrid funds has not been discussed extensively in literature.

Previous studies apparently do not allow for any returns from investing in other assets when investors are out of the markets. This study allows for returns from investing in alternative assets (such as money market fund) when an US investor is out of international funds. Most of the previous studies do not provide risk-adjusted returns but we analyze risk-adjusted returns in this paper. Risk-adjusted return seems interesting as a weekend effect might be expected to lower returns by keeping one out of the market more often. Suppose an investor had expected, in statistical term, 5% returns for some periods, and 15% for other periods from a security; thus the security provides an average 10% returns. If the high returns were earned half of the time by being in the market, and the risk free rate was 4%, a strategy using the predictability would provide a return of 9.5% (0.5*15% + 0.5*4%), which would be less than the 10% earned by a buy-and-hold strategy. However, risk adjusted, the strategy gives better returns because of low risks associated with risk-free instruments. For an investor who could use margin, the strategy of being in the market with margin on a good day could give higher returns than buy-and-hold

strategy given equal exposure to market risk. An investor who could not use margin in a security (such as typical retirement account or mutual fund) still might find such a strategy useful if for risk control reasons he would normally hold substantial risk free assets (such as money market funds).

Using 2,479 daily return observations from all categories of 117 international equity mutual funds and 6 international hybrid funds, we explore the weekend predictability and potential exploitability of those returns. This exploration splits the sample, uses the initial sub-sample to investigate return patterns and develops trading strategies, and tests those strategies on the holdout sample. We propose several trading strategies to exploit the weekend effect for international funds. The risk-adjusted returns of the proposed trading strategies are computed and evaluated out of sample. Empirical results suggest that the institutional features of international funds allow investors to exploit the weekend effect and achieve higher risk-adjusted returns. We also test Treynor and Mazuy (1966) and Henriksson and Merton (1981) market timing models and find positive and statistically significant timing measures for the weekend trading strategies.

The rest of the paper is organized as follows: section two discusses the predictability of mutual fund returns and limitations of self-correcting forces; section three discusses the relevant literature on the weekend effect; section four discusses sample data and methodology; section five documents empirical results, develops trading strategies, analyzes the risk-adjusted returns of trading strategies, and tests market timing models. Section six presents possible future research and extensions of this study and finally, section seven concludes the paper.

2. Predictability of Mutual Fund Returns and Limitations of Self-Correcting Forces

Mutual funds are portfolios that gather assets from investors and collectively invest those assets in stocks, bonds or money market funds. Therefore the effect that produces the predictability in the stock prices would also produce predictability in the NAVs of a mutual funds or retirement annuities. Miller and Prather (2000) and Miller, Prather and Mazumder (2003) argue that the day-of-the-week effects in mutual funds, or retirement annuities lack the self-correcting nature of trading in stocks. If an investor of stock market finds a rule that predicts that stock's closing prices will rise by a significant amount from Thursday to Friday, he will buy stocks at Thursday's closing price and sell stocks at Friday's closing price. This will provide him some profits. However if many investors find out this profitable trading rule, they will use it and

their trading will eliminate the profit by bidding the Thursday's closing price up (demand pressure) and lowering the Friday's closing price down (supply pressure). Therefore, any effort to exploit predictabilities by trading individual stocks tends to eliminate the predictability, and quickly reduce them to the level where the remaining trading profits are offset by transactions costs.

Similar to individual stock investor, an investor of mutual fund might also be able to make profits by buying the mutual fund or retirement annuity at Thursday's NAV and selling it at Friday's NAV. However the trading strategy would not eliminate the effect observed in stocks if the trading was done in mutual funds or retirement annuities. It is because that the fund manager does not have the influx of funds until after Thursday 4 PM ET when the funds' NAVs are calculated and the trades are actually done. If the fund manager takes no action until the new funds are received, the effect may continue because no action is taken to affect stock prices. As an alternate, if the fund manager responds to the influx of new funds by buying more stocks immediately then either of the following may happen; (1) if fund manger's buying is too little to affect the prices, the effect will continue or (2) if fund manager's buying is large enough to affect prices, it will increase the closing Friday prices of the underlying stocks of the mutual funds, and eventually fund's NAV will be even higher on Friday. The fund trading actually accentuates the price change. Thus, day-to-day predictabilities could persist even if they were known.

3. Literature on the Day of the Week Effects

3.1. Evidence from the US Markets

In a recent survey article Pettengill (2003) documents that the day-of-the-week effect in stock markets dates back to 1930s. Fields (1931) identifies the effect and concludes that the Dow Jones Industrial Average (DJIA) index returns are positive on Saturdays and negative on Mondays.[1] Cross (1973) finds that the Standard and Poor's (S&P) index returns during 1953-1970 are significantly negative on Mondays (-0.18%) and positive on Fridays (0.12%). French (1980) examines the daily seasonal of S&P 500 during 1953-1977 and finds statistically significant negative Monday returns. Gibbons and Hess (1981) examine the S&P 500, CRSP indices and 30 individual stocks of the DJIA and document that Monday returns are significantly negative for individual stocks and indices. Keim and Stambaugh (1984) find negative Monday

[1] The US markets were open on Saturdays every month before 1946 and non-summer months before 1953.

returns and positive returns on the last trading day of the week for the S&P composite index during 1928-1982. Rogalski (1984) documents that the day-of-the-week effect occurs during non-trading period (Friday close to Monday open) irrespective of firm sizes. Negative overnight weekend returns are also documented by Smirlock and Starks (1986) for the DJIA index, Dyl and Maberly (1986) for the S&P 500 futures index; Harris (1986) and Jain and Joh (1988) for the NYSE index; and Chow, Hsiao and Solt (1997) for the S&P 500 index. Siegel (1998) provides the longest time frame (112 years) of investigation on the day-of-the-week effect for the DJIA index. From 1885 to 1997, he reports that the average daily return has been 0.024%, while the average return for Mondays has been a minus 0.110%.

Recent studies document a shift in the day-of-the-week effect especially for large firms. Connolly (1989) shows some degree of Monday shifts for the US markets during mid-1970s. Kamara (1997) examines the S&P 500 index and small-cap index of the NYSE from 1962 through 1993 and finds that the Monday effect has declined significantly for large stocks after the introduction of the S&P 500 futures in 1982. Brusa, Liu and Schulman (2000) find a reverse weekend effect for the S&P500, NYSE, DJIA and CRSP value-weighted indices during 1990-1994. However, negative Monday effect still dominates for small-firms. Steeley (2001) and Sun and Tong (2002) also document a shift in the Monday effect. Al-Rjoub, Hassan and Varela (2004) also show that the weekend effect seems to reverse in January, especially in the first week of January irrespective of sizes.

3.2. Evidence from Foreign Markets

Monday is a poor day, not only in the United States, but also in other parts of the World. Jaffe and Westerfield (1985a) examine the day-of-the-week effect for Australia, Canada, Japan, UK and USA and document negative Monday returns although the weekend effect is slightly weaker in Australia and Japan (the lowest mean returns occur on Tuesday for Australia and Japan). Jaffe and Westerfield (1985b) also find negative Tuesday returns for Japan during 1970-1983. International evidence of the day-of-the-week effect is also investigated for UK [Board and Sutcliffe (1988), Draper and Paudyal (2002)]; European Countries [Santesmases (1986) for Spain, Solnik and Bousquet (1990) for France]; developed countries [Condoyanni, O'Hanlon and Ward (1987) and Dubois and Louvet (1996)]; Emerging markets from Asia [Aggarwal and Rivoli (1989), Lee, Pettit and Swankoski (1990), Clare, Ibrahim and Thomas (1998), Mookerjee

and Yu (1999)]. Most of these studies document negative and the lowest Monday returns; however, some of these studies also document negative Tuesday returns especially for some Asian markets.

One possible explanation for difference in the international weekend effect is the time differences between international markets and the US markets. Negative US Monday returns are followed by negative Far Eastern Tuesday returns. Condoyanni, O'Hanlon and Ward (1987) and Aggarwal and Rivoli (1989) find results consistent with time-zone hypothesis. However, Jaffe and Westerfield (1985b) reject this hypothesis as they find insignificant cross-correlation between Monday US returns and Tuesday Japan returns. The day-of-the-week effects in foreign currency markets are documented in literature [Coats (1981), McFarland, Pettit and Sung (1982), Thatcher and Blenman (2001)]; however, Jaffe and Westerfield (1985a,b) show that currency seasonal does not offset the stock market seasonal.

3.3. Day-of-the-week Serial Correlation

In most of the studies on security return prediction, autocorrelation and cross-autocorrelation patterns in portfolio returns are treated as sources of predictability. Nonsynchronous or infrequent trading can result in significant small stock portfolio autocorrelations [Lo and MacKinlay (1990)]. Cross (1973) documents strong correlations between Friday and Monday returns. Keim and Stambaugh (1984) show that the mean autocorrelation between Friday and Monday returns is higher. Abraham and Ikenberry (1994) examine the 1963-1991 CRSP data and find positive correlations between Friday and Monday returns.

Besembinder and Hertzel (1993) examine the serial dependence of stock and futures markets around non-trading days and find patterns of significant daily return autocorrelations that vary with the day-of-the-week. They find that (a) the autocorrelation of returns between the first and second days after weekends or holidays is the lowest and sometimes negative; and (b) the autocorrelation of returns between other successive days of the week is also low except Friday. They document abnormally large positive return autocorrelations between the last day before and the first day after weekends or holidays for over 100 years (1885-1989) for both the DJIA stock and futures markets.

Higgins and Peterson (1999) show large first-order autocorrelations between the returns on Friday and Monday for the NYSE and Amex Securities during 1963-1994. Tong (2000) documents high weekend correlations for 23 countries from Asia, Europe and North America. Although Tong points out that down Fridays are only minorities of Fridays, his findings confirm the tendency of markets to go down on Mondays if Fridays are down.

3.4. Trading Strategies based on the Weekend Effect

Several studies propose different trading strategies to exploit the observed weekend effect and day-to-day serial correlations in stock returns. French (1980) suggests that investors may sell the S&P500 on Friday afternoon and buy it back on Monday afternoon and hold the cash over the weekend. This strategy earns a 13.4% annualized average returns as opposed to a 5.5% annualized average return from a buy-and-hold strategy in absence of transactions costs. Kim (1998) also proposed similar trading strategy that earns high returns in absence of transactions costs for US, UK, Canada, Japan, Korea and Australia.

Bessembinder and Hertzel (1993) propose to open a long (short) position over the weekend if Friday's stock return is positive (negative). Their trading rule for DJIA index apparently yields 24.1% annual returns as opposed to 9.7% buy-and-hold annual returns. Although a small transaction cost (0.13%) eliminates profits from stock markets but the trading strategy may generate profit in futures markets in the presence of some transactions costs.

Ko & Lee (1993) propose to sell at Friday's close if and only if the index returns in previous week is down and to buy back at Mondays close. This strategy works for most of their sample countries, including the US. However, they conclude that transactions costs eliminate excess returns; however institutional investors with low transactions costs might be benefited from the strategy.

Chow, Hsiao and Solt (1997) propose (a) to open a short position over the weekend only if the Friday return is negative and (b) to open a short position over the weekend if and only if the negative Friday return is below a negative cut-off benchmark value. Using hourly index returns for the S&P500 from 1970 through 1993, they find positive returns for both trading strategies in absence of transactions costs. However, the second strategy may generate sufficient profit to compensate the transactions costs if Friday's prior return is below a cut-off value in between –0.70 and –1.00.

None of the previous studies, however, discuss the possibility of exploiting the weekend predictability using retirement funds, annuities, and mutual funds that usually permit switching between in and out of portfolios at almost zero cost. Recently Compton and Kunkel (1999) examine the possibility of exploiting the weekend effect by employing a switching strategy within a tax-deferred, no transfer cost retirement accounts. They propose a trading strategy that permits investors to switch to TIAA-CREF's stock account on Monday and then switch back to TIAA-CREF's money market account on Friday. Since money market fund earns 3 days (Saturday through Monday) returns over the weekend and this avoids the Monday declines. Their strategy provides higher risk-adjusted returns in absence of transactions costs and taxes associated with account switching.

Miller, Prather and Mazumder (2003) extend the evidence of the day-of-the-week effects by examining the return patterns of mutual fund asset classes. Their empirical results reveal that daily dynamic trading strategies exist that can reduce risk and increase returns resulting in improved Sharpe and Treynor measures and positive Treynor-Mazuy and Henriksson-Merton timing measures.

