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Two essays on exchange -traded funds

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TWO ESSAYS ON EXCHANGE-TRADED FUNDS

by

Natalya V. Delcoure, B. A., M. B. A.

A Dissertation Presented in Partial Fulfillment
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ABSTRACT

The purpose of this study is twofold. The first objective is to conduct an empirical inquiry into the diversification benefits of exchange-traded funds. The second objective is to examine whether exchange-traded funds exhibit superior performance compared to their rival closed-end country fund and traditional index mutual fund. I document that American investors manifest their preference for WEBS as a substitute for closed-end country funds. While I find that WEBS satisfy their objective of following their home indexes better than their rival closed-end country fund, the two-factor model I employ indicates that, despite some diversification benefits, WEBS also maintain certain risk exposure to the U.S. market. However, the U.S. market exposure of WEBS is marginal relative to closed-end country funds. Thus, WEBS provide American investors with a higher expected rate of return minimizing their risk exposure compared to closed-end country funds.

I find that over one, two, three, and four year periods, WEBS' performance is less dependent on the performance of the U.S. market than their rival closed-end country fund. Thus, I conclude, despite the growing interdependence of world equity markets, American investors are still able to achieve international diversification portfolio benefits by including WEBS in their asset allocation decision.

Also, I examine the performance, diversification and hedging abilities of SPDRs, MidCap SPDRs, sector specific SPDRs, DIAMONDS, and their

rival traditional index fund. I document that exchange-traded funds exhibit higher tracking accuracy of their underlying index compared to traditional index mutual funds. Also, on a risk-return basis, investors would accomplish greater performance and diversification gains by employing exchange-traded funds versus traditional index mutual funds.

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CHAPTER 1

INTRODUCTION

The economic expansion in the 1990's triggered a tremendous growth in cash inflows in 401K plans, mutual and pension funds, and other financial intermediaries. Mutual funds, banks, stock exchanges and other financial institutions responded to this growing demand for new savings avenues by creating new investment tools that allow investors to achieve desired portfolio diversification. The theoretical approach of how to assemble a portfolio that is congruent with the investor's goals and risk preferences was introduced by Markowitz in the early 1950s (Simons, 1999). Such an approach uses optimization techniques, historical data returns, risks and correlations of available securities to construct a portfolio with the highest possible return for a given level of risk. This theory has been unanimously accepted for almost a half century, and is actively utilized by mutual fund and pension fund managers. The increasing complexity of calculations of an optimal portfolio led investors to seek the desired diversification through investment in 401K plans, mutual funds, and pension funds.

In the past two decades, American investors have been persuaded to select international securities as a part of their investment portfolio. The recent boom in cross-border portfolio investment suggests that more and more investors accept international portfolio diversification as part of modern portfolio management. The

practice of treating the S&P 500 as a market-index portfolio, which is common to American investors, is increasingly considered inappropriate, since U.S. equities represent less than 50% of world equity capitalization (World Equity Benchmark Shares Prospectus, 1999-2000). International diversification can be achieved through both direct and indirect investment in foreign securities aside from investing in foreign securities, exchange-listed securities such as American depository receipts (ADRs), mutual funds, closed-end country funds, multinational corporations (MNC), offshore hedge funds, and stock index futures.

In the past two decades, decreasing cash flow barriers, declining transaction and information costs, and increasing capital market globalization trends have created great awareness and desire among investors for more international portfolio diversification. Although investors agree on the benefits of international diversification, the number of direct foreign security investments is growing at a slower pace than indirect foreign investments. To satisfy the growing demand for international portfolio diversification, many mutual funds have offered investors opportunity to utilize country specific closed-end funds for indirect investments in selected overseas markets. These securities are listed on national stock markets. They trade as if they are domestic stocks. Various studies, such as Grubel (1968), Levy and Sarnat (1970), Harvey (1995) and DeSantis (1994), and Anderson, Coleman, Frohlich, and Steagall (2000) demonstrate the benefits of international diversification via indirect foreign investments. At the same time, there is a stream of empirical research that questions these benefits. Bailey and Lim (1992) investigate 20 country funds traded on the NYSE. They find that country fund returns behave as U.S. stock returns. These findings are especially true for emerging markets funds. Bailey and Lim

conclude that international portfolio diversification can be achieved only through direct security investments. Chang, Eun, and Kolodny (1995) examine the potential of closed-end country funds as international portfolio diversification vehicles. Based on the empirical analysis of 15 closed-end country funds, they reach a similar conclusion about indirect foreign investments. Chang, Eun, and Koldony determine that the U. S. market betas of closed-end country funds are substantially higher than their local market betas. According to Chang, Eun, and Kolodny, this fact tends to reduce the effectiveness of closed-end fund as a vehicle for international portfolio diversification. However, the authors suggest that investors can achieve desired international portfolio diversification by investing across closed-end mutual funds. Johnson, Schneeweis, and Dinning (1993) reach a similar conclusion and cast doubts on the advantages of closed-end country funds as an international portfolio diversification instrument.

Another investment vehicle available to investors seeking international diversification is the American depository receipt (ADR), which makes international investing simpler and less costly. An ADR is a negotiable certificate that provides American investors ownership rights to equity in a foreign country. An ADR is created when a financial institution purchases shares of a foreign firm in that firm's country and deposits them with a bank's overseas branch. Each ADR becomes a claim on a given number of shares of stock held by this financial institution. ADRs are listed on national stock exchanges and can be traded over-the-counter as well. Officer and Hoffmeister (1987) find that ADRs reduce costs and investors' risk exposure when they are combined in a portfolio with domestic securities. They conclude that ADRs give investors desired international portfolio diversification. The analysis of Wahab and Khandwala (1993) shows that ADRs provide expected returns

and better risk-reduction benefits than equity investment. Webb, Officer, and Boyd (1995) agree that ADRs decrease the transaction cost, however, doubt their diversification abilities. Their study includes 74 ADRs from 15 countries. The empirical results indicate that ADRs provide very little international diversification.

Multinational corporations (MNC) are considered another international diversification vehicle. A MNC is a portfolio of internationally diversified cash flows, where these cash flows may have a very low correlation with one another depending on the economic cycle in different countries. Thus, a MNC could be considered a diversification vehicle for investors seeking international exposure. However, Russell (1998) in an empirical study of 20 MNCs, finds that MNCs do not display "multinational" diversification benefits.

Offshore hedge funds have existed for nearly 2 decades; however, due to the presence of limited regulatory oversight and motivation to make themselves and their performance known, very little empirical research has been done on the diversification benefits of hedge funds (Brown, Goetzmann, and Ibbotson (1999)). Offshore hedge funds differ from regular mutual funds. They have broader flexibility in their portfolio selection and position they hold, and provide international and domestic diversification. Brown, Goetzmann, and Ibbotson (1999) find that hedge funds have lower systematic risk than the U. S. stock market and returns that are comparable to the S&P 500.

Stock index futures have attracted great attention from investors in recent years due to their high liquidity and lower transaction costs compared to cash markets. These futures are traded in more than fifteen countries. Jorion and Roisenberg (1993) find that stock index futures have the ability to replicate international equity indices.

Their five country synthetic portfolio is highly correlated with the Morgan Stanley Capital International world stock index.

To satisfy the investors' increasing demand for diversification, the American Stock Exchange (AMEX) recently has introduced a number of exchange-traded funds, such as World Equity Benchmark Shares (WEBS), Standard and Poor's Depository Receipts (SPDRs), and the Dow Industrials (DIAMONDS). WEBS have traded on the AMEX since April 4, 1996. Investors can choose among 21 open-end series Funds. They can be redeemed and created on a daily basis. The trading prices of WEBS do not deviate far from their net asset values. Khorana, Nelling, and Trester (1998) find that passively managed WEBS and actively managed closed-end funds exhibit very similar market performance. The empirical results show that WEBS serve as a foreign diversification vehicle better than closed-end country funds.

In the past twenty years, the compound annual growth rate of assets under mutual fund management has been greater than 22 percent. As of June 9, 1999, mutual funds held 1/3 of all U.S. equities and accounted for 2/3 of all trading in U.S. stocks. In 1998, 99 percent ($406 billion) of American families' savings went into mutual funds (Epstein, 1999). In the early 1980s, total assets in mutual funds was $50 billion; by the end of 1998 the total had risen to $5.5 trillion. Equity mutual funds account for 40.1 percent of the financial assets under management in the U.S. These funds hold almost 12.2 percent of all corporate equity (Epstein, 1999). A logical question to ask is why mutual funds are so popular among investors. The usual reasons given for the popularity of mutual funds as investment vehicles are the following: customer service, low transaction costs, diversification, and professional management. Service, low transaction costs, and diversification are provided both by

actively and passively managed mutual funds. However, professional management differentiates the actively managed funds from the passively managed mutual funds. Whether mutual fund managers have superior timing and stock-picking ability has been of great interest during the last decade among both practitioners and academia. A number of studies, such as Jensen (1968), McDonald (1974), Chang and Lewellen (1984), Cumby and Glen (1990), Eun, Kolodny, and Resnick (1991), Brown and Goetzmann (1995), Malkiel (1995), and Grinblatt and Titman (1989), find that although some mutual funds may exhibit superior performance on a gross return basis, they fail to do so on a net return basis.

Index funds are increasingly popular among American investors because of their high performance, low expense, tax efficiency, and broad market representation. Another class of mutual funds, "sector funds" or "specialty funds," provides investors with portfolio diversification through investment in a particular economics sector or industry. According to the 1998 Pensions & Investments survey, by the end of 1997, indexed assets totaled over $1 trillion and continue to grow at a rapid pace. As of October 4, 1999, according to the *Wall Street Journal*, 37.6% of the year's mutual fund investment went into index funds, which reached $44.59 billion as of August 30, 1998 (Miller and Meckel, 1999). Investors and financial planners choose index funds for a variety of reasons. One attractive feature is the ability of the index fund to track the specific asset class and match investor's risk tolerance. Because of their investment objectives, index funds risk and return characteristics differ from managed mutual funds. Khorana and Nelling (1997) examine 147 sector funds and find that their performance is sensitive to the selected benchmark. The empirical results indicate that sector funds perform as well as more diversified managed mutual funds,

and their risk is comparable to the risk of traditional equity mutual funds. However, sector funds have higher expenses than traditional equity mutual funds. Gruber (1995) finds that index funds exhibit performance comparable to actively managed equity funds. Howe and Pope (1993) find that specialty mutual funds exhibit greater total risk and posses greater unsystematic risk than traditional equity mutual funds. On the other hand, Howe and Pope determine that specialty mutual fund returns are comparable with returns of the traditional mutual funds. Thus, traditional index funds are an attractive investment; however, they may underperform their benchmarks by the amount of their fees. In 1993, the AMEX introduced an alternative to popular index funds. Standard and Poor's Depository Receipts (SPDRs) is an exchange-traded investment Trust based on Standard and Poor's 500 Composite Stock Price Index. The concept has been expanded with the introduction of MidCap SPDRs, Standard and Poor's MidCap 400 Depository Receipts. SPDRs provide broad diversification in one security. The price fluctuations caused by specific company or industry fluctuations are greatly reduced for SPDRs holders. Since SPDRs are designed to track the performance of the Index, not beat it, investors do not pay management or load fees. The stock is traded throughout the day, and may be purchased and redeemed at will; short selling is permitted at any time during trading hours. SPDR holdings can pay quarterly cash dividends representing dividends accumulated on the stocks of the Index held in Trust, and provide investors with tax efficiency, since the SPDR Trust only sells securities to reflect changes in the composition of the Index. In addition, SPDRs are sold by exchange trading and do not require the sale of stocks and the generation of capital gains that are necessary for traditional index mutual funds in effecting cash redemptions. Both SPDRs and MidCap SPDRs allow investors to

closely track the performance and the dividend yield of S&P 500 and S&P MidCap 400 Indexes, respectively.