Of course with most mutual funds one could not make short sales, but getting out of markets based on the day's action might still be profitable. Probably the most useful serial correlations would be over the weekend, since if Friday is up, shifting out of international funds would give three days of money market (or bond) returns while avoiding a likely down Monday. We extend the weekend literature on security market returns in this paper by examining the weekend predictability and profitable trading opportunities for the US-based international mutual funds.

4. Data and Methodology

4.1. Mutual Fund Data

The initial sample of international funds comes from both *Morningstar Principia Pro* and *CDA Weisenberger* at the end of the period (October 2002). To be included in our study, the fund must have been in continuous operation during the period January 4, 1993 through October 31, 2002.[2] Since open-end mutual funds are permitted to change the objective if shareholders

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

approve the change, both *Morningstar* and *CDA* are consulted to eliminate any international fund that changed objectives during the period of study. The purpose of eliminating these funds is to ensure, as much as possible, the homogeneity of funds representing each category of international funds. This is important since we want to capture the uniqueness of the return properties of each international fund in each category. For multiple share classes within the same fund family, we use the share class, which was incepted first. If the inception date is same for multiple share classes, we chose the share class that begins with the first alphabet after the fund's name (this situation only occurred for one Latin fund).[3]

The final sample consists of 2,479 daily returns of 117 international equity mutual 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), World fund (29). The sample also includes 6 international Hybrid funds.[4]

4.2. Mutual Fund Return computation

Using Dial Data's daily NAV and distribution data for each of the selected funds, we compute daily returns for each fund. To ensure the quality of the data we follow the screening procedure of Busse (1999).[5] Continuously compounded daily mutual fund returns are computed by using the following equation:

$$R_{i,t} = \ln \frac{value_{i,t}}{value_{i,t-1}} \qquad (1)$$

where $R_{i,t}$ is the return on fund i during the period t, $value_{i,t}$ is the value of an investment in fund i at time t. An equally weighted index return for each international fund category is computed by summing the returns of individual funds (i) within the international fund category (c), and computing their average daily return using equation (2).

[3] 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.

[4] It should be noted 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.

[5] 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.

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

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

4.3 Foreign Index Return Data

This study requires the data development for appropriate foreign indices to investigate the day-to-day predictability of sample international funds. We select foreign indices on the basis of the approximate regional or country composition of underlying shares of each sample international fund.[6] Funds for which the major underlying shares are located in a single country (for example, Japan funds) we use corresponding country index. We use different categories of the Morgan Stanley Capital International (MSCI) indices for most of the regional and diversified funds because the MSCI indices represent many countries and these indices 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. Continuously compounded daily returns for each foreign index are computed by taking the natural logarithm of the change in daily closing prices of each foreign market index.

4.4. Methodology

Following Varela (2002) we skip foreign holidays and match the returns of each market index against the returns of each sample fund. Then we use the following OLS regression equation to investigate the relationship between a fund and a foreign index.

[6] Except Japan funds and Fidelity Canada fund, all other sample funds of this study are composed of portfolios of shares from more than one country or region. Since daily data on portfolio share compositions is not disclosed to public, we could not match the daily portfolio of shares of a fund with its corresponding country or regional index. Since mutual fund rebalances its portfolios over time, we use the analysis sections of '*Morningstar Mutual Fund'* and notice that the regional or country portfolio composition of a fund varies in between 5% to 25% during the

$$R_{i,t} = \alpha + \beta I_{i,t} + \varepsilon_t \qquad (3)$$

where $R_{i,t}$ is fund i's return on day t; $I_{i,t}$ is foreign Index i's return on day t; α, β and ε_t are intercept, slope coefficient and error term respectively.

Once the relationship between a fund and a foreign index is established, we then investigate the differences in daily mean returns for a foreign index that emerges as the best benchmark index for each international fund category. We use the following standard day-of-the-week regression model to examine the degree, to which the daily mean returns of other weekdays are significantly different from Mondays,

$$R_t = \alpha_0 + \sum_{j=1}^{4} \alpha_j D_j + \varepsilon_t \qquad (4)$$

where, R_t is foreign index returns on day t and D_j is dummy variables indicating the day of the week. For example, D takes the value of 1 for a specific day of the week or 0 otherwise (i.e. j = 1 for Tuesday, j = 2 for Wednesday, j = 3 for Thursday, j = 4 for Friday). If the return occurs on Friday, $D_4 = 1$ and all other dummies are zero ($D_1 = D_2 = D_3 = 0$). The intercept α_0 represents Monday's mean returns. Coefficients α_1, α_2, α_3 and α_4 represent the differences between the mean returns for a particular day and Monday's mean returns. ε_t is an error term. If the foreign index exhibits daily seasonal effect investors may exploit an international fund by following the daily market movements of its corresponding foreign index. We also compute the first-order serial correlations of each foreign index for each pair of days of the week. This is important because mutual fund investors may exploit the higher serial correlations and increase their profit.

5. Empirical Results

5.1. Relationship between International Mutual Fund and Foreign Index

To mitigate the data-snooping bias (if any), initially we divide the sample of international funds and foreign indices into two sub samples with approximately equal number of observations: sub sample I has 1242 daily observations from January 4, 1993 through November

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sample period. We ignore this variation and assume that the approximate regional or country composition at the end of the sample period is similar over the entire sample period.

28, 1997 and sub sample II (holdout sample) has 1237 daily observations from December 1, 1997 through October 31, 2002. We use the initial sample to investigate the day-of-the-week effect and develop trading strategies. The holdout sample is used to evaluate the returns of trading strategies. We begin the analysis with equal-weighted fund portfolios for each fund category and then analyze the empirical results for individual funds. The fund portfolios or indices offer the advantage of having less residual variance or less idiosyncratic risk and therefore more precise parameter estimates. This is useful in making inferences about possible patterns. Then, we check whether these patterns also exist for individual international funds.[7]

The slope coefficients, T-statistics and R^2 of the regression equation (3) are presented in Table 1 for portfolios of international funds. Since the intercepts of the regression in all cases are extremely low and insignificant, we did not report them. The results of Table 1 document that all slope coefficients are greater than zero and less than one and significant at one percent level. For example, portfolio of Diversified Emerging Market funds has a slope coefficient of 0.7732 when the MSCI Emerging market index is used as an independent variable in regression equation (3). It suggests a strong same day relationship between Diversified Emerging market funds and the MSCI Emerging market index. Moreover, slope coefficient is significant at one percent level and the R^2 of the regression is also high (0.8213).

<Insert Table 1 Here>

The results of Table 1 document strong relationship between a (a) Diversified Emerging market fund and the MSCI Emerging market index; (b) Diversified Pacific/Asia fund and the MSCI Pacific Index; (c) Europe fund and the MSCI Europe index; (d) Japan fund and all the Japanese indices; (e) Pacific/Asia excluding Japan fund and the MSCI Pacific ex Japan index as well as the MSCI Far East Free ex Japan index; (f) Foreign fund and the MSCI Europe, Asia and Far East (EAFE) index; (g) Latin fund and the MSCI Latin index; (h) World fund and the MSCI World index; and (i) International Hybrid fund and the MSCI World index.[8]

[7] It may be noted here that we only report the results for portfolios of funds. The results for individual funds are qualitatively similar to the results found for portfolios of funds. Although we do not report the results for individual funds but we analyze the result, mostly in different footnotes. Empirical results for individual funds are available from authors.

[8] As we noted earlier, all of the sample international funds (except Japan funds and Fidelity Canada fund) invest in more than one country or region. We also use local foreign index (in regression equation 3) from countries or regions, where the sample funds have significant portfolio shares. A comparison between Table 1 and the results found for local country indices reveals that even though some of the international funds have significant portfolio shares in a single country, but regression coefficients are higher for the corresponding MSCI indices than that of for the relevant local country indices.

For Japan funds, the highest slope coefficients are found when the TOPIX 2nd section is used as an independent variable. However, the R^2 of the regression is relatively higher when the TOPIX 1st section and the Nikkei 225 indices are considered. To develop trading strategies for Japan funds, TOPIX 2nd index is used because it has the strongest relationship with Japan funds.

The slope coefficients and R^2 of the regression for Diversified Pacific/Asia funds in equation (3) are the highest when the MSCI Pacific index is used as an independent variable. Both the MSCI Far East ex. Japan and the MSCI Pacific ex. Japan indices provide high slope coefficients and R^2 values for Pacific/Asia ex. Japan funds; however the MSCI Pacific ex. Japan index provides the highest slope coefficients and the MSCI Far East index provides the highest R^2 values. The MSCI Pacific index and the MSCI Far East ex. Japan index are used to develop trading strategies for Diversified Pacific/Asia funds and Pacific/Asia ex. Japan funds respectively.

5.2. The Day-of-the-Week Effects in Foreign Indices

We use the foreign indices that provide the highest slope coefficients to investigate the day-of-the-week predictability and to develop trading strategy to exploit international funds. The day-of-the-week regression results of equation (4) are reported in Table 2 for foreign indices. According to calendar time hypothesis developed by French (1980), investors should earn returns of at least 3 times on Monday because capital is invested for three days and investors bear more uncertainties and risks during the weekend. Table 2 rejects calendar time hypothesis and documents evidence of negative Monday effect for many foreign indices, but not for all. Table 2 also reveals that there are differences in the daily mean returns between Mondays and non-Monday days of the week. According to trading time hypothesis, stock returns are generated only in trading hours (i.e. mean overnight returns should be zero). This implies that there is no day-of-the-week effect (i.e. the alpha coefficients in equation (4) are not significantly different from zero). The F-value from equation (4) measures the joint significance of the coefficients and a significant F-value would reject the hypothesis that returns are equal across days. Empirical results of Table 2 reject the trading time hypothesis because of differences in daily mean returns. F-values are also statistically significant for some indices (though not for all). These differences in returns appear large enough to be potentially exploitable for international funds because Miller, Prather and Mazumder (2003) document that mutual fund can be exploited by following

daily dynamic trading strategies. Mutual funds invested in retirement accounts are real transactions-free and investors may realize the gains from the day-of-the-week (or weekend) trading strategy if they invest in tax-sheltered retirement funds and annuities. Empirical results of Table 2 suggest that the weekend effect can be exploited using international mutual funds. For example, negative Monday returns are observed for the MSCI Emerging Market, MSCI Pacific, MSCI Far East, MSCI Latin and all Japanese Indices. Monday returns are also the lowest for the MSCI EAFE index. Since the return of the MSCI Emerging market index is positive on non-Monday days of the week, it suggests that investors might have incentives to be out of Emerging market funds on Mondays and in the funds on other days of the week. This is similar to selling (buying) Emerging market funds on Fridays (Mondays) as the MSCI Emerging index historically exhibit high (low) returns on Fridays (Mondays).

<Insert Table 2 Here>

5.3.First Order Serial Correlations in Foreign Indices

Table 3 reports the first order serial correlations in foreign indices. The first order serial correlations in returns for foreign indices are in generally higher and statistically significant for Friday-Monday pair. For example, the highest serial correlations for the MSCI Emerging market, MSCI Pacific Asia excluding Japan and MSCI World indices are found for Friday-Monday pair (i.e. Monday serial correlation). Monday serial correlations are also higher for other indices. This implies that if Friday's return is up (down), the returns on the following Monday will also be up (down). The results of serial correlations suggest that the weekend serial correlations are higher for some of the indices, which can potentially be exploitable.

The last column of Table 3 also shows that most of the foreign indices used in this study exhibit positive first-order serial correlations. Investors may use the knowledge of serial correlations in foreign indices to form trading strategies. Investors require watching the market and being able to make decisions based on the same days' foreign index value. However, some investors may not able to do that. For instance, some annuities and retirement accounts have started penalizing frequent traders by requiring them to place order by mail. This kills a serial correlation trading strategy based on the indices. However, investors who follow a calendar pattern trading strategy may send orders by mail and use calendar day trading strategy. Since

foreign indices are serially correlated, the wealth maximizing trading strategy is close to be in international funds if the day before was up; otherwise be out from international funds.

<Insert Table 3 Here>

5.4. Development of Trading Strategies

Based on the day-of-the-week and serial correlations results of foreign indices, this study proposes several trading strategies: (1) following French (1980), Kim (1988), Chow, Hsiao and Solt (1997), and Compton and Kunkel (1999), we propose a ***simple weekend trading strategy*** that allows investors of international funds to shift their money into money market funds on Friday to avoid negative Monday returns and then switch back into the risky international funds on Monday; (2) following Miller, Prather and Mazumder (2003), we follow a ***complex trading strategy*** that allows investors of international funds to shift their money into money market funds on day(s) of the week when the corresponding foreign index historically exhibits negative (or the lowest) mean returns and then switch back into the risky international funds on day(s) when the foreign index historically exhibits positive mean returns; (3) since most of the foreign indices exhibit positive serial correlations during the weekend, we also propose a ***restricted weekend trading strategy*** that allows investors of international funds to sell funds (and shift their investment into money market funds) on Fridays if the corresponding foreign index returns on Fridays are down or hold an international funds on Fridays if the foreign index returns on Fridays are up.[9] Money market fund is considered as an alternative parking investment for the proposed trading strategies. In all cases, switching to a money market fund allows investors to enjoy the low but less-risky returns.

[9] Bessembinder and Hertzel (1993), Boudoukh, Richardson and Whitelaw (1994) and Safvenblad (2000) document that the autocorrelations are significantly higher between Friday and Monday returns. The weekend serial correlation can not be explained by non-synchronous trading since information generated during the weekend is incorporated in stock prices on Monday morning. A strong weekend serial correlation implies that investors would more likely to close their positions before the weekend (i.e. on Friday afternoon), when they risk a weekend nontrading and possible losses. Probably the best strategy would be investing in international funds if serial correlations are the highest for any pair of the days of the week and of course if foreign index returns are up on the earliest day of any pair; otherwise sell international funds if the index returns on the earliest day are down. For example, most benchmark indices exhibit the highest serial correlations during the weekends (Friday – Monday pair). This implies a restricted weekend trading strategy. However, not all indices exhibit the highest serial correlations during the weekends (for example, the highest serial correlations for the MSCI Pacific index are observed for Wed –Thu pair). Probably investors of Diversified Pacific/Asia funds should hold funds if Wednesday's returns are up and sell funds if Wednesday's returns are down. But for simplicity, we follow a common restricted weekend trading strategy for all categories of international funds.

Table 4 presents the proposed trading strategies. The simple weekend and restricted weekend strategies are common trading strategies applied to all categories of sample international funds. The complex strategy is a complex and conservative trading strategy that allows investors to escape the negative mean returns of the funds for day(s) of the week with negative returns. For example, investors of Latin American funds would likely switch into money market funds to avoid negative returns on Mondays and Thursdays because the MSCI Latin index displayed negative returns on Mondays and Thursdays. Investors of Latin funds hold the funds on Tuesdays, Wednesdays and Fridays.

<Insert Table 4 Here>

Mazumder, Miller and Naka (2004) also document statistically significant positive serial correlations in international funds and positive cross-correlations between international funds and their corresponding foreign indices. The positive serial correlation in mutual funds refers that if the NAV of a fund goes up today, it will more likely go up tomorrow. We document strong same day positive relationships between international funds and corresponding foreign indices (Table 1) and positive first-order serial correlations in foreign indices (table 3). The results in turn suggest that buying on an up move in a foreign index should be profitable for the US-based international mutual funds. Accordingly we also propose a ***Serial Correlation Trading Strategy*** that suggests to buy-and-hold an international fund on days when its benchmarked foreign index is up and to sell an international fund on days when its benchmarked foreign index is down. One important limitations of serial correlation trading strategy is that investors may not make many trades that a serial correlation trading strategy requires and fund companies eventually may restrict investors. Varela (2002) also uses foreign indices to form trading rule for Japan, China, and New Zealand funds. We extend his work by examining and proposing trading strategies for all categories of international funds.

5.5. Returns and Risks of Trading Strategies

We report the daily mean returns and standard deviations (risks) of buy-and-hold and the proposed simple weekend, complex, and restricted weekend trading strategies in Table 5. The results in generally, suggest that all the proposed trading strategies provide higher daily mean returns than that of the buy-and-hold strategy. However, both the simple and restricted weekend strategies emerge as the most profitable trading strategies for international funds. This is an

extremely important result because under both form of weekend strategies investors are out of the risky international funds over the weekend and Monday. This is also strong evidence that the weekend effect is stronger, and therefore more exploitable, than the other, possibly more transitory, days of the week.

<Insert Table 5 Here>

Both the complex and restricted trading strategies provide higher daily mean returns and lower daily standard deviations for Diversified Emerging Market funds. However, a complex strategy provides the highest daily mean returns (0.0342%) and the lowest daily mean standard deviations (0.9176%) for Diversified Emerging Market funds.[10]

A simple weekend strategy provides the highest daily mean returns and the lowest daily average risks for (both portfolio and individual) Diversified Pacific/Asia funds. The daily mean returns and risks of portfolio of Diversified Pacific/Asia funds are –0.0310% and 1.3295% respectively for buy-and-hold investors. The daily mean returns are increased and risks are reduced for Diversified Pacific/Asia funds by following a simple weekend strategy.

A restricted weekend strategy provides the highest daily mean returns for portfolios of Europe, Foreign, World and International Hybrid funds. For example, the daily buy-and-hold mean returns for portfolios of Europe, Foreign, World and International Hybrid funds are –0.0421%, –0.0380%, –0.0413% and –0.0209% respectively. But a restricted weekend strategy enhances the daily mean returns for portfolios of Europe, Foreign, World and International Hybrid funds to –0.0131%, 0.0008%, 0.0048% and 0.0021% respectively. Even though the returns for portfolio of Europe funds from a restricted weekend strategy are negative, however it outperforms the buy-and-hold returns. The daily average risks for portfolios of Europe, Foreign, World and International Hybrid funds are 1.1558%, 1.0174%, 1.0276%, and 0.6328% respectively. A restricted weekend strategy reduces the daily average risks of portfolios of Europe, Foreign, World and International Hybrid funds to 1.0865%, 0.9522%, 0.9600% and

[10] Although we did not report the results for individual funds, however the results are mixed. The daily mean returns and risks of Merrill Lynch Dev Cap Market A (MADCX) fund are –0.0318% and 1.3224% respectively for buy-and-hold investors. Investors may increase the daily mean returns and reduce the daily average risks of MADCX fund by following all of the proposed trading strategies. However, the daily mean returns of MADCX fund are the highest (0.0436%) and the daily mean standard deviations are the lowest (0.9606%) for a complex trading strategy. Similar results are found for Montgomery Emerging Market R (MNEMX) fund by following a complex strategy. But Morgan Stanley Institutional Emerging Market A (MGEMX) and Templeton Developing Market A (TEDMX) funds provide the highest and lowest daily mean returns when investors follow a restricted weekend strategy and a complex strategy respectively.

0.6052% respectively.[11] Overall a restricted weekend strategy emerges as the best trading strategy for investors of Europe, Foreign, World and International Hybrid funds.

A simple weekend strategy provides the highest daily mean returns and the lowest daily average risks for portfolio of Japan funds. The buy-and-hold daily average returns and risks of portfolio of Japan funds are –0.0246% and 1.4668% respectively; however a simple weekend strategy generates the highest daily mean returns (0.0140%) and reduces risks to 1.2938%.[12]

A complex trading strategy generates the highest daily mean returns (0.0566%) and the lowest daily risks (0.9656%) for Pacific/Asia ex. Japan funds. However, higher returns and lowers risks are also achieved for Pacific/Asia ex. Japan funds by following both forms of weekend strategies.[13] Finally a complex strategy also provides the highest daily mean returns (0.0403%) and the lowest daily average risks (1.3374%) for portfolio of Latin funds.

Table 5 also documents the results for the paired t-test to test the null hypothesis of no significant difference in daily mean returns between buy-and-hold and trading strategies. The F-test is also conducted to test the hypothesis of no significant difference in daily mean standard deviations between buy-and-hold and trading strategies. The results of t-test suggest that there is statistically significant difference in daily average returns between buy-and-hold and trading strategies for almost all categories of international funds (except when investors follow a complex trading strategy for Europe, Japan, World and International Hybrid funds). However,

[11] A restricted weekend strategy provides the highest daily mean returns for all individual Europe funds except Fidelity Europe (FIEUX), Invesco European Investment (FEURX), T. Rowe Price European Stock (PRESX) and Vanguard Euro Stock Index (VEURX) funds. FIEUX and FEURX funds provide the highest daily mean returns by following a simple weekend strategy and PRESX and VEURX funds provide the highest daily mean returns by following a complex strategy. A restricted weekend strategy provides the highest daily mean returns for all individual Foreign funds except Columbia Stock International (CMISX), Credit Suisse International (RBIEX), Dreyfus Premier International Growth A (DRGLX), Fidelity Overseas T (FAERX), Fidelity International Growth and Inc (FIGRX), Fidelity Overseas (FOSFX), GAM International A (GAMNX) and USAA International (USIFX) funds. A simple weekend strategy generates the highest daily mean returns for CMISX, RBIEX, DRGLX, FAERX, FIGRX, FOSFX, GAMNX and USIFX funds. A restricted weekend strategy also provides the highest daily mean returns for all individual World funds except American Heritage (AHERX) fund, for which a simple weekend strategy provides the highest daily mean returns. The highest daily mean returns for all individual International Hybrid funds, except MFS Global Total Return A (MFWTX) fund, are achieved by following a restricted weekend strategy. A simple weekend strategy provides the highest daily mean returns for MFS fund.

[12] For individual Japan funds, a simple weekend strategy provides the highest daily mean returns for T. Rowe Price Japan (PRJPX) and Vanguard Pacific Stock Index (VPACX) funds and a restricted weekend strategy provides the highest daily mean returns for DFA Japanese Small Company (DFJSX) and the Japan Fund-Adv S (SJPNX) funds. Moreover, average risks are also reduced for individual Japan funds under both form of weekend strategies.

[13] For individual Pacific/Asia ex. Japan funds, a complex strategy provides the highest daily mean returns for Liberty Newport Tiger T. (CNTTX) and Morgan Stanley Institutional Asian Equity A (MSAEX) funds. However, a simple weekend strategy generates the highest daily mean returns for Eaton Vance Greater China Growth A (EVCGX), Merrill Lynch Dragon Fund B (MBDRX) and T. Rowe Price New Asia (PRASX) funds.

this is not important, because a complex strategy is not the dominant trading strategy for Europe, Japan, World or International Hybrid Funds. Finally, the results for F-test suggest that there is statistically significant difference in daily mean standard deviations between buy-and-hold and trading strategies for all categories of international mutual funds.

Table 5 also documents that the buy-and-hold daily mean returns for most of the sample funds are negative because the holdout sample covers a period dominated by global bear markets. Most of the stock markets around the world performed poorly during the holdout sample period (1997-2002). Most of the daily mean returns from the proposed trading strategies are positive and outperform the buy-and-hold returns. The risks are also reduced when investors follow the proposed trading strategies. This is not surprising since the trading strategies require being out of the market for some day(s) of the week or during the weekend. The proposed trading strategies may be very beneficial because investors could be made better off by using such trading strategies.

We also computed the number of roundtrip trades required for the each of the proposed trading strategies. The number of roundtrip trades required for a simple weekend strategy is 233 (i.e. one trade per 5.31 days) for all funds (except Japan funds for which the number of trades is 211). The number of roundtrip trades required for a complex trading strategy is provided in parentheses after the name of each fund category: Diversified Emerging Market (473); Diversified Pacific/Asia (233); Europe (249); Foreign (233); International Hybrid (249); Japan (249); Latin (473); Pacific/Asia excluding Japan (495) and World (295). The number of roundtrip trades required for a restricted weekend strategy is provided in the parentheses after the name of each fund category: Diversified Emerging Market (103); Diversified Pacific/Asia (114); Europe (96); Foreign (106); International Hybrid (104); Japan (81); Latin (108); Pacific/Asia excluding Japan (105) and World (104).