On January 20, 1998, AMEX launched another portfolio diversification product, DIAMONDS. DIAMONDS represent shares of 30 highly capitalized stocks, and provide investors with diversification and trading convenience, opportunity to receive quarterly cash dividends, and provide tax and transaction cost efficiency.

In 2000, Barclays capitalized on the popularity of exchange-traded funds (ETFs) among American investors and introduced additional investment products, and renamed ETFs, iShares. The purpose of this study is to examine whether the exchange-traded funds, WEBS, SPDRs, and DIAMONDS, provide investors with desired diversification and performance compared to closed-end country funds and traditional index mutual funds. This study contributes to the following areas in finance literature: a rapidly growing literature on emerging financial markets, the literature on closed-end country funds, the literature on index funds, and the new branch of financial research that includes exchanged-traded funds.

CHAPTER 2

LITERATURE REVIEW

Section 1. Background

In the past decade the virtues of portfolio diversification have been of considerable interest to both practitioners and academicians. In response to this growing demand for diversification, financial intermediaries have been offering a great variety of both domestic and international diversification vehicles to American investors. In the past two decades, more and more investors have chosen not to trade securities on their account; instead, they invest their funds through intermediaries, that purchase securities on their behalf. The most popular among these financial intermediaries are investment companies. The Investment Company Act of 1940 classifies investment companies an either unit investment trusts or managed investment companies.

Unit investment trusts are pools of investments that are fixed for the life of the fund. Unit investment trusts are usually formed by a brokerage company, which acts as a sponsor. The sponsor buys a portfolio of securities and deposits them into a trust, and then sells to the public "units" or redeemable trust certificates. All income from the portfolio is paid to the shareholders by the fund's trustees, which can be a bank or trust company. The unit trust requires very little active management, and its portfolio

composition is fixed for the life of the fund; therefore these trusts are referred as unmanaged.

There are two types of managed investment companies: closed-end and open-end. Both open- and closed-end companies are managed by a board of directors, elected by shareholders. The annual management fees range from .2% to 1.5% of assets. Very often the management company is the same for a number of investment companies and is the same firm that organized the investment company. One of the main differences between open- and closed-end companies is the process of redemption of their shares. An open-end fund stands ready to redeem and issue shares at their net asset value (NAV). A closed-end fund does not redeem or issue new shares. Investors who want to liquidate their shares have to sell them to other investors. Thus, the market price and NAV for closed-end funds may differ. The closed-end fund shares can be purchased through a broker and are traded on organized stock exchanges. At the time of issuance, closed-end funds may sell above their NAV; however, after issuance closed-end fund shares usually trade at a discount.

Open-end fund shares are not traded on an organized exchange. Instead, investors buy and sell shares through the investment company. Open-end fund shares are never traded below their NAV, since funds stand ready to redeem shares at NAV, however, the offering price of open-end mutual funds usually exceeds NAV.

Investors make their portfolio allocation decisions according to their risk preferences, investment horizon, mutual fund investment policy, past mutual fund performance, management fees, and other fund expenses, such as front- or back-end load fees, mutual fund operating expenses, associated with mutual fund operating its portfolio, including administrative expenses and advisory fees. Since 1980, mutual

funds have been allowed to charge distribution fees, such as advertising and promotion expenses, and brokerage commission. These fees are named 12b-1 fees after the SEC rule. Obviously, investors would benefit from investing in no-load no fee funds distributed directly by mutual funds that provide return comparable to investors' risk. Investors must choose between passive and active portfolio management. Active management involves selecting and trading a portfolio of stocks based on which companies and industries will likely maximize portfolio performance. Active managers try to beat the relevant market indexes. On the other hand, passive management, often called indexing, involves investing in a group of stocks that represents the composition of a broad index. The object of indexed investing is not to beat a market's overall performance – just to track it closely.

New markets are emerging due to the fact that many of the age-old barriers between currencies, foreign trade, and countries no longer exist. Within the past decade alone, thousands of new companies have been listed on foreign exchanges. Around the world the process of privatization of such vital industries as transportation, financial and telecommunication services is allowing them to compete in the global marketplace. Rising standards of living are enabling consumers in more countries to buy more goods and services. As a result, some foreign markets are growing at a much faster pace than the U. S. market. Equity markets outside of the Unites States represent over 50% of the world's total capitalization. However, finding the best overseas investments requires time and money. That is why more individual and institutional investors are taking advantage of a simple and cost-efficient way to gain an access to foreign stock markets through international index investing. One should be aware of the potential risk associated with investing in foreign equity markets. This

risk is associated with the political and economical instability of individual markets, especially emerging ones, since these markets tend to be more volatile than the U. S. market. Developed markets are usually considered to be the 20 markets that comprise most of the widely used international benchmark, the Morgan Stanley Capital Index. These include 15 European markets: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom; and 5 Asian markets: Australia, Japan, Hong Kong, New Zealand, and Singapore. Canada and Malaysia are also considered to be developed markets, but are not part of the MSCI Europe and Far East Asia (EAFE) Index.

In the 1990s, AMEX introduced a new investment vehicle - exchange-traded funds, such as WEBS, SPDRs, select sector SPDRs, MidCap SPDRs, and DIAMONDS. WEBS' unique structure has kept their share price very close to their NAV. They track their NAV with about a 97% correlation (WEBS Prospectus, 1999-2000). WEBS have been listed and traded on the AMEX since March 1996. Investors can choose among 21 open-end investment companies, each holding a portfolio of securities selected to closely track the MSCI index for a particular country (see Appendix A). MSCI indexes are the international equity performance standards used by over 90% of North American financial institutions. Because most countries' markets use different calculation methods, base dates and other criteria, accurate nation-to-nation comparisons using locally created indexes can be difficult and inaccurate. Since Morgan Stanley Capital International applies the same criteria and calculation methodology in each country across the globe, MSCI indexes have been widely used as international equity performance benchmarks since their inception in 1969.

WEBS are managed by Barclays Global Fund Advisors, one of the largest equity index managers in the world. The company uses optimization models to construct portfolios of ordinary shares that have capitalization and fundamental industry investment characteristics similar to those of the relevant MSCI index. Barclays periodically rebalances each WEBS portfolio to reflect changes in the underlying index and to keep the WEBS' performance and characteristics in line.

WEBS' pricing is continuous during normal trading hours. The share price of each WEBS series fluctuates with changes in the market value of its underlying portfolio of securities and in the exchange rates between the U. S. dollar and the relevant foreign currency, and with the WEBS series' income and expenses. Shares can be redeemed and created every business day, and short selling is permitted on a downtick.

WEBS differ from closed-end funds, which are also exchange-listed securities, but frequently trade at substantial discounts or premiums to their NAV. In contrast, WEBS series' are created and redeemed at will. Therefore, the trading price of the WEBS series should not deviate far from its NAV. However, WEBS, according to WEBS' 2000 Prospectus, are also subject to the following principal risks:

1. Market risk is associated with NAV changes as the market value of the stocks it holds changes.
2. Foreign security risk is due to less liquid and less efficient securities markets; greater price volatility; exchange rate fluctuations and exchange controls; less publicly available information about issuers; the imposition of taxes and exchange controls; higher transaction and custody costs; settlement delays and risk of loss; difficulties in enforcing contracts; smaller market capitalizations;

higher inflation, social, economic, and political uncertainties, and the risk of expropriation of assets.

3. Management risk is the risk that the investment advisor's strategy, the implementation of which is subject to a number of constraints, may not produce the anticipated results.
4. Currency risk arises from the fact that a WEBS' NAV is determined on the basis of U.S. dollars, and the local currency may depreciate against the U.S. dollar.
5. Emerging market risk is incurred because some foreign markets in which WEBS Series invest are considered to be emerging market countries. These countries are exposed to greater market volatility, lower trading volume, political and economic instability, greater risk of market shutdown and more governmental limitations on foreign investment policy than those typically found in a developed market. The WEBS Index Series that are exposed to emerging market risk are Brazil, Malaysia and Mexico.
6. Some of the WEBS Series are faced with non-diversification risk because these Series invest most of their assets in securities issued by a small number of companies. Thus WEBS Index Series are more susceptible to the risk associated with these particular companies, or to a single economic, political or regulatory occurrence.
7. Finally, WEBS Series may face trading risk. While the creation and redemption feature of WEBS is designed to make it likely that WEBS will trade close to their NAV, disruptions to creations and redemptions may result in trading prices that differ significantly from NAV. Also, there can be no

assurance that an active trading market will exist for WEBS of each series on the AMEX.

Nevertheless, WEBS offer investors the benefits of simple, low-cost investing abroad through a single U. S. dollar trade, easy access to a country's entire equity market and international diversification. They have a built-in tax efficiency due to a low-turnover and low operating expense ratios, no high management fees, and no sales load.

The American Stock Exchange introduced Standard and Poor's Depository Receipts in 1993, an Exchange-traded unit investment trust based on the Standard & Poor's 500 Composite Stock Price index, followed by the introduction of MidCap SPDRs, Standard and Poor's MidCap 400 Depository Receipts. SPDRs shares are always represented by shares of S&P 500 companies held in trust. The Trustee Bank of SPDRs is State Street Bank and Trust Company. The SPDR Trusts are passively managed with the goal of closely tracking the S&P 500. With the absence of high management and sponsor fees associated with active management of a portfolio of stocks, expenses for the SPDR Trust are among the lowest for the investments of this type.

MidCap SPDRs shares are represented by shares of the S&P MidCap 400 companies held in the trust. The trustee bank for MidCap SPDRs is the Bank of New York. MidCap SPDR Trust is passively managed with the goal of closely mimicking the S&P MidCap 400 Index. The absence of high management and sponsor fees help to keep the Trust operation expenses very low.

While many investors have similar outlooks on economic conditions, no two are exactly alike. The opportunity to invest in Select Sector SPDR Funds is

considered useful for asset allocation, and for following industry trends, or for balancing a portfolio. According to SPDRs' Prospectus (1999), each of the following funds are designed to, before expenses, closely track the price performance and dividend yield of a particular Select Sector Index:

1. The Basic Industries Select Sector SPDRs Fund, which is composed of more than 50 companies involved in such basic industries as integrated steel products, chemicals, fibers, paper and gold. Among its largest components are E. I. DuPont de Nemours & Company, Monsanto and Dow Chemical Companies.
2. The Consumer Services Select Sector SPDRs Fund that is composed of more than 40 stocks include entertainment (Walt Disney Co., Time Warner), publishing, prepared foods (McDonald's Corp.), medical services, lodging and gaming.
3. The Consumer Staples Select Sector SPDRs Fund invests in more than 60 companies that are involved in the development and production of consumer products that include cosmetics and personal care, pharmaceuticals, soft drinks, tobacco, and food products. Among these companies are Coca-Cola Company, Merck & Company, Inc. and Pfizer Inc.
4. The Cyclical/Transportation Select Sector SPDRs Fund buys stock in building materials, retailing, apparel, housewares, air transportation, automotive manufacturing, shipping and trucking companies. More than 70 companies are represented in this index, which includes Wal-Mart Stores, Inc., Ford Motor Company and Home Depot, Inc.