5.6. Sharpe, Treynor and Jensen Measures for Trading Strategies

Sharpe (1966), Treynor (1965) and Jensen (1968) measures are used to evaluate risk-adjusted returns of trading strategies. This is important because we found that the daily mean returns are increased and risks are reduced especially for both forms of weekend strategies. We want to investigate whether the returns from trading strategies are superior to buy-and-hold returns given the risks are adjusted. The Sharpe, Treynor and Jensen measures will provide

information regarding the superior risk-adjusted returns. The Sharpe (S) and Treynor (T) measures are computed using equations (5) and (6) respectively:

$$S = \frac{R_p - R_f}{\sigma_p} \tag{5}$$

$$T = \frac{R_p - R_f}{\beta_p} \tag{6}$$

where R_p is portfolio return, R_f is risk-free return, σ_p is portfolio standard deviation and β_p is portfolio systematic risk. The Sharpe measure computes excess portfolio returns above the risk free returns adjusted for total risks (standard deviations). Since total risks consist of both systematic and unsystematic risks, Treynor index is used to compute excess portfolio returns adjusted for systematic or market risks (beta). A high and positive Sharpe or Treynor measure refers to superior risk-adjusted performance of a fund.

As a test of robustness, the Jensen (1968) measure is computed using equation (7) to determine whether the positive risk-adjusted returns are statistically significant:

$$R_p - R_f = \alpha + \beta\left(R_m - R_f\right) + \varepsilon \tag{7}$$

where R_p is portfolio return, R_f is risk-free return, α and β are selectivity (risk-adjusted return) and systematic risk coefficients respectively, R_m is market return and ε is the error term. The intercept α is also known as Jensen's alpha. It shows excess portfolio returns over excess market returns. A positive (negative) and statistically significant α indicates superior (inferior) performance above (below) the market. The estimated risk-parameter (β) coefficient of the Jensen regression is biased downward in the presence of market timing ability and the estimated selectivity parameter (α) is biased upward in the presence of risk-adjusted returns.

To analyze the Sharpe, Treynor and Jensen measures, money market fund, instead of T-bill, is used as a proxy for the risk-free rate. Because shifting to T-bills requires more than one day (selling the mutual funds, obtaining cash after the sale has settled and then buying T-bills). Besides T-bills cannot be bought at all if the funds are in variable annuities or many types of retirement accounts. However investors in mutual funds, retirement accounts or variable annuities can shift to money market funds within the same day.

Table 6 and 7 report the Sharpe and Treynor measures respectively. A closer inspection of the Sharpe and Treynor measures documents that all of the proposed trading strategies

absolutely outperform the buy-and-hold strategy. The Sharpe measures in Table 6 suggest that a complex strategy provides the highest Sharpe measures for portfolio of Diversified Emerging market funds.[14] The buy-and-hold Sharpe measure for portfolio of Diversified Emerging market funds is –0.0407; however a complex strategy generates the highest and positive Sharpe measure of 0.0178. A complex strategy also provides the highest Sharpe measures for portfolio of Pacific/Asia ex. Japan funds.[15] The highest Sharpe measure for Latin fund is also generated by a complex trading rule.

A simple weekend strategy provides the highest Sharpe measures for portfolio and individual Diversified Pacific/Asia funds. A restricted weekend strategy provides the highest Sharpe measures for portfolio of Europe funds.[16] A restricted weekend strategy also provides the highest Sharpe measures for portfolio of foreign funds.[17] The highest Sharpe measures are also found for portfolios of World and International Hybrid funds by following a restricted weekend strategy.[18] Both forms of weekend trading strategies provide higher Sharpe measures for Japan funds. The buy-and-hold Sharpe measure for portfolio of Japan funds is –0.0288; however, a simple weekend strategy generates the highest Sharpe measure (-0.0028) for portfolio of Japan funds.[19]

<Insert Table 6 Here>

The Treynor measures in Table 7 also reveal similar results reported for the Sharpe measures. A complex trading strategy provides the highest Treynor measures for individual and

[14] This finding is consistent for all individual Diversified Emerging market funds except Templeton Developing Markets A (TEDMX) fund for which a restricted weekend strategy provides the highest Sharpe ratio.
[15] As reported in sub-section 5.5, although a simple weekend strategy generates the highest daily mean returns for Eaton Vance Greater China Growth A (EVCGX), Merrill Lynch Dragon B (MBDRX) and T. Rowe Price New Asia (PRASX) funds, but the Sharpe measures for EVCGX, MBDRX and PRASX funds are the highest under a simple weekend strategy. Rather, Sharpe measures for all individual Pacific/Asia ex. Japan funds are the highest under a complex trading strategy.
[16] The results are consistent for all individual Europe funds except Fidelity Europe (FIEUX) and T. Rowe Price European Stock (PRESX) funds.
[17] A restricted weekend strategy also exhibits the highest Sharpe ratios for all individual foreign funds except Columbia Stock International (CMISX), Fidelity International Growth and Inc (FIGRX), Fidelity Overseas (FOSFX), GAM International A (GAMNX) and USAA International (USIFX) funds. A simple weekend strategy provides the highest Sharpe measures for CMISX, FIGRX, FOSFX, GAMNX and USIFX funds.
[18] The Sharpe measures are the highest under a restricted weekend strategy for all individual World funds except American Heritage (AHERX) fund, for which a simple weekend strategy produces the highest Sharpe ratio. A restricted weekend strategy also generates the highest Sharpe measures for all individual International Hybrid funds except MFS Global Total Return A (MFWTX) fund, for which a simple weekend strategy provides the highest Sharpe measure.

portfolio of Diversified Emerging market funds (except for Templeton Developing Markets A (TEDMX) funds, for which a restricted weekend strategy provides the highest Treynor measure) The buy-and-hold Treynor measure for Diversified Emerging market portfolio of funds is –0.00054 and a complex strategy generates the highest and positive Treynor measure of 0.00033. A complex strategy provides the highest Treynor measures for portfolio of Pacific/Asia ex. Japan funds. For individual Pacific/Asia ex. Japan funds, the Treynor measures are qualitatively similar to the results observed for the Sharpe measures. A complex strategy also provides the highest and positive Treynor measure (0.00043) for Latin fund.

A restricted weekend strategy provides the highest Treynor measures for all Europe funds.[20] The highest Treynor measures for portfolio of foreign funds are achieved by following a restricted weekend strategy.[21] A restricted weekend strategy also provides the highest Treynor measures for portfolios of World and International Hybrid funds.[22] A simple weekend strategy provides the highest Treynor measures for portfolio of Japan funds. However, both forms of weekend trading strategies generate higher returns for individual Japan funds.

<Insert Table 7 Here>

There may be some period when, on average, returns from a fund underperform the returns of a risk-free asset. In such a situation, negative Sharpe and Treynor measures could occur because of negative excess returns (undesirable) or lower volatility (desirable). Morningstar states that: "*there are some drawbacks to using the Sharpe ratio. If two funds have equal positive average excess returns, the one that has the lower return volatility [i.e. standard deviation] receives a higher Sharpe ratio score. However, if the average excess returns are*

[19] For individual Japan funds, a simple weekend strategy generates the highest Sharpe measures for T. Rowe Price Japan (PRJPX) and Vanguard Pacific Stock Index (VPACX) funds and a restricted weekend strategy provides the highest Sharpe measures for DFA Japanese Small Company (DFJSX) and the Japan Fund-Adv S (SJPNX) funds.
[20] After appropriate risk-adjustment, a restricted weekend strategy also provides the highest Treynor measures for all individual Europe funds except Fidelity Europe (FIEUX), T. Rowe Price European Stock (PRESX) and Vanguard Europe Stock Index (VEURX) funds.
[21] A restricted weekend strategy also provides the highest Treynor measures for all individual foreign funds except Columbia Stock International (CMISX), Dreyfus Premier International Growth A (DRGLX), Fidelity International Growth and Inc (FIGRX), Fidelity Overseas fund (FOSFX), Oakmark International fund (OAKIX), T. Rowe Price International Discovery (PRIDX) and USAA International (USIFX) funds. A simple weekend strategy provides the highest Treynor ratios for CMISX, DRGLX, FIGRX, FOSFX, OAKIX, PRIDX and USIFX funds.
[22] A restricted weekend strategy provides the highest Treynor ratios for all individual World funds except American Heritage (AHERX) fund, for which a simple weekend strategy provides the highest Treynor value. The highest Treynor measures are also obtained under a restricted weekend strategy for all individual International Hybrid funds except MFS Global Total Return A (MFWTX) fund, for which a simple weekend strategy generates the highest Treynor measure.

equal and negative, the fund with the higher volatility receives the higher score. While this result is consistent with portfolio theory, many retails investors find it counterintuitive. Unless advised appropriately, they may be reluctant to accept a fund rating based on the Sharpe ratio, or similar measures, in periods when the majority of the funds have negative excess returns." However, we think the above explanation is inconsistent with the basic principle of risk-adjusted returns, because higher risks are preferable if they are associated with higher returns. On the other hand, when excess returns are positive, Sharpe measures penalize the higher standard deviations. Therefore, similar rule should apply when excess returns are negative. Although most of the Sharpe and Treynor measures for the proposed trading strategies are negative but they dominate the buy-and-hold Sharpe and Treynor measures. Overall, the simple and restricted weekend strategies outperformed the buy-and-hold strategy in terms of higher risk-adjusted returns for portfolios of Diversified Emerging Market, Diversified Pacific/Asia, Europe, Japan, Foreign, World and International Hybrid funds. A complex strategy emerges as the best trading strategy for portfolios of Pacific/Asia ex. Japan and Latin funds.

The Jensen measures for trading strategies are reported in Table 8. The Jensen measures suggest that the Jensen alphas of trading strategies are positive for half of cases although not all of them are statistically significant. The Jensen model fit is good for portfolio of Diversified Emerging market funds when investors follow a restricted weekend trading strategy. The Jensen alpha is the highest, positive and statistically significant at 1% level, risks are also less than the market risks and the coefficient of determination $\left(R^2\right)$ is also higher for portfolio of Diversified Emerging market funds by following a restricted weekend strategy. The model for portfolio of Diversified Emerging market funds explains more than 80% of the risk-adjusted returns of a restricted weekend strategy. Risk-adjusted returns of a restricted weekend strategy for portfolio of Diversified Emerging market funds are positive (0.0542 percent) and statistically significant at better than the one-percent level. Moreover, systematic risk of a restricted weekend strategy is less than that of the market index (β=0.8307). Similar results are obtained for individual Diversified Emerging funds by following a restricted weekend strategy. A restricted weekend strategy also provides the highest and positive risk-adjusted returns for most of the portfolio and individual Pacific Asia ex. Japan, Foreign, Latin, and World funds.

Both forms of weekend strategies provide positive Jensen's alpha for Diversified Emerging market, Diversified Pacific/Asia, Pacific Asia ex. Japan, and Latin funds. A simple

weekend trading strategy produces positive (0.0370 percent) and statistically significant (10% level) Jensen's alpha for portfolio of Diversified Pacific/Asia funds. In addition, risks of a simple weekend strategy (0.5402) are also less than the market risks and the coefficient of determination $\left(R^2\right)$ is high (0.4972) for portfolio of Diversified Pacific/Asia funds. A simple weekend strategy also provides positive risk-adjusted returns for most of the individual Diversified Pacific/Asia funds. Moreover, a complex strategy provides positive and statistically significant Jensen's alpha for Diversified Emerging Market, Pacific Asia ex. Japan, and Latin funds.

<Insert Table 8 Here>

The Sharpe, Treynor and Jensen measures of risk-adjusted returns provide evidences that in generally the simple and restricted weekend trading strategies appear to be the best trading strategies for investors of international funds.

5.7. Risks and Returns of Serial Correlation Trading Strategy

The proposed serial correlation trading strategy suggests that investor of an international fund should buy the fund whenever its own foreign market index is up and sell the fund whenever its own foreign market index is down. Table 9 documents and compares the daily mean returns and risks of a serial correlation strategy with that of a buy-and-hold strategy. The results suggest that a serial correlation strategy produces higher daily mean returns and lower daily average risks for portfolios of all categories of international funds. For example, daily mean buy-and-hold returns and risks are –0.0318% and 1.3224% respectively for portfolio of Diversified Emerging funds. Investors of Diversified Emerging market funds may increase daily mean returns and reduce daily average risks to 0.1457% and 0.8000% respectively by following a serial correlation trading strategy. The paired t-test to test the null hypothesis of no significant difference in daily mean returns between the buy-and-hold and serial correlation strategies is statistically significant at 1% level for portfolio of Diversified Emerging funds. The F-test to test the hypothesis of no significant difference in daily mean standard deviations between the buy-and-hold and serial correlation strategies is also statistically significant at 1% level for portfolio of Diversified Emerging funds. A comparison between the serial correlation trading strategy and simple weekend, complex, and restricted weekend trading strategies suggest that the serial correlation strategy performs better than the simple weekend, complex, and restricted weekend

trading strategies because investors who follow a serial correlation strategy trade more frequently. We computed the number of roundtrip trades required for a serial correlation trading strategy. The number of roundtrip trades is provided in the parentheses after each fund category: Diversified Emerging Market (249); Diversified Pacific/Asia (286); Europe (294); Foreign (267); Japan (227); Latin (275); Pacific/Asia excluding Japan (278), World (255) and International Hybrid (255).