5. The Energy Select Sector SPDRs Fund invests in more than 30 companies that develop and produce crude oil and natural gas, provide drilling and other energy-service oriented activities. Leaders in this group include Exxon Corp., Royal Dutch Petroleum Company, and Chevron Corp.
6. The Financial Select Sector SPDRs Fund is represented by investments in a wide array of diversified financial services firms. Their business ranges from investment management to commercial and investment banking. This SPDR is represented by more than 70 companies including American International Group Inc., Citigroup Inc. and BankAmerica Corporation.
7. The Industrial Select Sector SPDRs Fund includes stocks of such companies as General Electric Co., Minnesota Mining and Manufacturing Co. and Tyco International, LTD. The Industrial Select SPDR Fund invests in electrical equipment, construction equipment, waste management services and industrial machinery products. It holds shares of 30 most heavily market capitalized industrial companies.
8. The Technology Select Sector SPDRs Fund investments are concentrated in defense manufacturing, telecommunications equipment, microcomputer components, integrated computer circuits and process monitoring systems, including such companies as Microsoft Corporation, Intel Corporation and IBM.
9. Finally, the Utilities Select Sector SPDRs Fund is represented by investments in utilities providing communication services, electrical power and natural gas distribution. More than 40 companies are represented in this SPDRs Fund,

including Bell Atlantic Corporation, SBC Communications, Inc. and BellSouth Corporation.

All eleven SPDRs Funds are listed on the AMEX and provide investors with broad diversification opportunities and lower investment costs. Investors can buy or sell shares of any SPDRs in a single transaction. Just like stock, SPDRs holdings pay out quarterly cash dividends representing dividends accumulated on the stocks held by the respective SPDRs Fund. Because SPDRs Funds are designed to closely track their related Indexes, they are less likely than actively managed portfolios to trade securities which can create potentially high capital gains distributions. Generally, SPDRs Funds will sell securities to reflect changes in the composition of an Index. In addition, since SPDRs Funds are sold through exchange trading, they usually do not require the sale of stocks and the generation of capital gains that is required by mutual funds in effecting cash redemptions. SPDRs also can be bought on margin and sold short on a downtick at any time during trading hours. However, SPDRs Funds do face some risk. SPDRs are subject to the risks of an investment in a broadly based portfolio of common stocks, including the risk that the general level of stock prices may decline, thus adversely affecting the value of the investment. Also, according to SPDRs 1999 Prospectus, MidCap SPDRs and Select Sector SPDRs are faced with some additional types of risk, such as:

1. Lack of diversification risk, which is due to compliance with diversification requirements of the Internal Revenue Code.
2. Absence of prior active market risk is associated with the fact the SPDRs are newly organized series of an investment company with no operating history.

While the shares have been approved for listing on the AMEX, there is no assurance that active trading markets for the shares will be maintained.

3. Trading risk rises from the fact that the trading on the AMEX may be halted due to market conditions.
4. The net asset value of the shares will fluctuate with changes in the market value of SPDRs Funds' securities holdings. The difference in price may be due to the fact that the supply and demand in the market for a particular SPDRs at any point of time is not always identical to the supply and demand in the market for the underlying basket of SPDRs Index securities.
5. Foreign investment risk is associated with the fact that each SPDRs Fund may invest in foreign securities or ADRs, thus it may involve additional investment risk due to foreign exposure

Since the beginning of 1998, shares of the Dow Jones Industrial Trust (DIAMONDS) have traded on the American Stock Exchange. DIAMONDS allow investors to buy or sell shares in the entire portfolio of the 30 stocks in the Dow Jones Industrial Average as easily as they do shares of a single stock. DIAMONDS shares are always represented by the shares of the companies included in the Dow Jones Industrial Average held in trust. The Trustee Bank for DIAMONDS is State Street Bank and Trust Company. DIAMONDS are passively managed. Investing in DIAMONDS provides investors with broad diversification achieved through holding shares of 30 blue-chip stocks, but also trading convenience, tax efficiency, market adaptability and the opportunity for dividends. DIAMONDS can be short sold on a downtick. DIAMONDS also offer the absence of high management and sponsor fees, keeping their expenses among the lowest for investments of this type.

According to DIAMONDS Prospectus (1999), investment in DIAMONDS expose investors to general investment risk associated with the fluctuations of the security value over time. Because DIAMONDS are listed on the stock exchange, trading can be halted due to extraordinary market volatility, thus DIAMONDS are exposed to trading risk. DIAMONDS are subject to the risks of an investment in a portfolio of large-capitalization common stocks, including the risk that the general level of stock prices may decline, thereby adversely affecting the value of such investment.

Section 2. Previous Studies of Mutual Fund Performance Measures

Sophisticated inquiry into mutual fund performance started with the study, Wharton Report, done for the SEC by Friend, Brown, Herman, and Vickers (1962). The early works of Sharpe (1966), Treynor and Mazuy (1966), and Jensen (1968) provide a comprehensive examination of mutual fund investment performance measures. Grinblatt and Titman (1993) introduce and evaluate a new measure of portfolio performance on the data sample of 155 mutual funds from December 31, 1974 through December 31, 1984. The measure is based on the assumption that rational investors can predict security returns and, profit from these changing expected returns. Investors can alter the portfolio weight over time in such manner that weights of assets with higher predicted returns will increase and weights of assets with lower predicted returns will decrease.

Sharpe (1966), in a study of 34 open-end mutual funds between 1954 and 1963, lends support to the view that the capital market is efficient and defines reward-

to-variability ratio as a mutual fund performance measure. The reward-to-variability ratio is defined as follows:

$$R/V\ ratio = (r - r_f)/\sigma, \text{ where}$$

$(r - r_f)$ is the difference between the fund's average annual return and risk-free interest rate;

σ is the standard deviation of the annual rate of return and shows the amount of risk actually borne.

He finds that the ratio for the sample is 40 basis points lower than the ratio calculated for the Dow Jones Industrial Average over the sample period. Sharpe reports the reward-to-variability ratios for each of 34 open-end funds, and compares them across funds according to their levels of investment fees. He finds that better performing funds tend to have the least expenses.

As it is cited in Bodie, Kane and Marcus (1999), Treynor and Mazuy (1966) employ quadratic regression to account for timing and stock-picking abilities of mutual fund managers. This measure is developed to explain beta variations that are linearly related to the return of the benchmark portfolio. The Treynor and Mazuy index is defined as follows:

$$TM = a + b*(R_m - R_f) + c*(R_m - R_f)^2 + e_p, \text{ where}$$

TM is Treynor-Mazuy Total Performance Measure;

R_m is the market portfolio return;

R_f is the risk-free return;

a, b, and c are regression coefficients,

e_p is the error term.

The last term in the equation provide an estimate of management timing ability.

Jensen (1968) finds that mutual fund managers earn negative net returns (gross returns minus fund operating cost) and introduces an alternative measure of mutual fund performance: $R_{pt} = \alpha_p + \beta_p * R_{mt} + u_{pt}$ (Jensen, 1968), where

R_{pt} is excess return (nominal return minus risk-free return) on a managed portfolio in period t;

β_p is a regression coefficient;

R_{mt} is excess return on market portfolio in period t;

α_p is an intercept term; and

u_{pt} is an error term in period t.

The test framework examines whether the intercept is significantly different from zero. Today, financial literature often refers to this test as the test of "Jensen's alpha." Jensen (1968) finds that funds' alpha is negative, meaning, that mutual fund managers are not able to beat the market, which again supports market efficiency.

Grinblatt and Titman (1993) develop and test a new measure of portfolio performance. Their data sample consists of 155 mutual funds from 1974 through 1984. They compute a covariance between portfolio weights and returns:

$scov\ (w_j, R_j) = \Sigma\, w_{jt}\,(R_{jt} - R_j)/T = \Sigma\,(w_{jt} - w_j)R_{jt}/T$, where

scov is sample covariance between the weights and returns of asset j,

w_{jt} is the portfolio weight at the beginning of period t with sample mean w_j, and

R_{jt} is the portfolio return from date t to date $t+1$ with sample mean R_j.

The empirical evidence suggests that between December 1976 and March 1985, mutual funds achieve a positive abnormal investment performance. The strongest evidence of abnormal performance is found in the aggressive growth mutual funds. The empirical results indicate that mutual fund managers achieve superior performance in the first half of the sample period, and the superior performance persists in the second part of the sample period as well.

Section 3. Previous Studies of Mutual Fund Performance with Characteristic-based Benchmarks

A number of empirical studies have been devoted to the identification of an appropriate benchmark when measuring mutual fund performance (Roll (1988), Grinblatt and Titman (1989), Okunev (1990), Grinblatt and Titman (1993), Daniel, Grinblatt, Titman, and Wermers (1997)). Sharpe (1994) introduced a revised Sharpe ratio for measuring fund returns relative to a designated benchmark index, which is determined by the mutual fund investment style. Since, the exchange-traded funds are designed to track a specific market index, the investigation of an appropriate benchmark when measuring exchange-traded funds' performance is not necessary.

Section 4. Previous Studies of Mutual Fund Investment Performance

More recent studies have assessed the relationship between mutual fund investment performance and other parameters, such as expenses, asset turnover, and load status. These studies have reported conflicting results. Sharpe (1966) shows that mutual funds that incur higher expenses provide lower net returns to their investors. Horwitz (1966) concludes that there is a direct relationship between fund expense ratio and the variability of mutual fund returns. Lakonishok (1981) finds that high expenses

of mutual fund management are counterproductive. Ferris and Chance (1987) and Trzcinka and Zweig (1990) determine that funds charging 12b-1 fees produce lower net returns than mutual funds that do not charge 12b-1 fees. Grinblatt and Titman (1989) find mutual fund gross returns between 1975 and 1984 are inversely related to fund asset size. Gorman (1991), analyzing annual returns and asset size for a sample of 335 mutual funds from 1974 to 1985, confirms this result, concluding that risk-adjusted net returns of mutual funds are inversely related to mutual fund size. Veit, Cheney, Madura, and Lucas (1988), examining a random sample of 70 mutual funds between 1969 and 1983, find no difference in mean performance between load and no-load mutual funds. At the same time, Gorman (1991) reaches the opposite conclusion determining that no-load mutual funds tend to outperform load mutual funds.

Ippolito (1989) incorporates Grossman and Stiglitz's (1980) idea that more informationally competent mutual funds exhibit higher efficiency in their operations, and this lead to lower expenses and higher risk-adjusted returns. Ippolito analyzes 143 mutual funds from 1965 through 1984, employing the capital asset pricing model including all earnings, capital gains, and net of all fees and expense except load charges. He finds that mutual fund charges associated with higher asset turnover, load status and expense are offset by superior results. This finding supports the hypothesis that mutual funds are superior information gatherers and efficient traders.

Grinblatt and Titman (1994) examine whether fund size, expense, management fees, and portfolio turnover determine mutual fund performance. Their study employs 279 mutual funds from 1974 through 1984. The empirical results produced by regression analysis point to a significant positive relationship between mutual fund performance and portfolio turnover, and a significant negative relationship between

mutual fund performance and management fees. Grinblatt and Titman conclude that mutual funds that spend the most on research and trade the most, may discover underpriced stocks.

Droms and Walker (1994) extend the empirical research on the performance of international mutual funds through employment of Fuller-Battese (1974) cross-sectional/time-series analysis for 108 international equity mutual funds from 1971 through 1990. The authors determine in the context of the capital asset pricing model that international equity mutual funds do not attain excess risk-adjusted rates of return. This implies that international equity mutual funds exhibit properties of market efficiency and earn rates of return corresponding to their risk exposure. Droms and Walker conclude that international equity mutual funds, in fact, can serve as portfolio diversification vehicles, and their performance is unrelated to expense ratios. Droms and Walker find no reward in paying load charges for international equity mutual funds, since the common belief that load funds provide better performance to their investors is not supported by their empirical findings. They also find that asset size and portfolio turnover are unrelated to mutual fund performance.