<Insert Table 9 Here>

5.8. Market Timing Analysis for Trading Strategy Returns

The proposed trading strategies require shifting investment in between international funds and money market funds to capture gain in up markets and avoid losses in down markets. We use the Treynor-Mazuy (TM) (1966) and Henriksson-Merton (HM) (1981) market-timing models to test the performances of the trading strategies. The equations for the TM and HM, respectively, are:

$$\text{TM: } R_p - R_f = \alpha + \beta\left(R_m - R_f\right) + \gamma\left(R_m - R_f\right)^2 + \varepsilon \tag{8}$$

$$\text{HM: } R_p - R_f = \alpha + \beta\left(R_m - R_f\right) + \gamma\left(R_m - R_f\right)D + \varepsilon \tag{9}$$

where $R_p - R_f$ is portfolio excess return, $R_m - R_f$ is market excess return, and α, β and γ are coefficients for selectivity (risk-adjusted returns), systematic risk, and market timing respectively, D is dummy variable that takes a value of 1 if the market return exceeds the risk-free rate or zero if the market return is below the risk-free rate and ε is random error term.

The Capital Asset Pricing Model (CAPM) and the Jensen measure exhibit the linear relationship between fund and market returns; however the CAPM and Jensen model do not capture the effects of fund managers or investors who adjust portfolio risks on the basis of a timing forecast. Treynor and Mazuy (1966) argue that if fund managers or investors can forecast market returns correctly, they will hold a larger (smaller) proportion of a market portfolio when the market returns are high (low). The TM measure uses the second moment of excess market returns to capture curvature in the regression. In other words, any market-timing attempt causes

curvature in the characteristic line and the curvature and scatter depend on the proportion of correct and incorrect guesses and the magnitude of the gambles. Using the quadratic term separates market timing from security selection measures. A linear model such as the CAPM or the Jensen measure doesn't capture this argument. Coefficient of timing ability, γ, will be positive in equation (8), if a fund manager or investor can increase (decrease) a fund's exposure to a market index prior to a up (down) market. If γ is not significantly different from zero, then the quadratic term adds no explanatory power. A significant negative γ refers to inferior timing ability. The HM measure of equation (9) uses a dummy variable (D), where D is 1 if market return exceeds risk-free returns $\left(R_m > R_f\right)$ or 0 otherwise. In a bear market investor's beta will be β and in a bull market investor's beta will be $\beta + \gamma$. The coefficient of the dummy variable (γ) in equation (9) measures the timing ability of fund managers or investors. Market is efficient, if the intercept α in equation (8) and (9) is not significantly different from zero. A statistically significant positive α refers to superior selection ability of funds.

We report the TM and HM measures for the simple weekend, complex, and restricted weekend trading strategies in Tables 10, 11, and 12 respectively.[23] The results of the TM measures in generally, suggest that the trading strategies exhibit statistically positive timing ability. The simple weekend and complex strategies provide statistically significant positive and higher TM market-timing coefficients (γ) for individual and portfolio of Diversified Emerging market and Pacific/Asia ex. Japan funds. Both forms of weekend strategies provide positive and statistically significant γ coefficients for individual and portfolios of Diversified Pacific/Asia and Japan funds. A restricted weekend strategy produces positive γ coefficients for portfolios and most of the individual Japan, Pacific/Asia ex. Japan, Foreign, World and International Hybrid funds; however not all positive market timing coefficients are statistically significant.

[23] We also compute the TM and HM regression results for buy-and-hold strategy (results are available from authors). The market-timing coefficient (γ) is expected to be negative for buy-and-hold strategy. The results document that almost all funds exhibit negative market timing coefficients. Besides, alphas (selectivity coefficients) are not statistically different from zero. The results are consistent with the efficient market hypothesis i.e. information and trading have costs, which reduces net returns. A comparison between buy-and-hold and trading strategies TM and HM results reveal that the coefficient of determinations (R^2) of TM and HM measures for trading strategies are improved. The TM and HM results of buy-and-hold strategy suggest that the mutual fund managers, on average, do not produce differential selectivity and timing results. However, the TM and HM results of trading strategies suggest that mutual fund investors have superior selection and timing ability if they follow the proposed trading strategies.

None of the weekend strategies provide positive timing coefficients for portfolio of Europe funds (although a restricted weekend strategy provides positive timing coefficients for some individual Europe funds). Rather a complex trading strategy provides statistically significant γ coefficients for portfolio of Europe funds. A complex strategy also provides positive and statistically significant TM market timing coefficient for Latin fund.

<Insert Table 10 Here>

<Insert Table 11 Here>

<Insert Table 12 Here>

The empirical results of the HM measures in Tables 10, 11 and 12 suggest that while fewer asset classes produce statistically significant positive timing, the results are qualitatively similar to the results of TM measures. The HM market timing coefficients (γ) of all trading strategies are positive and statistically significant for all individual and portfolio of Diversified Emerging market funds. The HM market timing coefficients of a simple weekend strategy are positive and statistically significant for Diversified Pacific/Asia funds. The complex and restricted weekend strategies provide positive HM market-timing coefficients for individual and portfolio of Europe funds. A restricted weekend strategy produces positive HM market timing coefficients for most of the sample Foreign, World and International Hybrid funds; however not all positive market timing coefficients are statistically significant. A restricted weekend strategy also provides positive and statistically significant HM timing measures for individual and portfolios of Japan funds. The simple weekend and complex strategies produce positive and statistically significant HM market timing coefficients for individual and portfolio of Pacific/Asia ex. Japan funds. A complex strategy also provides positive and statistically significant HM market timing coefficient for Latin fund.

Most of the mutual fund performance literature suggests that mutual funds (or other managed portfolios) display perverse market timing ability when compared to an unmanaged index. Treynor and Mazuy (1966) found significant positive market timing ability in only 1 fund out of 57 sample funds. Henriksson and Merton (1981) found significant positive market timing ability in only 3 out of 116 funds. However, despite those indications of perverse timing, the perverse timing may not be the result of decisions made by active portfolio managers or investors. Warther (1995) argues that some indications of perverse timing are the result of fund flows into mutual funds that are correlated with expectations of future market performance. If

managers cannot rapidly invest these funds, the cash position of the fund will increase causing the beta to decrease. Therefore, while it would appear that the manager decreased the beta at the wrong time, the beta decrease was not due to a managerial decision but an externality. Further, Edelen (1999) finds that monthly cash flows are capable of explicating some negative timing ability.

Using daily mutual fund data for TM and HM models, we were able to show significant positive timing ability for international mutual funds, especially by following weekend trading strategy that incorporate a weekend effect. Our results are consistent with Bollen and Busse (2001) who document that mutual funds possess more timing ability than previously reported in performance literature. One plausible reason for the success of the trading strategy is that it is possible that the daily and weekend returns can be successfully forecasted but mutual fund portfolio managers may not be able to exploit the day-of-the-week patterns in security returns due to transaction costs. However, if individual investors can also forecast daily return patterns, and are able to escape transaction costs by trading fund shares at no charge, those investors (1) may be able to shift funds between international fund and money market fund (or cash) to avoid some negative returns and (2) may contribute to the documented perverse timing as discussed by Warther (1995) and Edelen (1999).

6. Possible Extension of this Study

In this paper, we use the returns of foreign indices to predict the returns of the US-based international funds. Accordingly we propose several trading strategies on the basis of up or down movements of corresponding foreign indices. However, we argue that investors of international funds may predict funds' returns by following daily seasonal effect in the US indices. The contrast between low serial correlations for most indices (except for the MSCI emerging markets) and high serial correlations for the MSCI World index on certain days in Table 3 is interesting. It might be possible only if there is one region in the MSCI World index that is not in the other indices and which on some days leads and this of course is the US index. In turn the negative Tuesday and Friday coefficient for the MSCI World index suggests that the effect of the US varies with the day of the week. This can be estimated for the US indices to form possible trading strategies for international funds. Besides, Mazumder, Miller and Naka (2004) show that the US leads many foreign markets and the mutual funds. A recent study by Miller, Prather and

Mazumder (2003) also documents the day-of-the-week effects for ten mutual fund asset classes that include both domestic and international funds. On theoretical grounds, there are reasons for believing that the US effect might differ by day of the week. A US effect on Asian and Japan indicates that the US Friday is affecting the Asian or Japan markets on the following Monday. This suggests a trading strategy: if the US is up on Friday, investors of international mutual funds should stay in funds; if Friday is down, then investors should get out of the international funds. Investigating the day-of-the-week trading strategies for international funds using US indices may further extend this study.

7. Conclusion and Limitations of this Study

The weekend effect in stock returns provides no operational trading strategy because of transactions costs. However, transaction costs may be escaped by trading mutual funds and variable annuities. Using 2,479 daily return observations from nine categories of 123 US-based international open-end mutual funds, we analyze the potential exploitability of their returns by capitalizing the weekend effect. The investigation splits the sample, uses the initial sub sample to investigate day-of-the-week return patterns and to develop trading rules, and then tests those rules on the holdout sample. The results suggest that trading strategies, especially the weekend trading strategy, can both increase returns and moderate risks. Investors can enjoy positive risk-adjusted returns in terms of higher Sharpe, Treynor, and Jensen measures by following a weekend trading strategy for international funds. Additionally, Treynor-Mazuy and Henriksson-Merton market timing models suggest that the weekend trading strategy produces positive timing measures. Our results also suggest that investors of international funds may earn higher returns by following a serial correlation trading strategy.

In practice, investors might limit their day-of-the-week (or weekend) trading to tax-sheltered accounts because of the numerous trades required. A complexity such a strategy would create for tax reporting is major cost imposed on the long-term shareholders. However, there are probably many individuals with substantial wealth in retirement funds that would find a day-of-the-week or weekend strategy useful. The day-of-the-week or weekend trading strategies, while benefiting the individual investor, might not be in the interest of other holders of the funds. The fund families would incur extra administrative costs from such frequent trading (as would a retirement plan or variable annuity within which such trades were being made). If only a few

investors attempted frequent trading and the fund was experiencing net inflows, the only effect might be larger net inflows on some days than on others. However, if more than a few investors used strategies that involved frequent trading there would be days of net outflows for the fund. If large sums were traded by day-of-the-week or weekend rules, the funds would incur large expenses (spreads and commissions) in buying and selling securities in order to stay fully invested. At best a fund that realized that it received net buying on some days and net selling on others, might adopt a policy of timing its purchases for the days that it received funds and timing its sales for the days it lost funds. It might also maintain larger cash reserves so it would not have to buy and sell securities.

It should be realized that frequent trading is not in the interests of funds and that fund instruments should be designed to restrict such trading. This can be done by placing limitations on the frequency of trading or by adding trading fees. Of course, any such restrictions should be disclosed before sale and investors should not be offered products with assurances of the easy trading only to have the fund later try to prevent or reduce trading. Given that profitable and utility enhancing strategies appear to exist, funds should anticipate that eventually they will have to deal with frequent trading and should design their products accordingly. Prospectuses might provide for small fees per trade to cover the additional administrative costs of placing trades and either also place limits on the number or frequency of trades, or impose fees that are a percentage of value for trades that are quickly reversed.

REFERENCES

Abraham, Abraham and David L. Ikenberry, 1994, The Individual Investor and the Weekend Effect, *Journal of Financial and Quantitative Analysis* 29, No. 1, March, pp. 263-277.

Al-Rjoub, Samer A., M. Kabir Hassan and Oscar Varela, 2004, January Reversals in the U.S. Weekend Effect,", Working Paper.

Bessembinder, Hendrik and Michael G. Hertzel, 1993, Return Autocorrelations around Nontrading Days, *Review of Financial Studies* 6, No. 1, pp. 155-189.

Board, J. L. G. and C. M. S. Sutcliffe, 1988, The Weekend Effect in UK Stock Market Returns, *Journal of Business, Finance & Accounting* 15, No. 2, Summer, pp. 199-213.

Bollen, Nicholas P. B. and Jeffrey A. Busse, 2001, On the Timing Ability of Mutual Fund Managers, *Journal of Finance* 56, No. 3, (June), pp. 1075-1094.

Boudoukh, Jacob, Matthew P. Richardson and Robert F. Whitelaw, 1994, A Tale of Three Schools: Insights on Autocorrelations of Short-Horizon Stock Returns, *Review of Financial Studies* 7, Fall, No. 3, pp. 539-573.

Brusa, Jorge, Pu Liu and Craig Schulman, 2000, The Weekend Effect, 'Reverse' Weekend Effect, and Firm Size, *Journal of Business Finance and Accounting* 27, No. 5, July, pp. 555-574.

Busse, Jeffrey A., 1999. Volatility Timing in Mutual Funds: Evidence from Daily Returns, *Review of Financial Studies* 12, No. 5, Winter, pp. 1009-1041.

Chow, Edward H., Ping Hsiao and Michael E. Solt, 1997, Trading Returns for the Weekend Effect Using Intraday Data, *Journal of Business, Finance and Accounting* 24, No. 3, April, pp. 425-444.

Clare, A., M. Ibrahim and S. Thomas, 1998, The Impact of Settlement Procedures on Day-of -the-Week Effects: Evidence from the Kuala Lumpur Stock Exchange, *Journal of Business Finance and Accounting* 25, No. 3, May,

Coats, Warren L. Jr., 1981, The Weekend Eurodollar Game, *Journal of Finance* 36, No. 3, June, pp. 649-659.

Compton, William S. and Robert A. Kunkel, 1999, A Tax-Free Exploitation of the Weekend Effect: A "Switching" Strategy in the College Retirement Equities Fund (CREF), *American Business Review* 17, No. 2, June, pp. 17-23.

Condoyanni, L., J. O'Hanlon and C. W. R. Ward, 1987, Day-of-the-Week Effects on Stock Returns: International Evidence, *Journal of Business, Finance and Accounting* 14, No. 2, Summer, pp. 159-174.

Connolly, Robert A., 1989, An Examination of the Robustness the Weekend Effect, *Journal of Financial and Quantitative Analysis* 24, No. 2, June, pp. 133-169.

Cross, Frank, 1973, The Behavior of Stock Prices on Fridays and Mondays, *Financial Analysts Journal* 29, No. 6, November/December, pp. 67-69.

Draper, Paul and Krishna Paudyal, 2002, Explaining Monday Returns, *Journal of Financial Research* 25, No. 4, Winter, pp. 507-520.

Dubois, M. and P. Louvet, 1996, The Day-of-the-Week Effect: International Evidence, *Journal of Banking and Finance* 20, No. 9, November, pp. 1463-1484.

Dyl, Edward A., and Edwin D. Maberly, 1986, The Weekly Pattern in Stock Index Futures: A Further Note, *Journal of Finance* 41, No. 5, December, pp. 1149-1152.

Edelen, Roger M., 1999, Investor Flows and the Assessed Performance of Open-End Mutual Funds, *Journal of Financial Economics* 53, September, pp. 439-466.

Fields, Morris J., 1931, Stock Prices: A Problem in Verification, *Journal of Business* 4, No. October 1931, pp. 415-418.
French, Kenneth R., 1980, Stock Returns and the Weekend Effect, *Journal of Financial Economics* 8, No. 1, March, pp. 55-70.
Gibbons, Michael R. and Patrick Hess, 1981, Day-of-the-Week Effects and Asset Returns, *Journal of Business* 54, No. 4, October, pp. 579-596.
Harris, Lawrence, 1986, A Transactions Data Study of Weekly and Intra Daily Patterns in Stock Returns, *Journal of Financial Economics* 16, No. 1, May, pp. 99-117.
Henriksson, Roy D. and Robert C. Merton, 1981, On Market Timing and Investment Performance: Statistical Procedures for Evaluating Forecasting Skills, *Journal of Business* 54, October, pp. 513-534.
Higgins, Eric James and David R. Peterson, 1999, Day–of–the–Week Autocorrelations, Cross -Autocorrelations and the Weekend Phenomenon, *Financial Review* 34, No. 4, November, pp. 159-170.
Jaffe, Jeffrey, & Randolph Westerfield, 1985a, The Weekend Effect in Common Sock Returns: The International Evidence, *Journal of Finance* 40, No. 2, June, pp. 433-454.
Jaffee, Jeffrey & Randolph Westerfield, 1985b, Patterns in Japanese Common Stock Returns: Day of the Week and Turn of the year Effects, *Journal of Financial and Quantitative Analysis* 20, No. 2, June, pp. 261- 272.
Jain, Prem C., and Gun-Ho Joh, 1988, The Dependence between Hourly Prices and Trading Volume, *Journal of Financial and Quantitative Analysis* 23, No. 3, September, pp. 269 -284.
Jensen, Michael C.,1968, The Performance of Mutual Funds in the Period 1945-1964, *Journal of Finance* 23, May, pp. 389-416.
Kamara, Avraham, 1997, New Evidence on the Monday Seasonal in Stock Returns, *Journal of Business* 70, No. 1, January, pp. 63-84.
Keim, Donald B., and Robert F. Stambaugh, 1984, A Further Investigation of the Weekend Effect in Stock Returns, *Journal of Finance* 39, No. 3, July, pp. 819-635.
Kim, Sun-Woong, 1988, Capitalizing on the Weekend Effect, *Journal of Portfolio Management* 14, No. 3, Spring, pp. 59-63.
Ko, Kwang-Soo. & Sang-Bin Lee, 1993, *International Behavior of Stock Prices on Monday: Nineteen Major Stock Markets*, pp. 329-353. in Stansell, Stanley R. (ed.) International Financial Market Integration, (Chapter 16), Blackwell Publishers, Cambridge, MA.
Lee, In Sup, Richardson Pettit and Mark V. Swankoski, 1990, Daily Return Relationships Among Asian Stock Markets, *Journal of Business, Finance and Accounting* 17, No. 2, Spring, pp. 265-284.
Mazumder, M. Imtiaz, Edward M. Miller, and Atsuyuki Naka, 2004, Trading Rules and Predictability of the US-based International Mutual Funds, Working Paper.
McFarland, James W., R. Richardson Pettit and Sam K. Sung, 1982, The Distribution of Foreign Exchange Price Changes: Trading Day Effects and Risk Measurement, *Journal of Finance* 37, No. 3, June, pp. 693-717.
Miller, Edward M., and Larry J. Prather, 2000, Exploitable Patterns in Retirement Annuity Returns: Evidence from TIAA/CREF, *Financial Services Review* 9, No. 3, Fall, pp. 219 -230.
Miller, Edward M., Larry J. Prather and M. Imtiaz Mazumder, 2003, Day-of-the-Week Effects among Mutual Funds, *Quarterly Journal of Business and Economics* 42, pp. 113-128.

Mookerjee, Rajen and Qiao Yu, 1999, Seasonality in Returns on the Chinese Stock Markets: The Case of Shanghai and Shenzhen, *Global Finance Journal* 10 (1), pp. 93-105.
Pettengill, Glenn, 2003, A Survey of the Monday Effect Literature, *Quarterly Journal of Business and Economics* 42, pp. 3-28.
Rogalski, Richard J., 1984, New Findings Regarding Day-of-the-week Returns over Trading and Non-trading Periods: A Note, *Journal of Finance* 39, No. 5, December, pp. 1603-1614.
Safvenblad, Patrik, 2000, Trading Volume and Autocorrelation: Empirical Evidence from the Stockholm Stock Exchange, *Journal of Banking and Finance* 24, pp. 1275-1287.
Santesmases, Miguel, 1986, An Investigation of the Spanish Stock Market Seasonalities, *Journal of Business, Finance and Accounting* 13, No. 2, pp. 267-276.
Sharpe, William F., 1966, Mutual Fund Performance," *Journal of Business* 39, January, pp. 119 -138.
Siegel, Jeremy J., 1998, *Stocks for the Long Run*, 2nd Ed., New York: McGraw Hill.
Smirlock, Michael. and Laura Starks, 1986, Day-of-the-Week and Intraday Effects in Stock Returns, *Journal of Financial Economics* 17, No. 1, September, pp. 197-210.
Solnik, Bruno and Laurence Bousquet, 1990, Day-of-the-week effect on the Paris Bourse: A Note, *Journal of Banking and Finance* 14, No. 2/3, August, pp. 461-468.
Steeley, James E., 2001, A Note on Information Seasonality and the Disappearance of the Weekend Effect in The UK Stock Market, *Journal of Banking and Finance* 25, No. 10, October, pp. 1941-1956.
Sun, Qian and Wilson H.S. Tong, 2002, Another New Look at the Monday Effect, *Journal of Business, Finance and Accounting* 29, No. 7 & 8, September/October, pp. 1123-1147.
Thatcher, Janet S. and Lloyd P. Blenman, 2001, Synthetic Trades and Calendar Day Patterns: The Case of the Dollar/Sterling Markets, *Financial Review* 36, No. 2, May, pp. 177-200.
Tong, Wilson, 2000, International Evidence of Weekend Anomalies, *Journal of Financial Research* 23, No. 4, Winter, pp. 495-522.
Treynor, Jack L., 1965, How to Rate Management of Investment Funds, *Harvard Business Review* 43, January/February, pp. 63-75.
Treynor, Jack L. and Kay K. Mazuy, 1966, Can Mutual Funds Outguess the Market? *Harvard Business Review* 44, July/August, pp. 131-136.
Varela, Oscar, 2002, The Efficiency of Net Asset Values for Asian-Country Mutual Funds in the US, *Journal of Business Finance and Accounting* 29, No. 5 and 6, June/July, pp. 761-786
Warther, Vincent A., 1995, Aggregate Mutual Fund Flows and Security Returns, *Journal of Financial Economics* 39, November, pp. 209-235.

Table 1: Relationships between International Mutual Funds and Foreign Indices

The table documents the results of regression equation (3): $R_{i,t} = \alpha + \beta I_{i,t} + \varepsilon_t$. Column one lists the portfolios of sample funds. The MSCI Emerging Market, Europe, EAFE, and Latin America Indices are used as benchmark indices for Diversified Emerging Market, Europe, Foreign and Latin America funds respectively. The MSCI Far East and Pacific Indices are used as benchmark indices for Diversified Pacific/Asia funds. The MSCI Far East excluding Japan and Pacific excluding Japan Indices are used as benchmark indices for Pacific/Asia excluding Japan funds. The MSCI World Index is used as benchmark index for World and International Hybrid funds. For Japan funds, the benchmark indices used are the Topix 1st and Topix 2nd sections and the Nikkei 225. Columns two through four present the slope coefficients, T-statistics of slope coefficients and R-squares of the regression respectively. All T-statistics are significant at 1% (***) level. The sample period is from January 4, 1993 through November 28, 1997.

Portfolios of Fund Categories	Slope Coefficient	T-Statistics	R-Square
Diversified Emerging Market Fund	0.7732	75.47***	0.8213
Europe Fund	0.7571	74.30***	0.8167
Foreign Fund	0.6120	58.27***	0.7326
Latin Fund	0.8087	89.73***	0.8666
World Fund	0.6986	39.37***	0.5558
International Hybrid Fund	0.4092	38.35***	0.5428

	MSCI Far East Index			MSCI Pacific Index		
	Slope Coefficient	T-Statistics	R-Square	Slope Coefficient	T-Statistics	R-Square
Diversified Pacific/Asia Fund	0.4704	28.14***	0.3899	0.5061	29.25***	0.4085

	Topix 1st Section			Topix 2nd Section			Nikkei 225 Index		
	Slope Coeff	T-Statistics	R-Square	Slope Coeff	T-Statistics	R-Square	Slope Coeff	T-Statistics	R-Square
Japan Fund	0.7908	44.77***	0.6303	0.9072	30.54***	0.4423	0.6137	37.79***	0.5483

	MSCI Far East ex. Japan Index			MSCI Pacific ex. Japan Index		
	Slope Coefficient	T-Statistics	R-Square	Slope Coefficient	T-Statistics	R-Square
Pacific/Asia ex. Japan Fund	0.9468	70.99***	0.8027	0.9448	64.68***	0.7715

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

Table 2: Day-of-the-week Effects in Foreign Indices

This table reports the results of day-of-the-week regression equation (4): $R_t = \alpha_0 + \sum_{j=1}^{4} \alpha_j D_j + \varepsilon_t$. Column one reports names of the Foreign Index. Columns two through six document the coefficient values of the regression. D_1 through D_4 represent the dummy variables for non-Monday weekdays. Column seven reports the F-test values to test the joint significance of the coefficients. Coefficient α_0 measures the mean Monday return, and α_1 through α_4 measure the difference in returns between other weekday and Monday. $\alpha_0 + \alpha_1$, $\alpha_0 + \alpha_2$, $\alpha_0 + \alpha_3$, and $\alpha_0 + \alpha_4$ are the actual mean returns on Tuesday, Wednesday, Thursday and Friday respectively. Significance level at the 1%, 5% and 10% level are denoted by ***, ** and * respectively. The sample period is from January 4, 1993 through November 28, 1997.