In 1995, Droms and Walker add several new perspectives to the growing body of the investment performance of mutual funds literature by examining the performance of 150 equity mutual funds over a 20 year period, from 1971 through 1990. Using cross-section/time-series regression methodology, they determine that mutual fund portfolios with higher risk, earn higher returns, which is consistent with the CAPM. Also, their empirical evidence indicates that smaller fund portfolios appear to be more risky, and mutual fund returns are independent of load or no-load fees.

In 1996, Droms and Walker extend their earlier study (Droms and Walker (1994)) on mutual fund performance in an attempt to address the multivariate relationships between investment performance and asset size based on cross-sectional/time-series data for 151 equity mutual funds from 1971 to 1990. Empirical results of the Droms and Walker's study suggest that mutual funds offer efficient diversification opportunities for investors. Droms and Walker find that higher expenses are associated with higher mutual fund returns. At the same time, they confirm the previously reached conclusion that mutual fund investors do not get rewarded for paying load charges, since load and no-load mutual funds earn comparable returns. The empirical results do not support a relationship between mutual fund performance and asset turnover, and asset size.

The notion of superior mutual fund performance and asset size has two contradicting explanations. The bulk of mutual fund performance literature finds mutual fund performance to be inversely related to its asset size and explains this finding due to the fact that a mutual fund gets to be too big to be manageable efficiently. Another stream of mutual fund literature finds positive relationship between mutual fund performance and asset size is due to economies of scale assisting big mutual funds in spreading its information acquisition more efficiently. Ciccotello and Grant (1996) evaluate mutual fund performance over a 10 year period from 1982 to 1992. They find that larger funds tend to have lower expenses and a lower turnover ratio. At the same time, Ciccotello and Grant conclude that there is no systematic relationship between fund size and its performance.

In 1980, the Securities and Exchange Commission (SEC) adopted rule 12b-1 allowing mutual funds to charge fees associated with the distribution of their shares.

The debate associated with rule 12b-1 evolves on whether the distribution fees would increase the size of the fund to achieve economies of scale and thus reducing shareholders' cost. The proponents of the rule 12b-1 argue that the use of these fees increases the stability of mutual fund assets and reduces the fund's operating costs. However, the empirical research results suggest that rule 12b-1 actually increases fund expense ratios. McLeod and Malhotra (1996) examine the effect of rule 12b-1 on the performance of bond mutual funds between 1988 and 1994. The empirical evidence indicates that rule 12b-1 imposed additional cost on investors between 1988 and 1990, however, due to the imposed cap on 12b-1 investors cost declined between 1991 and 1994. At the same time, bond funds subject to the rule 12b-1 do not earn a higher rate of return than funds without a 12b-1 plan.

In 1997, Malhotra and McLeod extend their earlier analysis of the rule 12b-1 effect on the performance of equity and bond mutual funds. The data sample consists of returns on equity and bond mutual funds for 1992 and 1993. Their findings suggest that funds with 12b-1 charges have higher average expenses than non-12b-1 funds, thus it costs more to manage a 12b-1 fund. Also, 12b-1 funds have higher sales charges and asset growth compared to non-12b-1 funds, however their yields are less than the yield for non-12b-1 funds. Malhotra and McLeod suggest that investors should carefully look at the size, age, turnover ratio, cash ratio, and 12b-1 fees of the fund before making an investment decision. If investors decide to invest in bond funds, they should select large non-12b-1 funds with low sales charges. However, bond funds with high expense ratios produce higher yields.

Khorana and Nelling (1997) turn their attention to the performance of sector funds and their diversification benefits. The sample consists of 147 sector funds

between 1976 and 1992. The empirical evidence shows that sector funds are sensitive to the selected benchmark used to measure performance. Sector funds exhibit higher expense ratios than other mutual funds. This fact can be explained by the usually small size and narrow investment objectives of sector funds. Thus, they are not able to realize economies of scale, and may use higher loads and expenses to recover their higher fixed cost. The overall sector fund performance is found to be comparable with domestic equity funds on a risk-adjusted basis. Khorana and Nelling find that sector funds are less risky than other funds, in terms of systematic risk, and may be used by investors as an effective diversification vehicle.

In 1998, Dellva and Olson expand the body of financial research on the relationship between mutual fund performance and expenses and different load and deferred sales charges, redemption and 12b-1 fees using all equity mutual funds from 1987 through 1992. The empirical evidence indicates that funds with front-end loads have lower risk-adjusted performance than funds without these charges. The authors support prior conclusions that 12b-1 fees increase fund expenses, however, if the fund generates higher risk-adjusted performance, these fees could be justified. Deferred sales charges and asset size are found to be unrelated to risk-adjusted mutual fund performance. Dellva and Olson find that international mutual funds have higher expense ratios than other fund types.

Brown, Goetzmann and Ibbotson (1999) examine whether offshore hedge funds exhibit superior performance at considerable risk compared to other mutual funds. Due to the scarcity of available data, there are very few studies that examine offshore hedge funds performance. The data set includes hedge funds from 1989 through 1995. Based on the empirical results, the authors conclude offshore hedge

funds exhibit positive risk-adjusted performance and low correlation with the U.S. market, thus offshore hedge funds could serve as a valuable diversification tool for investors.

Section 5. Previous Studies of Mutual Fund International Diversification Benefits

Two special characteristics have emerged in equity investing in the last decade: a dramatic growth in investment in index funds and an increasing interest in international investment diversification. The increasing investment in index funds has been triggered by the strong performance of the S&P Indexes during the last decade of the 20th century compared to underperformance of actively managed mutual funds. The growth in international investing has been driven by increasing globalization and privatization in the world market, and decreasing restrictions on international investments and lowered barriers to cash flows. The diversification benefits from indexing investments and exposure to emerging equity markets have attracted enormous attention among private and institutional investors, practitioners and academicians.

Grubel (1968) states that international diversification provides investors with a source of welfare gains. The author empirically determines that international capital movements are a function of the asset growth rate in two different countries and interest rate differentials. Grubel demonstrates the international portfolio diversification gains on an example of 11 major countries. The data cover the period from January 1959 through December 1966. The empirical results support the theoretical implications of the experimental model and suggest that diversification among the assets from eleven countries permits investors to attain higher rates of

return. Grubel concludes that if past experience is considered indicative of future developments, then the obtained empirical results imply that future international diversification of investors' portfolios is profitable.

Levy and Sarnat (1970) investigate potential gains obtained from international diversification. They use empirically determined optimal international portfolios. The data set includes 28 countries' common stocks for the period between 1951 and 1967. The empirical investigation results lead the authors to the conclusion that despite the relatively good performance of the U.S. market, American investors can still benefit from international diversification.

Lessard (1973) extends the empirical analysis of Grubel (1968) and Levy and Sarnat (1970) in international portfolio diversification theory. He employs multivariate analysis on a set of 4 South American developing countries. The data set employs quarterly returns on 110 common stocks between December 1958 and December 1968. The empirical results from factor and principal components analysis imply the presence of substantial gains from investing in these countries. The author evaluates the magnitude of gains achieved by international diversification by comparing the historical performance of two different types of national and international portfolios: one selected by a naive strategy and one selected by mean-variance efficiency criteria. The naive strategy calls for investing equal amounts in each national stock, creating a type of market portfolio. For the international portfolio, Lessard weights the stocks from each country so that they comprise one-fourth of the total portfolio. The results of naive and mean-variance efficient portfolios indicate that investors would benefit from international diversification.

Errunza (1977) substantiates the argument of international portfolio diversification through the examination of less developed countries' indices between 1951 and 1971. He uses the mean-variance model for the generation of efficient sets of portfolios. The empirical results support the argument for international portfolio diversification. Errunza concludes that capital flows resulting from diversification can significantly improve the international liquidity position of less developed countries and provide desired portfolio diversification.

The "market segmentation" hypothesis states that international markets are "segmented" due to geographical, economic, and cultural differences. Thus, an investor would attain diversification by selecting securities in countries that are segmented from each other. The international pricing models of Black (1974), Stulz (1981), and Adler and Dumas (1983) predicate the advantages of international portfolio diversification.

Stulz (1981) finds that due to the presence of international investment barriers, based on the derived international asset-pricing model, it is costly for domestic investors to hold international securities. Adler and Dumas (1983) further test the "market segmentation" hypothesis. They explore the benefits of international diversification and conclude that overseas investments reduce portfolio risk.

Ito and Roley (1987), Eun and Sim (1989), Barclay, Litzenberger, and Warner (1990), Hamao, Masulis, and Ng (1990), Kendall, Kretzmer, and Hertzel (1990) investigate linkage between international markets and the effect of intraday flows of information on international asset price volatility. Eun and Sim (1989) explore an interdependence among national stock markets on the example of 9 foreign stock market indices between 1980 and 1985 using the vector-autoregressive analysis

(VAR) developed by Sims (1980). Hamao, Masulis, and Ng (1990) investigate daily and intraday stock-price activity over the three-year period, April 1, 1985, to March 31, 1988 from Tokyo, London, and New York stock exchanges using an autoregressive conditionally heteroskedastic (ARCH) model. The empirical results suggest the presence of a spill-over effect from New York to Tokyo, London to Tokyo, and New York to London.

Bailey and Stulz (1990) explore international portfolio diversification opportunities of the Pacific Basin markets. The study uses daily U. S. dollar returns for 9 Pacific Basin stock market indexes and the U. S. S&P 500 index from January 1977 to December 1985. Using the mean-variance method, the authors find empirical evidence for international portfolio diversification by investing in Pacific Basin stocks. At the same time, while risk reduction provided by diversifying into Pacific Basin stocks is found to be substantial, the authors indicate that it could be considerably overstated using daily data. Bailey and Stulz suggest the use of the monthly return as a more appropriate measure to investigate the gain from international portfolio diversification.

Eun, Kolodny, and Resnick (1991) extend the empirical research of Grubel (1968), Levy and Sarnat (1970), and Lessard (1973) of potential gains from international diversification. They investigate the performance of 19 U. S. – based international funds in terms of mean-variance efficiency. The benchmark portfolios include the S&P 500 Index, the Morgan Stanley Capital International (MSCI) World Index, and a self-constructed index of U. S. multinational firms. They explore how well each of the international funds complement a well-diversified U. S. portfolio in enhancing mean-variance efficiency. They conduct selectivity and market-timing

ability tests to determine to what degree international mutual funds provide a hedge against downside risk in the U. S. stock market and whether international mutual funds exhibit a better hedge against U. S. inflation compared to the domestic stock investment. Their empirical results show that international mutual funds can serve as a valuable portfolio diversification tool for American investors. Also, according to the Sharpe performance measure, the majority of international mutual funds outperform the S&P 500 Index during the sample period between 1977 and 1986. The authors conclude that American investors could have benefited from partially or wholly investing in any of the sample international mutual funds during the ten-year period.

Roll (1988) determines that markets of countries with similar industries tend to exhibit higher correlation than countries with dissimilar industries. Koch and Koch (1991) study the lead-lag relationship between 8 national stock markets using a dynamic simultaneous equations model. The empirical results are indicative of the growing regional interdependence among countries in the same geographical area. French and Poterba (1991) find that households exhibit incomplete diversification due to the strong home-country bias.

Bailey and Lim (1992) examine the diversification benefits of closed-end country funds. The data sample includes 19 closed-end country funds between January 2, 1985 through June 30, 1989. Their empirical findings show that the closed-end country returns often resemble domestic U.S. stock returns instead of returns from foreign stock portfolios. Thus, Bailey and Lim conclude that closed-end country funds provide little diversification, and investors are better off by investing directly into foreign markets through purchasing foreign equity in order to enjoy the benefits of international diversification.

Speidell and Sappenfield (1992) study global diversification on an example of 17 developed equity markets and 18 emerging equity markets. The authors suggest that over the years, developed equity markets tend to integrate due to the increasing presence of institutional investors, increasing indexing trends, and linkage among economic fortunes of European countries. Thus, the importance of the emerging market increases as a tool for international portfolio diversification. The empirical results lead the authors to conclude that as the diversification across developed countries is reduced, emerging equity markets become increasingly important in asset allocation.

Johnson, Schneeweis, and Dinning (1993) provide a comparison of investment in closed-end country funds with direct investments in foreign indices. Their results indicate limited benefits from diversification in emerging markets. The sample consists of stock indexes for emerging and developed capital markets between January 1989 and July 1992. Their empirical findings indicate that closed-end country fund returns are more closely correlated with the U. S. market index than to the performance of local stock indexes and thus only emerging equity markets can serve as a viable diversification tool for American investors.

Chang, Eun, and Kolodny (1995) investigate the potential of closed-end country funds as a vehicle of international portfolio diversification. The data sample consists of all funds that were initiated prior to December 1988 and remained publicly traded for at least two years. The authors use the two-factor market model in order to determine the diversification abilities of closed-end country funds. Their empirical results lead to the conclusion that closed-end country funds exhibit significant exposure to the U.S. market and act more like U.S. securities than do their underlying

assets. However, closed-end country funds still have a great exposure to their local market factors, and thus do provide diversification benefits to U.S. investors.

Bodurtha, Kim and Lee (1995) investigate behavior of 31 closed-end country fund premiums between 1986 and 1990. Their empirical analysis shows that closed-end country fund premium movements mirror the U.S. specific risk, and stock prices of closed-end country funds follow the U.S. market. Thus, the authors challenge the ability of closed-end country funds to be beneficial to American investors in achieving international diversification. .

DeSantis (1994), Harvey (1995) and F. A. de Roon, T. E. Nijman, and B. J. M. Werker (2000) document substantial diversification benefits from investing in emerging equity markets. Harvey (1995) provides a comprehensive analysis of 20 new equity markets in emerging economies. Despite their large volatility, emerging country returns exhibit high average returns and low correlation with developed country returns. As a result, the inclusion of emerging market assets in a mean-variance efficient portfolio will allow American investors to significantly reduce their portfolio volatility and increase expected returns. However, these studies fail to account for high transaction costs, low liquidity, and investment constraints associated with investments in emerging markets. Bekaert and Urias (1996) address these shortcomings by examining the diversification benefits of closed-end country funds by performing mean-variance spanning tests introduced by Hansen and Jagannathan (1991). The sample consists of 43 U. S. funds and 37 U.K. trusts investing in emerging markets between January 1986 and August 1993. The empirical findings argue that U.K. trusts provide investors with international portfolio diversification benefits, where U.S. closed-end country funds do not. However, investors can achieve

a desired portfolio diversification by holding International Financial Corporation Investable indices.

Gallo and Swanson (1996) investigate the diversification benefits of 37 U.S. – based international equity mutual funds between 1985 and 1993 using international arbitrage pricing theory and the two-index model. The two models produce conflicting results. Based on the index model, international mutual fund managers on average, perform as well as market proxies. However, the international arbitrage pricing model indicates superior performance for international mutual fund managers. The empirical results indicate that the performance of international equity mutual funds track the index benchmark throughout the sample period, and provide substantial international diversification benefits to American investors.

Khorana, Nelling, and Trester (1998) analyze the performance and the tracking ability of 17 WEBS for the first six months after their inception using a single-index model. The empirical findings document the indexing efficiency of WEBS. Examination of WEBS' diversification potential, leads the authors to the conclusion that WEBS are more highly correlated with the MSCI Index for their respective countries than closed-end mutual funds, and are less correlated with U.S. equities than closed-end mutual funds. Thus, the authors conclude that WEBS are a viable vehicle for achieving international portfolio diversification.

Russell (1998) reviews various international investment vehicles and analyzes their diversification potential. The data include 20 randomly selected closed-end country funds, ADRs, MNCs, and "purely domestic" firms that derive most of their sales and cash flows from domestic sources. The sample covers the period from January 1991 to December 1995. Russell employs the weekly dollar-denominated

securities returns and methodology derived from the Johnson, Schneeweis, and Dinning (1993) model, and the two-factor model to illustrate each security's diversification effect. The investigation asks whether these exchange-listed securities mimic their home country index or the U.S. market index. Their empirical results indicate the ability of closed-end country funds, ADRs, and MNCs provide effective diversification to American investors. Thus, Russell supports the conclusion offered by Jacquillat and Solnik (1978) that indirect foreign investment serves as a violable tool of international portfolio diversification.

Good, Ferguson, and Treynor (1976) examine the benefits of indexing and whether the benefits of indexing could be achieved through an actively managed portfolio. The theory behind an index fund is to hold available common stocks in proportion to their outstanding values, which will provide the best risk-return tradeoff.

At the same time, index funds have limitations with their practical application due to their high risk caused by the limited number of stocks, the below average emphasis of dynamic stocks, and high transaction costs. The authors conclude that a carefully planned and managed portfolio can provide a program that competes effectively with the index fund in terms of controlling risk and holding down transaction costs.

Calderwood (1977) argues that index funds based on the S&P 500 Index are faced with the same problems as other managed funds, since the decision to add or to eliminate stock in the S&P 500 comes from the Standard and Poor Committee members. So in reality index funds based on the S&P 500 Index are just another form of managed funds.

Howe and Pope (1993) investigate risk, return, and diversification of specialty mutual funds. Specialty funds restrict their investments to a particular industry or industry sector, due to that fact they may retain greater unsystematic risks than traditional equity mutual funds. The data consist of all specialty mutual funds that were traded between December 31, 1986 through June 30, 1989. The empirical results support the hypothesis that on average specialty mutual funds have greater total risk and retain significantly more unsystematic risk than traditional equity mutual funds. At the same time, the authors suggest that if specialty mutual funds are part of a well-diversified portfolio, then they can provide investors with the desired performance comparable to that of traditional equity mutual funds.

Khorana and Nelling (1997) investigate the performance of sector mutual funds. The data consist of monthly returns on 147 sector funds between 1976 and 1992.

Using Sharpe (1966) and Treynor (1966) performance measures, the authors conclude that sector funds perform as well as more-diversified equity mutual funds. The investigation of cross-sectional variation in sector fund performance indicates that sector funds' systematic risk is comparable with equity mutual funds' risk. Thus, investors would benefit from adding sector mutual funds to their diversified portfolios.

Bogle (1998) supports advantages of index funds compared to traditional mutual funds. The empirical study of 741 mutual funds between 1992 and 1996 indicates that the average return for all index funds is above the average return for equity mutual funds. At the same time, the average risk of equity mutual funds is higher than the average risk of index funds. Bogle concludes that rational investors

would seek the low-cost funds, and the best wager for all, they should consider index funds. Thus, index funds could be viewed as a valuable diversification mechanism.

Brown, Goetzmann, and Ibbotson (1999) analyze performance of off-shore hedge funds. Their sample consists of hand-collected data on more than 200 funds between 1989 and 1995. Their empirical findings suggest that the low covariance of off-shore hedge funds with the U.S. stock market is evidence that off-shore hedge funds can serve as a diversification vehicle for American investors.

Simons (1999) investigates the diversification opportunities of index funds using monthly returns of index funds from January 1980 through September 1998. His empirical results show that the Pacific Basin countries Index has been more volatile than the U. S. and European Indexes. Simons supports benefits of international portfolio diversification and concludes that investors would achieve optimal risk-return trade off by investing in an international portfolio of European and U.S. securities.

My study provides a more in-depth analysis of diversification benefits, index tracking efficacy, and the return-generating mechanism of WEBS compared to closed-end country funds. Also, I examine intertemporal patterns of the interdependence among international equity markets on the example of WEBS and closed-end country funds, and perform WEBS' and closed-end country funds' risk analysis. Further, I study risk-return characteristics and mean-variance efficiency, and tracking accuracy of SPDRs and DIAMONDS compared to traditional index mutual funds. Finally, I determine the sensitivity of the return generating mechanism and hedging benefits of SPDRs and DIAMONDS to macroeconomic variables versus traditional index mutual funds.

CHAPTER 3

METHODOLOGY

The purpose of this chapter is to describe and provide theoretical support for the methodological procedures to be used in the dissertation. This chapter includes (1) a description of the research question and the related hypothesis, (2) a discussion of the testing procedures, and (3) the hypotheses testing procedures to be used.

Research Purpose

This study has two objectives. The first objective of this study is to conduct an inquiry into the diversification benefits of the exchange-traded funds (WEBS, SPDRs, and DIAMONDS). The second objective of this study is to examine whether the exchange-traded funds (WEBS, SPDRs, and DIAMONDS) exhibit superior performance compared to closed-end country funds and traditional index mutual funds.

World Equity Benchmarks (WEBS)

The purpose of this investigation is to determine the diversification abilities of WEBS as an international investment instrument. Before 1996, American investors could gain exposure to a particular country through either direct equity investment or through investing in actively managed closed-end country funds. In March 1996,

AMEX introduced exchange-traded index funds (WEBS) that give American investors an alternative vehicle to achieve international portfolio diversification. Khorana, Nelling and Trester (1998) compare the performance, trading, and pricing characteristics of WEBS and closed-end country funds using daily data between April 1996 and October 1996. In particular, Khorana, Nelling and Trester's study investigates the changes in discounts and trading volume on closed-end funds around the WEBS inception and compares their performance. Furthermore, Khorana, Nelling, and Trester investigate the tracking ability of closed-end country funds and WEBS, and the extent to which WEBS provide American investors with greater international diversification benefits.

The data sample of my investigation consists of weekly prices for WEBS and corresponding closed-end country funds between April 1996 and December 1999 obtained from Bloomberg Database. The WEBS' and closed-end country funds' performance data is obtained from Edgar-on-line. The asset values of country funds are established abroad, in the foreign markets, and the market price of closed-end country fund is determined in the U.S. market. According to Bodurtha, Kim, and Lee (1995), the noise traders literature indicates that when investors trade on "pseudo-signals" of news appearance investors share common sentiments in regard to the country fund. Since foreign investors are unaffected by U.S. "pseudo-signals," the NAVs of country funds should provide a useful value benchmark for evaluating market sentiments. Also, country funds can be examined in relation to more than one market factor. These country fund characteristics allow the separation of the time-variation in country fund stock price and NAV components in the context of foreign and U.S. market activities.

The NAV of closed-end country funds is determined in the market of its country of origin; however, their market price is determined in the secondary U.S. market where closed-end country funds' shares are traded. Thus, I determine the closed-end country funds' return based on their NAV and market price. Further, I compare WEBS performance to closed-end country funds performance based on their NAV and market price.

To measure the performance of WEBS and closed-end country funds, their respective raw returns are calculated as follows:

$$R_t = (P_t - P_{t-1})/P_{t-1}, \text{ where}$$

P_t is the price of the fund in period t,

P_{t-1} is the price of the fund in period $t-1$.