Indices	α_0 (Mon)	α_1 (Tue)	α_2 (Wed)	α_3 (Thu)	α_4 (Fri)	F-Test
MSCI Emerging	-0.1418***	0.1632**	0.2479***	0.1227*	0.2660***	4.1150***
MSCI Pacific	-0.0535	0.0574	0.0837	0.0821	0.0706	0.2329
MSCI Far East	-0.0577	0.0658	0.0832	0.0830	0.0728	0.2144
MSCI Europe	0.0782*	-0.0205	0.0085	-0.0615	-0.0156	0.3825
MSCI EAFE	0.0116	0.0269	0.0506	0.0185	0.0303	0.1552
MSCI Latin	-0.1896*	0.3403**	0.2463*	0.1832	0.4033***	2.3526*
MSCI Far East Ex. Japan	-0.0811	0.0340	0.2688***	-0.0355	0.1648*	3.1969**
MSCI Pacific Ex. Japan	-0.0346	-0.0027	0.2079**	-0.0579	0.1258	2.5486**
MSCI World	0.0498	0.0413	0.0041*	-0.0350	-0.0078	0.6058
Japan Topix 1st	-0.1680**	0.2117**	0.1915*	0.2281**	0.1729**	1.5419
Japan Topix 2nd	-0.1975***	0.1453*	0.2161***	0.2620***	0.2171***	3.6486***
Nikkei 225	-0.1815**	0.2648**	0.2228*	0.2567***	0.1331	1.5745

Table 3: First Order Serial Correlations in Foreign Indices

This table documents serial correlations in daily returns of foreign indices. Column one reports the names of the Foreign Indices. Columns two through six document Monday, Tuesday, Wednesday, Thursday and Friday serial correlations respectively. Monday serial correlation refers to the degree of association between the returns of Friday and the returns of the following Monday. Tuesday serial correlation represents the association between Tuesday returns and previous Monday returns. Similarly, serial correlations are calculated for Wednesday, Thursday and Friday. Column seven presents serial correlations for all days. Significance level at the 1%, 5% and 10% level are denoted by ***, ** and * respectively. The sample period is from January 4, 1993 through November 28, 1997.

Indices	Mon	Tue	Wed	Thu	Fri	All Days
MSCI Emerging	0.4634***	0.2461***	0.2710***	0.3312***	-0.0284	0.2845***
MSCI Pacific	-0.0066	-0.1307**	-0.1565**	0.0574	-0.0346	-0.0162
MSCI Far East	-0.0151	-0.1426**	-0.1480**	0.0487	-0.0259	-0.0197
MSCI Europe	0.0756	0.0380	0.0894	0.0131	0.1155	0.0514*
MSCI EAFE	0.0637	-0.0468	-0.0548	0.0801	0.0521	0.0383
MSCI Latin	0.3281***	-0.0658	0.1855***	0.3385***	-0.1052	0.1522***
MSCI Far East Ex. Japan	0.2850***	0.1210	-0.1000	0.3061***	-0.2013***	0.1459***
MSCI Pacific Ex. Japan	0.2487***	0.0747	-0.1413**	0.2037***	-0.2297***	0.0875***
MSCI World	0.2784***	-0.0476	0.2264***	0.1279**	-0.0165	0.1669***
Japan Topix 1st	0.0703	-0.0962	-0.0152	0.0269	0.2386***	0.0417
Japan Topix 2nd	0.4368***	0.2487***	0.4250***	0.3759***	0.5249***	0.3892***
Nikkei 225	-0.0561	-0.1170	-0.1119	-0.1358***	0.0680	-0.0610**

Table 4: Trading Strategies for International Mutual Funds

This table presents the proposed trading strategies. Column one lists the sample fund categories. Column two presents a simple weekend trading strategy, which is applicable to all categories of international funds. Column three presents a complex trading strategy. Column three is divided into two sub-columns: sub-column one lists the days of the week when an investor of a particular international fund category will be in the fund, whereas sub-column two lists the day(s) of the week when an investor will be out of international fund. Column four lists a restricted weekend trading strategy, which is applicable to all categories of international funds.

Fund Categories		Simple Weekend Trading Strategy	Complex Trading Strategy		Restricted Weekend Trading Strategy
			Days In- international Fund	Days Out-of-international-Fund	
Diversified Emerging		Sell international funds on Friday and shift investment to a money market fund; then shift investment to an international fund on Monday from money market fund.	Tue, Wed, Fri	Mon, Thu	Sell international Funds and shift investment to a Money market fund on Fridays if Friday returns of foreign indices are down; If Friday foreign index returns are high, then hold international funds
Diversified Pacific/Asia			Tue, Wed, Thu, Fri	Mon	
Europe			Mon, Tue, Wed, Fri	Thu	
Japan	Signal: Topix 1st		Tue, Wed, Thu, Fri	Mon	
	Signal: Topix 2nd		Wed, Thu, Fri	Mon, Tue	
	Signal: Nikkei 225		Tue, Wed, Thu	Mon, Fri	
Pacific/Asia Ex Japan			Wed, Fri	Mon, Tue, Thu	
Foreign			Tue, Wed, Thu, Fri	Mon	
Latin			Tue, Wed, Fri	Mon, Thu	
World			Mon, Tue, Wed, Fri	Thu	
International Hybrid			Mon, Tue, Wed, Fri	Thu	

Note: For Diversified Pacific/Asia and Foreign funds, the simple weekend and complex trading strategies are similar because Monday is the only day documenting either negative or the lowest returns for the MSCI Pacific and EAFE indices.

Table 5: Returns and Risks of Buy-and-hold, Simple Weekend, Complex, and Restricted Weekend Trading Strategies

This table presents the returns and risks of buy-and-hold, simple weekend, complex, and restricted weekend trading strategies. Column one lists the portfolios of each fund category. Columns two and three show mean daily returns and standard deviations (SD) of returns for a buy-and-hold strategy. Columns four and five present mean daily returns and standard deviations of returns for a simple weekend trading strategy; Columns six and seven present mean daily returns and standard deviations of returns for a complex trading strategy; and Columns eight and nine present mean daily returns and standard deviations of returns for a restricted weekend trading strategy. 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 Category	Buy-and-hold Strategy		Simple Weekend Strategy		Complex Strategy		Restricted Weekend Strategy	
	Mean Daily Returns	Mean Daily SD	Mean Daily Returns	Mean Daily SD	Mean Daily Returns	Mean Daily SD	Mean Daily Returns	Mean Daily SD
Diversified Emerging Market Fund	-0.0345%	1.2831%	0.0145%**	1.0785%***	0.0342%***	0.9176%***	0.0338%***	1.1857%***
Diversified Pacific/Asia Fund	-0.0310%	1.3295%	0.0312%***	1.0989%***			0.0034%***	1.2602%**
Europe Fund	-0.0421%	1.1558%	-0.0181%	1.0187%***	-0.0280%	1.0319%***	-0.0131%***	1.0865%**
Japan Fund	-0.0246%	1.4668%	0.0140%*	1.2938%***	0.0081%	1.1292%***	0.0117%***	1.3917%**
Pacific/Asia ex. Japan Fund	-0.0226%	1.5740%	0.0548%***	1.2835%***	0.0566%**	0.9656%***	0.0346%***	1.4761%**
Foreign Fund	-0.0380%	1.0174%	-0.0079%**	0.8860%***			0.0008%***	0.9522%**
Latin Fund	-0.0358%	1.7505%	0.0149%**	1.5861%***	0.0403%**	1.3374%***	0.0143%***	1.6812%*
World Fund	-0.0413%	1.0276%	-0.0123%**	0.9015%***	-0.0331%	0.9205%***	0.0048%***	0.9600%***
International Hybrid Fund	-0.0209%	0.6328%	-0.0002%**	0.5505%***	-0.0142%	0.5738%***	0.0021%***	0.6052%*

Note: The simple weekend and complex trading strategies are by definition similar for Diversified Pacific/Asia and Foreign Funds.

Table 6: The Sharpe Measures for Returns of Buy-and-hold and Trading Strategies

This table reports the Sharpe measure of equation (5): $S = \frac{R_p - R_f}{\sigma_p}$. Column one lists portfolios of fund categories. Columns two through five report the Sharpe measures (S) for buy-and-hold, simple weekend, complex, and restricted weekend trading strategies respectively. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Category	Buy-and-hold Strategy	Simple Weekend Strategy	Complex Strategy	Restricted Weekend Strategy
Diversified Emerging Market Fund	-0.0407	-0.0031	0.0178	0.0134
Diversified Pacific/Asia Fund	-0.0367	0.0122		-0.0114
Europe Fund	-0.0519	-0.0353	-0.0444	-0.0285
Japan Fund	-0.0288	-0.0028	-0.0085	-0.0042
Pacific/Asia ex. Japan Fund	-0.0257	0.0288	0.0401	0.0113
Foreign Fund	-0.0548	-0.0291		-0.0179
Latin Fund	-0.0307	-0.0018	0.0168	-0.0021
World Fund	-0.0575	-0.0334	-0.0553	-0.0136
International Hybrid Fund	-0.0611	-0.0327	-0.0557	-0.0259

Table 7: The Treynor Measures for Returns of Buy-and-hold and Trading Strategies

This table reports the Treynor measure of equation (6): $T = \frac{R_p - R_f}{\beta_p}$. Column one lists portfolios of fund categories. Columns two through five report the Treynor measures (T) for buy-and-hold, simple weekend, complex, and restricted weekend trading strategies respectively. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Category	Buy-and-hold Strategy	Simple Weekend Strategy	Complex Strategy	Restricted Weekend Strategy
Diversified Emerging Market Fund	-0.00054	-0.00005	0.00033	0.00019
Diversified Pacific/Asia Fund	-0.00068	0.00025		-0.00022
Europe Fund	-0.00071	-0.00055	-0.00069	-0.00047
Japan Fund	-0.00063	-0.00008	-0.00028	-0.00011
Pacific/Asia ex. Japan Fund	-0.00041	0.00056	0.00104	0.00019
Foreign Fund	-0.00064	-0.00039		-0.00022
Latin Fund	-0.00059	-0.00004	0.00043	-0.00004
World Fund	-0.00066	-0.00043	-0.00071	-0.00017
International Hybrid Fund	-0.00084	-0.00049	-0.00087	-0.00039