All returns are dollar denominated. Dividends are not included in the computations of weekly return. This is similar to the method used by Officer and Hoffmeister (1987) and Russell (1998).

In order to determine the mean-variance efficiency and indexing accuracy of WEBS and closed-end country funds, the following single factor model suggested by Gibbons (1982) is employed:

$$R_{i,t} = \alpha_i + \beta_{f,t} R_{f,t} + \varepsilon_{i,t}, \text{ where}$$

$R_{i,t}$ is the weekly return on the WEB (closed-end country fund) in week t,

f,t is the corresponding WEB (closed-end country fund),

α_i is an intercept term,

$\beta_{f,t}$ is a regression coefficient on the respective MSCI index return in week t,

$R_{f,t}$ is the weekly return on the MSCI index in week t,

$\varepsilon_{i,t}$ is a random error term that has zero mean and zero correlation with the world market portfolio.

H_0: $\beta_{f,t} = 1$

H_1: $\beta_{f,t} \neq 1$

A single factor model is estimated for each WEB and for both closed-end country fund market price and its underlying net asset value, i.e., I run a regression for each WEB and two regressions for each closed-end country fund. The examination of the estimated beta coefficient and R-squared values from the single factor model for WEBS and closed-end country funds indicates how well the WEB and the associated closed-end country fund mimic the underlying MSCI Index. Higher R-squared values for WEBS-MSCI regression, closed-end country fund-MSCI and their underlying asset value-MSCI regression would suggest higher tracking accuracy. I anticipate that WEBS are able to mimic the behavior of the underlying MSCI index and provide investors with the greater international diversification benefits than closed-end country funds.

H_0: $R^2_{WEBi} = R^2_{CEFi}$

H_1: $R^2_{WEBi} \neq R^2_{CEFi}$

WEBS and closed-end country funds reflect the effect of country-specific factors and therefore have a tendency to covary less across countries than within countries. Thus, internationally diversified portfolios should be substantially less risky than purely domestic portfolios. However, a substantial body of empirical research suggests that the return-generating mechanism of these securities may depend

not on the place where the cash flows are generated, but on where the securities are traded.

Jacquillat and Solnik (1978) find that the share prices of multinational corporations exhibit behavioral pattern similar to domestic corporations despite the fact that most of their cash flows are generated overseas. Roll (1988), Koch and Koch(1991), French and Poterba (1991) find evidence of incomplete diversification due to growing market interdependence. Bailey and Lim (1992), Bodurtha, Kim and Lee (1995), Bekaert and Urias (1996) dispute the diversification benefits of closed-end country funds compared to direct foreign equity holdings. Eun, Chen and Kolodny (1995) find that closed-end country funds retain significant exposure to the U.S. market and act more like U.S. securities. Russell (1998) finds that the U.S. exchange-listed securities, such as closed-end country funds, MNCs, and ADRs behave more like the host exchange rather than their home exchange. To investigate whether WEBS and closed-end country funds returns depend on the returns of the U.S. market, I use a simple regression single factor model:

$$R_{i,t} = \alpha_i + \beta_{d,t} R_{d,t} + \varepsilon_{i,t}, \text{ where}$$

$R_{i,t}$ is weekly return on the WEB (closed-end country fund) in period t,

i is the corresponding WEB (closed-end country fund),

d,t is the S&P 500 Index,

α_i is an intercept term,

$\beta_{d,t}$ is a regression coefficient on the S&P 500 Index return in week t,

$R_{d,t}$ is weekly return on the S&P 500 Index in period week t,

$\varepsilon_{i,t}$ is random error term that has zero mean and zero correlation with the U.S. market portfolio.

H_0: $\beta_{d,t} = 1$

H_1: $\beta_{d,t} \neq 1$

H_0: $R^2_{WEBi} = R^2_{CEFi}$

H_1: $R^2_{WEBi} \neq R^2_{CEFi}$

The result of the regression equation gives an indication whether the security mimics the U.S. market. I run three single-factor regressions: one for WEBS-S&P 500 Index and two for closed-end country funds-S&P 500 Index. I compare their respective estimated beta coefficients and R-squared values and find that these securities serve as a diversification mechanism for U.S. investors.

WEBS and closed-end country funds are traded in the U.S.; however, their underlying securities generate cash flows in their respective foreign countries. The fact that WEBS experience small divergence from their net asset value and closed-end country funds are sold at substantial premiums or discounts poses the question: Do WEBS behave more like a U.S. security than their underlying assets? And, if so, would American investors obtain international risk diversification by investing in WEBS?

In order to investigate this issue, I use the "two-factor" model suggested by Chang, Eun, and Kolodny (1995):

$$R_{i,t} = \alpha_i + \beta^{US} R^{US}_{\ t} + \beta^{F}_{j} R^{F}_{j,t} + \varepsilon_{it}, \text{ where}$$

$R_{i,t}$ is the return on the ith fund in period t,

α_i is an intercept term,

R^{US}_t is the return on the U.S. market index proxied by the Standard and Poor 500 Index in period t,

$R^{F}_{j,t}$ is the residual obtained from regressing country j (the home country for the ith fund) market index return on the U.S. market return in period t,

β^{F}_{j} is the value exposure to the U.S. investors to the "orthogonal" foreign market risk,

β^{US} is the value exposure to the U.S. investors to the "orthogonal" domestic market risk,

ε_{it} is random error term that has zero mean and zero correlation with the U.S.market portfolio proxied by the Standard and Poor 500 Index in period t.

H_0: $\beta_{WEB\ U.S.} = \beta_{CEF\ U.S.}$

H_1: $\beta_{WEB\ U.S.} \neq \beta_{CEF\ U.S.}$

H_0: $\beta_{WEB\ U.S.} = \beta_{CEFNAV\ U.S.}$

H_1: $\beta_{WEB\ U.S.} \neq \beta_{CEFNAV\ U.S.}$

H_0: $\beta_{WEBf} = \beta_{CEFf}$

H_1: $\beta_{WEBf} \neq \beta_{CEFf}$

H_0: $\beta_{WEBf} = \beta_{CEFNAVf}$

H_1: $\beta_{WEBf} \neq \beta_{CEFNAVf}$

The "two-factor" model is run for WEBS and for both closed-end mutual funds and their underlying net assets, i.e., I run a regression for WEBS and two regressions for each closed-end country fund.

Since WEBS and closed-end funds offer American investors an opportunity to invest in foreign securities, they are often viewed as substitutes. Thus, the introduction of WEBS in 1996 may have affected the trading volume of closed-end country funds. Khorana, Nelling, and Trester (1998) examine the average trading volume of closed-end country funds after the inception of WEBS. They find that from April 1996 through October 1996 the average trading volume on the closed-end country funds decreased substantially after the introduction of WEBS. I examine the change in trading volume of WEBS and closed-end country funds for an extended time period (April, 1996 through December, 1999). The purpose of this comparison is to determine whether investors exhibit preference for passively managed WEBS and index funds versus actively managed closed-end country funds over a longer time.

H_0: *The average weekly trading volume of WEBS = The average weekly trading volume of closed-end country funds.*

H_1: *The average weekly trading volume of WEBS ≠ The average weekly trading volume of closed-end country funds.*

The empirical investigation of diversification benefits of foreign investments would be incomplete if the question of intertemporal patterns of the correlation coefficients among the international stock markets is not examined. Makridakis and Wheelwright (1974), Haney and Lloyd (1978), Watson (1980), Maldonado and

Saunders (1981), Cheung (1993) using principal component analysis conclude that pairwise correlation coefficients between world stock markets are low and unstable.

Other researchers use more sophisticated methodologies to investigate the comovements of international stock markets. Ripley (1973) uses factor analysis to explore the interrelationship among equity prices. Panton, Lessig, and Joy (1976) apply cluster analysis to investigate similar relationships. Hillard (1979) and Fischer and Palasvirta (1990) administer spectral methods to examine the interrelationship between world stock markets. Dwyer and Hafer (1988) employ a unit root test to study the comovements of stock markets in the Unites States, the United Kingdom, West Germany, and Japan. Eun and Sim (1989) and Chowdhury (1994) use vector autoregression to investigate the interdependence of world stock markets.

Cheung and Ho (1991), following Phillipatos, Christofi and Christofi's (1983) analysis, use principal component analysis with the Box-Test, and cluster analysis to examine the stability of correlation among seven world markets between January 1977 and June 1988, and find that the correlation matrix is stable over time

Cheung and Mak (1992) apply univariate autoregressive integrated moving average models suggested by Box and Jenkins (1976) to Asian-Pacific emerging markets. They find a causal relationship between emerging markets and two developed markets, Japan and the United States.

Corhay, Rad, and Urbain (1993) examine the common trends between European stock markets between 1975 and 1991. The empirical results from the cointegration analysis indicate the presence of a long-run trend in behavior of European markets.

Arshanapalli and Doukas (1993), using daily closing data from January 1980through May 1990, examine the linkages between stock prices in major world exchanges, such as Germany, the United Kingdom, France, Japan and the United States. The empirical results of the cointegration test reject the null hypothesis of no cointegration between the major world stock exchanges. Thus, the evidence supports an interrelationship between major world financial markets.

Blackman, Holden, and Thomas (1994), Gosh, Saidi, and Johnson (1999), and Olienyk, Schwebach, and Zumwalt (1999) use cointegration analysis developed by Granger (1986), and Engle and Granger (1987) to test whether there is a long-run relationship between different national stock markets. The empirical results indicate the presence of long-run interdependence between foreign equity markets.

Principal component analysis is widely used in the investigation of the stability of the relations among international markets (King (1966), Makridakis and Wheelwright (1974), Ripley (1973), and Philipatos, Christofi and Christofi (1983)).

According to Johnson (1998), principal component analysis (PCA) gives a good indication whether the relationships between foreign markets are stable over time, and whether these foreign markets are interdependent. This analysis is performed prior to performing any other kind of multivariate analysis, since it reduces the dimensionality of the data without losing any information.

A principal component analysis deals with the explanation of the variance-covariance structure through a few linear combinations of the original variables. The new variables obtained through principal component analysis are called the principal components. These variables are uncorrelated with each other. If p random variable,

$X_1, X_2, \ldots\ldots, X_p$, have the covariance matrix λ with eigenvalues, $\lambda_1 > \lambda_2 > \ldots\ldots > \lambda_p > 0$, we consider the following linear combination:

$$Y_1 = a_{11}X_1 + a_{12}X_2 + \ldots\ldots + a_{p1}X_p.$$

$$Y_2 = a_{12}X_1 + a_{22}X_2 + \ldots\ldots + a_{p2}X_p.$$

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$$Y_p = a_{1p}X_1 + a_{2p}X_2 + \ldots\ldots + a_{pp}X_p.$$

The principal components are those uncorrelated linear combinations $Y_1, Y_2, \ldots\ldots, Y_p$ whose variances are maximized. It can be shown that:

$$\Sigma\, Var\,(X_i) = \Sigma\, Var\,(Y_i) = \lambda_1 + \lambda_2 + \lambda p,$$

where the proportion of total variance due to the k^{th} principal component, where k^{th} are various common factors that influence the variability of the market returns, is equal to:

$$\lambda_1 + \lambda_2 + \ldots + \lambda p, \text{ where } k = 1, 2, \ldots\ldots, p.$$

I examine the comovements of seventeen foreign markets for different time periods: one-year, two-years, three-years, and four years. According to Cheung and Ho (1991), a stable intertemporal relationship would lead to similar principal components across different time periods. I perform four principal component analyses. However, PCA is not rigorous enough to test whether foreign markets exhibit stable interdependence over time.

Cointegration analysis, developed by Granger (1983, 1986) and completed by Engle and Granger (1987), incorporates the presence of nonstationarity, long-term relationships and the short-run dynamics in the modeling process. The developments in the theory of cointegration (Engle and Granger, 1987) provide new methods of testing international equity market interdependence both in a long- and a short-run

(Arshanapalli and Doukas (1993), Corhay, Rad and Urbain (1993), Ghosh, Saidi and Johnson (1999)).

One of the popular beliefs of economic theory is that there are some economic variables that should not significantly diverge from each other in a long-run. So, these variables may experience some degree of divergence over a short-run, but economic forces (for example, market mechanisms) will bring these variables together again. A financial time-series is said to be integrated of order one, *I(1),* meaning that the individual share price series has a linear trend, if it becomes stationary after differencing once, meaning that share price series are integrated of order zero, *I(0)*. If two series are integrated of order one, *I(1)*, they may have a linear combination, which is stationary, without requiring differencing and, if they do, they are said to be cointegrated. However, if one is *I(0)* and the other is *I(1)* they cannot be cointegrated and in the long run they must move apart.

The first step in the cointegration test of two markets to be interrelated requires determination of whether each of the security is integrated in order one, meaning that the individual share price series has a linear trend. Suppose there are two time series, X_t and Y_t. To test whether the series of X_t values is stationary, the Augmented Dickey-Fuller (ADF) (1981) and Phillips-Peron (PP) (1988) testing procedures are employed, since ADF test loses its power as the value of p increases. Because, the test statistic does not have a t-distribution, I use tables of significance levels provided by Dickey and Fuller (1979). The unit root test uses the following regression:

$$Y_t = a_1 Y_{t-1} + \varepsilon_t, \text{ where}$$

Y_t is the price of the security or its underlying net asset value in period t,

a_1 is a coefficient in period $t-1$, and

ε_t is a white-noise error term with a zero mean and a constant variance-covariance matrix.

H_0: $a_1 = 1$

H_1: $a_1 \neq 1$.

The unit root test is also applied to the first difference of the logarithm of prices, $log(P_t/P_{t-1})$, for WEBS, closed-end funds and their underlying asset values. The null and alternative hypotheses are the same: a_1 equals or does not equal to 1.

H_0: $a_1 = 1$

H_1: $a_1 \neq 1$.

Once it is established that the series are cointegrated, their dynamic structure can be exploited for further investigation. If all the share price series are $I(1)$, it is possible that combinations of the series may be cointegrated. If, for example, the share prices for a security and a market index, X_t and Y_t, are cointegrated, then the relationship:

$$X_t = a + \beta Y_t + u_t$$

has a disturbance, u, which is stationary with a mean zero. This implies that, since

$$u_t = X_t - a - \beta Y_t,$$

then as time passes, the two series move together and do not drift apart. Thus a portfolio with shares in two countries will not achieve any benefits of diversification. More generally, if the series $X_{1t}, X_{2t}, \ldots, X_{pt}$ are all $I(1)$ and are cointegrated, then

$$u_t = X_{1t} - a - \beta_2 X_{2t} - \ldots - \beta_p X_{pt}$$

is stationary and the series move together. There will be no diversification benefit from holding a portfolio of shares in these countries, compared to holding shares in just one country, thus the error term equals zero.

The purpose of the cointegration test is to uncover which market forces are responsible for movement of securities' market values: the home-country stock market, proxied by MSCI, or the U.S. stock market, proxied by S&P 500 Index. Once it is established that the series are cointegrated, their dynamic structure can be a subject of further investigation. Engle and Granger (1987) show that cointegration implies, and is implied by, the existence of an error correction representation of the indices involved. The error correction model (ECM) is estimated by:

$$\Delta X_t = a_0 + a_1 u_{t-1} + B_1(L)(x_t - x_{t-1}) + B_2(L)(y_t - y_{t-1}) + e_{1t},$$

$$\Delta Y_t = a_2 + a_3 u_{t-1} + B_3(L)(x_t - x_{t-1}) + B_4(L)(y_t - y_{t-1}) + e_{2t},$$ where

$B_1(L)$, $B_2(L)$, $B_3(L)$, $B_4(L)$ are polynomials

L is the lagged operator,

e_{1t}, e_{2t} are white noise error terms, and

u_{t-1} is the lagged value of the error term from the following cointegration regression:

$$X_t = a + \beta Y_t + u_t.$$

The ECM is estimated for WEBS, closed-end country funds and their underlying asset values. It has the standard interpretation: the changes in X_t are due to the immediate, short-run effect from the changes in Y_t, and to last period's error, u_{t-1}, which represents the long-run adjustment to past disequilibrium. Hence, the estimation of the ECM is

also expected to provide evidence about the long-run relationship and the nature of the adjustment process among international markets.

Finally, the last objective of this study is to examine the relationship between WEBS and closed-end country funds risk, asset size, expense ratios, return and portfolio turnover. These relationships are examined via a time-series, cross-sectional regression method developed by Fuller-Battese (1974) and applied by Droms and Walker (1994, 1995, and 1996). The analysis allows testing whether the WEBS and closed-end country funds risk/return relationship are consistent with the capital asset pricing model.

Return is the annualized unadjusted total rate of return. Annualized data are used since the turnover rate is publicly available only on an annual basis. The estimation of the relationship between WEBS and closed-end country funds risk, asset size, expense ratios, return and portfolio turnover is analyzed by estimating the cross-section, time-series regression model is:

Risk (measured by SD) = f(R, A, E, T) and *Risk (measured by SD/R)=f(R, A, E, T)*,

where

R is the annualized total rate of return for the security assuming that all dividends are reinvested.

Risk is measured by both the standard deviation of total returns and the coefficient of variation. The coefficient of variation is the most commonly used return adjusted measure of variation.

A is total assets. Total assets are measured in millions of dollars at year-end for each security.

E is total fund expenses. The expense ratio is the ratio of the security's total expenses as a percentage of average net asset value.

T is the turnover rate. The turnover rate is the percentage of the dollar value of the security's portfolio that is replaced during a particular year to average portfolio net asset value.

Thus, four models are estimated: two for WEBS and two for closed-end country funds, where return is calculated based on NAV.

Fuller and Battese (1974) employ a generalized least square regression model with an estimated covariance matrix. This approach employs a variance component model. The random errors of a classical regression model are decomposed to contain particular factors to take account of the cross-section and time series components of the statistical model. The authors use standard deviation to measure portfolio risk. The model is assumed to be linear and it is estimated as:

$$Risk = a + b_1 Return + b_2 A + b_3 E + b_4 T + u_{it}, \text{ where}$$

U is an error term with zero mean and constant variance-covariance matrix. These error terms can be decomposed into independently distributed terms representing F WEB (v_i, $i=1, 2, ..., F$) or closed-end country fund, T time periods (w_t, $t=1,2,....T$), and FT (e_{it}) random elements:

$$u_{it} = v_i + w_t + e_{it}, \; i=1,2,..., F \text{ and } t = 1, 2, ..., T.$$

Fuller and Battese assume each of the decomposed error terms has a zero mean with $\sigma^2_v \geq 0$, $\sigma^2_w \geq 0$, and $\sigma^2_e > 0$. They employ estimates of these variances to develop V,

the variance-covariance matrix for U, $E(UU') = V$. The elements of V are linear combinations of σ^2_v, σ^2_w and σ^2_e, and V^{-1} is the estimated covariance matrix for $E(uu')$. Fuller and Battese (1974) present the sufficient conditions for the generalized least square estimates to be unbiased if the errors are symmetric around zero, have fourth moments and the expectation of $(\sigma^2_e)^{-1}$ exists. The authors develop sufficient conditions for the generalized least-square estimators for the decomposed error model to have the same asymptotic distribution as the generalized least squares estimators for the time-series, cross-section model. One of the major benefits of the Fuller-Battese model is that the estimated parameters are not specific for a particular fund or fund group. The parameters represent the security' environment over a period of time. The model does not account for survivorship bias, since WEBS and closed-end country funds have not merged or been acquired during the sample period.

$\boldsymbol{H_0}$: $b_1 \neq 0$

$\boldsymbol{H_1}$: $b_1 = 0$

The return coefficient is anticipated to be positive because of the risk/return tradeoff in the context of the capital asset pricing model. Higher risk requires higher expected returns. All of the coefficients in the second models are numerically smaller because risk, one of the independent variables, is scaled while the rest of the independent variables and the dependent variables are the same for all six models.

$\boldsymbol{H_0}$: $b_2 \neq 0$

$\boldsymbol{H_1}$: $b_2 = 0$

The asset coefficient is anticipated to be positive due to the fact that WEBS and closed-end country funds may enjoy economies of scale.

H_0: $b_3 \neq 0$

H_1: $b_3 = 0$

The expense coefficient is anticipated to be greater than zero, which is consistent with the hypothesis that securities that incur higher expenses may employ more sophisticated research and innovative investment strategies to earn an appropriate rate of return.

H_0: $b_4 \neq 0$

H_1: $b_4 = 0$

Based on the empirical evidence (Droms and Walker (1994, 1995, 1996), Ippolito (1989)), the turnover ratio is anticipated to be unrelated to the security performance.

Standard and Poor's Depository Receipts (SPDRs) and Dow Jones Index Fund Series (DIAMONDS)

The purpose of this empirical inquiry is to determine the effectiveness of exchange-traded funds, SPDRs and DIAMONDS, as a diversification tool for American investors, and their risk and return characteristics. Over the years American investors have been offered a great variety of domestic diversification tools, however, the last decade is characterized by an increasing popularity of index and specialty mutual funds among individual and institutional investors. Index funds represent an alternative to higher cost investing in actively managed mutual funds. The theoretical concept of a perfect index fund, if one is attainable, provides investors with the best possible risk-return tradeoff. In theory, a perfect index fund would provide an investor with the best possible risk-return tradeoff (Good, Walter, Ferguson, et. al.(1976)). The financial theory assumes that investors are rational, risk-averse, wealth maximizing

market participants who prefer more utility to less utility. Thus, investors would prefer the highest ratio of expected return to risk. In this case, an index fund is the security that in theory is able to achieve this goal better than all other portfolios.

To accomplish this goal, the perfect equity index fund would invest in all available common stocks in proportion to their market value. Since 1993, AMEX has introduced a number of exchange-traded funds that have attracted American investors due to their low transaction and management costs, tax efficiency and high liquidity.

Good, Ferguson, and Treynor (1976), Calderwood (1977), Bogle (1998), and Simons (1999) address the question of diversification benefits of index mutual funds. The empirical results of these studies confirm the null hypothesis of using index funds as a means to achieve diversification goals.

Howe and Pope (1993) and Khorana and Nelling (1997) examine the performance of sector or industry specific mutual funds. The empirical investigations allow authors to determine that these mutual funds generate rates of return comparable to the traditional equity mutual funds. Thus, American investors would benefit from adding sector or industry specific mutual funds to their diversified portfolio.

The sample includes weekly returns on SPDRs, MidCap SPDRs, Sectors Specific SPDRs from May 1995 through December 24, 1999, DIAMONDS from January 1998 through December 24, 1999, and traditional equity mutual funds for the corresponding time periods. To measure the performance of SPDRs, MidCap SPDRs, Sectors Specific SPDRs, DIAMONDS (exchange-traded funds or ETF), and traditional equity mutual funds, their respective raw returns are calculated using the following formula:

$$R_t = (P_t - P_{t-1})/P_{t-1}, \text{ where}$$

P_t is the price of the fund in period *t*,

P_{t-1} is the price of the fund in period *t-1*.