Table 8: The Jensen Measures for Returns of Trading Strategies

The results for the Jansen measure of equation (7): $R_p - R_f = \alpha + \beta(R_m - R_f) + \varepsilon$ are presented in this table. Column one lists the portfolios of fund categories. Columns two through four present the risk-adjusted return (α), systematic risk (β) and coefficient of determination (R^2) respectively for a simple weekend trading strategy. Columns five through seven present the risk-adjusted return (α), systematic risk (β) and coefficient of determination (R^2) respectively for a complex trading strategy. Columns eight through ten present the risk-adjusted return (α), systematic risk (β) and coefficient of determination (R^2) respectively for a restricted weekend trading strategy. Absolute T-statistics are in parenthesis below the coefficient estimates and the significance levels are provided in 1% (***), 5% (**) and 10% (*) level. Risk-adjusted return (α) is expressed in terms of percent. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Category	Simple Weekend Strategy			Complex Strategy			Restricted Weekend Strategy		
	α	β	R^2	α	β	R^2	α	β	R^2
Diversified Emerging Market Fund	0.0283 (1.5555)	0.6805 (47.8636)***	0.6497	0.0392 (2.0649)**	0.4928 (33.1407)***	0.4707	0.0542 (3.6023)***	0.8307 (70.6425)***	0.8017
Diversified Pacific/Asia Fund	0.0370 (1.6684)*	0.5402 (34.9453)***	0.4972				0.0141 (0.5790)	0.6454 (38.0012)***	0.5392
Europe Fund	-0.0152 (0.9696)	0.6523 (54.4034)***	0.7056	-0.0247 (1.5716)	0.6646 (55.3742)***	0.7129	-0.0064 (0.4704)	0.7428 (71.1951)***	0.8042
Japan Fund	-0.0035 (0.1009)	0.4541 (15.0892)***	0.1629	-0.0095 (0.3070)	0.3446 (12.8162)***	0.1231	-0.0053 (0.1454)	0.5486 (17.3867)***	0.2055
Pacific/Asia ex. Japan Fund	0.0590 (2.2473)**	0.6595 (33.9912)***	0.4834	0.0512 (2.1860)**	0.3731 (21.5417)***	0.2731	0.0467 (1.8791)*	0.8798 (47.8743)***	0.6500
Foreign Fund	-0.0020 (0.1450)	0.6625 (54.0732)***	0.7030				0.0110 (0.9130)	0.7608 (70.8353)***	0.8026
Latin Fund	0.0443 (1.9065)*	0.7501 (58.4528)***	0.7345	0.0558 (2.1041)**	0.5291 (36.1428)***	0.5140	0.0507 (2.4849)**	0.8395 (74.6267)***	0.8186
World Fund	-0.0087 (0.6003)	0.6992 (51.1269)***	0.6791	-0.0289 (1.9698)**	0.7180 (51.9251)***	0.6858	0.0121 (0.9028)	0.7884 (62.6755)***	0.7610
International Hybrid Fund	-0.0069 (0.6166)	0.3643 (34.7922)***	0.4950	-0.0207 (1.7350)*	0.3690 (32.8109)***	0.4657	-0.0027 (0.2254)	0.4068 (35.7969)***	0.5094

Table 9: Returns and Risks of a Serial Correlation Trading Strategy

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

Portfolios of Fund Category	Buy-and-hold Strategy		Serial Correlation Strategy	
	Mean Daily Returns	Mean Daily SD	Mean Daily Returns	Mean Daily SD
Diversified Emerging Market Fund	-0.0345%	1.2831%	0.1457%***	0.8000%***
Diversified Pacific/Asia Fund	-0.0310%	1.3295%	0.0557%***	0.9836%***
Europe Fund	-0.0421%	1.1558%	0.0604%***	0.7881%***
Japan Fund	-0.0246%	1.4668%	0.0476%***	0.9878%***
Pacific/Asia ex. Japan Fund	-0.0226%	1.5740%	0.1159%***	1.0826%***
Foreign Fund	-0.0380%	1.0174%	0.0714%***	0.6810%***
Latin Fund	-0.0358%	1.7505%	0.1481%***	1.1094%***
World Fund	-0.0413%	1.0276%	0.1049%***	0.6672%***
International Hybrid Fund	-0.0209%	0.6328%	0.0490%***	0.4199%***

Table 10: Treynor and Mazuy (TM) and Henriksson and Merton (HM) Market Timing Results of a Simple Weekend Trading Strategy

This table reports the Treynor-Mazuy market timing model of equation (8): $R_p - R_f = \alpha + \beta(R_m - R_f) + \gamma(R_m - R_f)^2 + \varepsilon$ and the Henriksson and Merton market timing model of equation (9): $R_p - R_f = \alpha + \beta(R_m - R_f) + \gamma(R_m - R_f)D + \varepsilon$ for a simple weekend trading strategy. Column one lists the portfolios of fund categories. Columns two through five present the coefficients of risk-adjusted returns in percent ((α), systematic risks ((β), market timing (γ) and coefficient of determinations (R^2) of TM model. Columns six through nine present the coefficients of risk-adjusted returns in percent ((α), systematic risks ((β), market timing (γ) and coefficient of determinations (R^2) of HM model. Absolute t-values are given in parentheses and the significance levels are provided at 1% (***), 5% (**) and 10% (*) level. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Category	TM measures				HM Measures			
	α	β	γ	R^2	α	β	γ	R^2
Diversified Emerging Market Fund	-0.0454	0.7454	4.6933	0.6880	-0.0929	0.5732	0.2643	0.6605
	(2.4970)**	(51.6819)***	(12.3041)***		(3.5259)***	(25.9027)***	(6.2629)***	
Diversified Pacific/Asia Fund	0.0168	0.5355	0.9710	0.4989	-0.0211	0.4847	0.1073	0.4993
	(0.6943)	(34.3176)***	(2.0598)**		(0.6257)	(16.8261)***	(2.2804)**	
Europe Fund	-0.0007	0.6515	- 0.4610	0.7058	-0.0046	0.6626	- 0.0216	0.7057
	(0.4133)	(54.1763)***	(0.9530)		(0.1942)	(31.4578)***	(0.5917)	
Japan Fund	-0.0419	0.4825	2.9082	0.1712	-0.0416	0.4104	0.0953	0.1638
	(1.1569)	(15.5215)***	(3.4211)***		(0.8613)	(8.3801)***	(1.1309)	
Pacific/Asia ex. Japan Fund	-0.0216	0.6943	4.4669	0.5222	-0.1031	0.5030	0.3362	0.4986
	(0.8151)	(36.5675)***	(10.0118)***		(2.7861)***	(15.7570)***	(6.1224)***	
Foreign Fund	-0.0101	0.6639	0.6486	0.7033	-0.0140	0.6492	0.0286	0.7032
	(0.6457)	(53.8941)***	(1.0850)		(0.6718)	(30.4789)***	(0.7653)	
Latin Fund	0.0351	0.7504	0.2808	0.7348	0.0225	0.7338	0.0343	0.7347
	(1.4304)	(58.4718)***	(1.1619)		(0.6882)	(34.2851)***	(0.9492)	
World Fund	-0.0140	0.6997	0.4650	0.6793	-0.0015	0.7079	-0.0181	0.6792
	(0.8559)	(51.0767)***	(0.7082)		(0.0694)	(29.4025)***	(0.4393)	
International Hybrid Fund	-0.0129	0.3649	0.5370	0.4955	-0.0132	0.3567	0.0159	0.4951
	(1.0337)	(34.7997)***	(1.0682)		(0.7848)	(19.3496) ***	(0.5024)	

Table 11: Treynor and Mazuy (TM) and Henriksson and Merton (HM) Market Timing Results of a Complex Trading Strategy

This table reports the Treynor-Mazuy market timing model of equation (8): $R_p - R_f = \alpha + \beta(R_m - R_f) + \gamma(R_m - R_f)^2 + \varepsilon$ and the Henriksson and Merton market timing model of equation (9): $R_p - R_f = \alpha + \beta(R_m - R_f) + \gamma(R_m - R_f)D + \varepsilon$ for a complex trading strategy. Column one lists the portfolios of fund categories. Columns two through five present the coefficients of risk-adjusted returns in percent (α), systematic risks (β), market timing (γ) and coefficient of determinations (R^2) of TM model. Columns six through nine present the coefficients of risk-adjusted returns in percent (α), systematic risks (β), market timing (γ) and coefficient of determinations (R^2) of HM model. Absolute t-values are given in parentheses and the significance levels are provided at 1% (***), 5% (**) and 10% (*) level. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Category	TM measures				HM Measures			
	α	β	γ	R^2	α	β	γ	R^2
Diversified Emerging Market Fund	-0.0330	0.5564	4.6042	0.5215	-0.1131	0.3579	0.3322	0.4943
	(1.7230)*	(36.6121)***	(11.4433)***		(4.1317)***	(15.5753)***	(7.5801)***	
Europe Fund	-0.0446	0.6668	1.1584	0.7142	-0.0427	0.6473	0.0365	0.7131
	(2.5104)**	(55.5039)***	(2.3963)**		(1.7875)*	(30.7109)***	(0.9994)	
Japan Fund	-0.0341	0.3628	1.8629	0.1276	-0.0256	0.3262	0.0402	0.1233
	(1.0510)	(13.0309)***	(2.4462)**		(0.5922)	(7.4513)***	(0.5336)	
Pacific/Asia ex. Japan Fund	0.0046	0.3932	2.5836	0.2960	-0.0474	0.2779	0.2045	0.2831
	(0.1907)	(22.6688)***	(6.3291)***		(1.4229)	(9.6737)***	(4.1384)***	
Latin Fund	0.0146	0.5320	2.1497	0.5379	-0.0916	0.4193	0.2319	0.5265
	(0.5339)	(37.2396)***	(7.9833)***		(2.4855)**	(17.3899)***	(5.6896)***	
World Fund	-0.0184	0.7170	-0.9409	0.6864	-0.0037	0.7486	-0.0637	0.6864
	(1.1141)	(51.7876)***	(1.4177)		(0.1662)	(30.7751)***	(1.5255)	
International Hybrid Fund	-0.0168	0.3886	-0.3508	0.4659	0.0128	0.3787	-0.0201	0.4659
	(1.2519)	(32.7167)***	(0.6495)		(0.7081)	(19.1253)***	(0.5918)	

Note: The simple weekend and complex trading strategies are by definition similar for Diversified Pacific/Asia and Foreign funds; therefore, TM and HM measures of a complex trading strategy for Diversified Pacific/Asia and Foreign funds are not reported here.

Table 12: Treynor and Mazuy (TM) and Henriksson and Merton (HM) Market Timing Results of a Restricted Weekend Trading Strategy

This table reports the Treynor-Mazuy market timing model of equation (8): $R_p - R_f = \alpha + \beta(R_m - R_f) + \gamma(R_m - R_f)^2 + \varepsilon$ and the Henriksson and Merton market timing model of equation (9): $R_p - R_f = \alpha + \beta(R_m - R_f) + \gamma(R_m - R_f)D + \varepsilon$ for a restricted weekend trading strategy. Column one lists the portfolios of fund categories. Columns two through five present the coefficients of risk-adjusted returns in percent ((α), systematic risks ((β), market timing (γ) and coefficient of determinations (R^2) of TM model. Columns six through nine present the coefficients of risk-adjusted returns in percent ((α), systematic risks ((β), market timing (γ) and coefficient of determinations (R^2) of HM model. Absolute t-values are given in parentheses and the significance levels are provided at 1% (***), 5% (**) and 10% (*) level. The sample is from December 1, 1997 to October 31, 2002.

Portfolios of Fund Category	TM measures				HM Measures			
	α	β	γ	R^2	α	β	γ	R^2
Diversified Emerging Market Fund	0.0354	0.8473	1.1950	0.8038	-0.0406	0.7469	0.2066	0.8072
	(2.2329)**	(67.3737)***	(3.5896)***		(1.8591)*	(40.7408)***	(5.9088)***	
Diversified Pacific/Asia Fund	0.0404	0.6515	1.2650	0.5414	0.0407	0.6708	-0.0491	0.5396
	(1.5201)	(38.0268)***	(2.4459)**		(1.0956)	(21.1538)***	(0.9482)	
Europe Fund	-0.0096	0.6506	-0.3539	0.7051	-0.0272	0.6521	0.0243	0.7053
	(0.5385)	(53.6331)***	(0.7257)		(1.4635)	(54.3218)***	(1.1700)	
Japan Fund	-0.0481	0.5803	3.2464	0.2144	-0.0810	0.4617	0.1897	0.2086
	(1.2683)	(17.8171)***	(3.6454)***		(1.6034)	(9.0075)***	(2.1492)**	
Pacific/Asia ex. Japan Fund	0.0460	0.8801	0.0412	0.6500	0.0094	0.8437	0.0774	0.6506
	(1.7609)*	(47.0632)***	(0.0937)		(0.2646)	(27.5177)***	(1.4672)	
Foreign Fund	0.0068	0.7615	0.3354	0.8027	-0.0004	0.7482	0.0271	0.8027
	(0.4965)	(70.4983)***	(0.6403)		(0.0208)	(40.0922)***	(0.8254)	
Latin Fund	0.0677	0.8388	-0.5201	0.8195	0.0768	0.8589	-0.0411	0.8189
	(3.1496)***	(74.6927)***	(2.4581)**		(2.6802)***	(45.8136)***	(1.2977)	
World Fund	0.0118	0.7885	0.0262	0.7610	0.0065	0.7818	0.0140	0.7610
	(0.7850)	(62.5534)***	(0.0435)		(0.3226)	(35.3281)***	(0.3696)	
International Hybrid Fund	-0.0079	0.4074	0.4599	0.5097	-0.0167	0.3900	0.0352	0.5098
	(0.5828)	(35.7835)***	(0.8434)		(0.9166)	(19.5152)***	(1.0254)	