All returns are dollar denominated. Dividends are not included in the computations of weekly returns. This is similar to the method used by Officer and Hoffmeister (1987) and Russell (1998).

In order to determine the mean-variance efficiency and indexing accuracy of exchange-traded funds the following single factor model suggested by Gibbons (1982) is applied:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}, \text{ where}$$

$R_{i,t}$ is the weekly return on the fund in period *t*,

α_i is an intercept term,

β_i is a regression coefficient on the respective market index return in week t,

$R_{m,t}$ is the weekly return on the market index in week *t*, where the Market Index for SPDRs and traditional equity mutual funds is the S&P 500 Index; MidCap SPDRs and MidCap index funds is the S&P 400 Index; Sector Specific SPDRs and sector index funds is the Sector Specific S&P Index, for DIAMONDS the underlying market index is the DJIA,

ε_{it} is random error term that has zero mean and zero correlation with the U.S. market portfolio proxied by the underlying Index in period *t*.

$\boldsymbol{H_0}$: $\beta_i = 1$

$\boldsymbol{H_1}$: $\beta_i \neq 1$

A single factor model is determined for each exchange-traded fund, and traditional index mutual fund. The examination of the estimated beta coefficient and

R-squared values from the single factor model for ETF and traditional index mutual funds give an indication of how well the security mimics the underlying market Index. Higher R-squared values for SPDRs-S&P 500 regression, MidCap SPDRs-S&P 400 Index regression, Sector Specific SPDRs-Sector Specific S&P Index regression, DIAMONDS-DJIA regression, and corresponding regression for traditional index mutual funds suggest their higher tracking accuracy and ability to mimic the behavior of the underlying market Index, and provide investors with the benefits of diversification.

H_0: *R-squared of exchange-traded funds = R-squared of traditional index mutual funds*

H_1: *R-squared of exchange-traded funds ≠ R-squared of traditional index mutual funds*

Due to the fact that ETFs invest in a narrower spectrum of equity, and, according to the Fund series Prospectus, are suppose to replicate the underlying Index with 95% tracking accuracy before expenses and transaction cost, it is reasonable to believe that these funds may retain similar unsystematic risk compared to the traditional index mutual funds. According to traditional index mutual fund profiles, these funds may exhibit different tracking accuracy of their underlying market index that varies from 65% to 99% before expenses and transaction cost.

H_0: σ *of return of exchange-traded funds* $=$ σ *of return of traditional equity mutual funds*

H_1: σ *of return of exchange-traded funds* $\neq$ σ *of return of traditional equity mutual funds*

Traditional approaches to measure the performance of mutual funds use historic returns to estimate expected performance. These measures do not take into

consideration the fact that risk and expected returns may vary due to changes in the macroeconomic environment.

Chen, Roll, and Ross (1986) suggest that a wide variety of macroeconomic factors, such as market returns, default risk, term risk, unanticipated changes in inflation, and unanticipated changes in a measure of economic performance, influence individual asset prices. Sharpe's (1982) empirical investigation of NYSE returns from 1931 through 1979 using factor analysis (FA) suggests that 40 percent of the variance in security returns is attributed to such factors as beta, dividend yield, size, bond beta, and alpha. Elton, Gruber and Blake (1996), through the estimation of a relative pricing model, attempt to explain expected returns for bond funds with fundamental economic variables. They find that such macroeconomic variables as market returns, default risk, term risk, unexpected changes in inflation, unanticipated changes in a measure of economic performance, index of aggregate bond returns and return on mortgage securities explain the expected returns of 123 bond mutual funds in a seven year period from January 1986 through December 1992. Khorana and Nelling (1997) examine the effect of macroeconomic variables on sector fund returns using factor analysis. They examine sector fund performance and diversification benefits from 1976 through 1992. Their empirical findings indicate that sector fund returns depend on the return of the S&P 500 Index, however, the economic interpretation of the second factor is less clear, but it appears to capture an unobservable essential difference between metal and other sectors (Khorana and Nelling, 1997).

In order to examine whether the exchange-traded funds are sensitive to changes in macroeconomic variables, I use factor analysis. According to Johnson (1998), factor analysis is concerned with explaining the covariance and/or correlation

structure among the measured variables. One basic objective of factor analysis is to determine whether the p response variables exhibit patterns of relationship with each other such that the variables can be partitioned into m subsets, each consisting of a group of variables tending to be more highly related to others within the subset than to those in other subsets. Another basic purpose of factor analysis is to derive a new set of uncorrelated variables, called *underlying factors*, with the hope that these new variables will give a better understanding of the data being analyzed. Suppose one observes a p-variate response vector $\boldsymbol{x}$ from a population that has mean $\boldsymbol{\mu}$ and variance-covariance matrix $\boldsymbol{\Sigma}$.

The factor analysis model assumes there are m underlying factors, where $m < p$, denoted by $f_1, f_2, f_3, \ldots f_m$, such that :

$$x_j = \lambda_{j1} f_1 + \lambda_{j2} f_2 + \ldots + \lambda_{jm} f_m + \eta_j, \quad \text{for } j = 1, 2, \ldots, p.$$

where x's have been centered about their means,

$f_1, f_2 \ldots f_m$ are the new variables called common factors,

$\eta_1, \eta_2, .. \eta_p$ are called specific factors, that describe the residual variation specific to the j^{th} response variable, and

λ_{jm} are multipliers, called correlation or loading factors.

To gain knowledge of whether exchange-traded and traditional index mutual funds are exposed to movements in key economic variables, I perform factor analysis of ETFs and traditional index mutual funds in order to determine the number of underlying common factors. Applying the Khorana and Nelling (1997) model, I perform an empirical investigation through regression analysis in order to obtain

economic intuition about the nature of the underlying factors. The regression model has the following form:

$$Rt = b_0 + b_1 Ret_t + b_2 CPI_t + b_3\, CONSEXP_t + b_4 TB3MO_t + b_5 TERMSPRD_t +$$

$$+ b_6 CORPSPRD_t + + b_7 DIVYLD_t + b_8 INDPROD_t, \text{ where}$$

Rt is the return on the security over period t,

Ret_t is the return on the S&P Index,

CPI_t is the percent change in the U.S. Consumer Price Index,

$CONSEXP_t$ is the percent change in the U.S. Index of Consumer Expectation, obtained by Conference Board Inc.

$TB3MO_t$ is the yield on three-month Treasury Bills,

$TERMSPRD_t$ is the difference in yields on long-term government bonds and three-month Treasury bills,

$CORPSPRD_t$ is the difference in yields on long-term corporate bonds and long-term government bonds,

$DIVYLD_t$ is the dividend yield on the CRSP value-weighted index,

$INDPROD_t$ is the percent change in industrial production,

b_0 is an intercept term, and

$b_1, \ldots..b_8$ are regression coefficients.

CHAPTER 4

EMPIRICAL RESULTS

Essay One

WEBS

Performance Comparison and Index Tracking Accuracy of WEBS and Closed-end Country Funds. Table 1 documents the mean-variance efficiency and indexing accuracy of WEBS relative to their home-country index. The examination of the estimated individual beta coefficients for WEBS suggests that their values are close to one and statistically significant. Also, the R-squared values are indicative of WEBS' moderately high Index tracking accuracy except for the Canadian WEB series. The R-squared values range from 85% for the Spain WEB series to 6% for the Canada WEB series. The results for Canada show the Canadian WEB Series' ineffectiveness in tracking its MSCI Index. According to the WEBS' 2000 Prospectus, WEBS series return can deviate from home-country index due to the presence of transaction costs and the fact that the series does not invest in every security comprising the benchmark. Each WEB series holds a representative sample of the securities in the MSCI Index that is selected using portfolio sampling technique. This technique considers each stock for inclusion in WEBS series based on its contribution to certain capitalization, industry, and fundamental investment

Table 1

Single-factor Model: WEBS and the MSCI Indices

$$R_{i,t} = \alpha_i + \beta_{f,t}R_{f,t} + e_{i,t,}$$

where $R_{i,t}$ is the return on security i at time t, $R_{f,t}$ is the return on the respective MSCI index at time t, $\beta_{f,t}$ is the coefficient on the corresponding country index, and $e_{i,t}$ is an error term

Country	**α**	**β**	**R^2**
Australia	-0.0006 (0.563)	0.9663 (0.000)	71
Austria	0.0006 (0.618)	0.9648 (0.000)	72
Belgium	-0.0020 (0.179)	0.9122 (0.000)	55
Canada	0.0008 (0.820)	0.1152 (0.002)	6
France	0.0004 (0.665)	0.9812 (0.000)	83
Germany	0.0004 (0.802)	0.8626 (0.000)	51
Hong Kong	-0.0004 (0.891)	0.9493 (0.000)	60
Italy	-0.0007 (0.664)	0.9234 (0.000)	69
Japan	0.0005 (0.668)	0.9583 (0.000)	82
Malaysia	-0.0012 (0.812)	0.6325 (0.000)	34
Mexico	-0.0003 (0.884)	1.0064 (0.000)	77
Netherlands	-0.0011 (0.276)	0.9074 (0.000)	79
Singapore	0.0007 (0.875)	1.1839 (0.000)	46
Spain	-0.0009 (0.401)	0.9338 (0.000)	85
Sweden	0.0024 (0.634)	0.4207 (0.000)	15
Switzerland	-0.0008 (0.528)	0.9688 (0.000)	76
United Kingdom	-0.0000 (0.972)	1.0792 (0.000)	73
Average		***0.8686***	***61***

Note: p-values are reported in parenthesis. The H_0: $\beta_{f,t} = 1$ is rejected only for Singapore WEB at 5% confidence level. For other WEBS' H_0: $\beta_{f,t} = 1$ at 5% confidence level.

characteristics. WEBS series' baskets are weighted by market value and can get top-heavy in some markets. The WEBS series' portfolio is rebalanced at times to mirror changes in the underlying MSCI Index or to adjust the WEBS' performance to the relevant MSCI Index. Such rebalancing leads to transaction costs and other expenses

for WEBS. Furthermore, each WEB series invests approximately 95% of its asset portfolio in stocks that are representative of its benchmark series. The remaining 5% of its assets can be invested in instruments ranging from money market securities to combinations of stock index futures contracts, options on future contracts, cash, local currency and forward currency futures. Finally, ETFs have to comply with the U.S. IRS rulings and other regulatory constraints that do not affect the tracking accuracy of the underlying MSCI Index, and are a subject to a different foreign withholding tax rate. Therefore, WEBS do not always track its benchmark portfolio with the same degree of accuracy as would an investment vehicle that invests in every security included in the benchmark.

Examination of the estimated beta coefficients and R-squared values for Pacific-Rim countries' WEBS shows that they are below the mean value. The Asian crisis had an adverse effect on the economies of the Pacific-Rim countries in late 1998 and 1999. According to the WEBS Prospectus 2000, currency volatility and general economic instability led to the imposition of stringent capital controls in September 1998 on Malaysia series. The series was forced to suspend the creation of new units, and therefore, the Malaysia series began trading at prices that deviated substantially from their NAV.

The null hypothesis of WEBS' systematic risk equal to one is rejected only for the Singapore WEB series at a 5% confidence level. As a small open economy that is specialized in electronic goods manufacturing, Singapore is particularly vulnerable to changes in external macroeconomic environment.

Further, the R-squared of some European WEBS are close to the sample mean except for Sweden (14%), Germany (50%), and Belgium (55%) WEB series. WEBS

are faced with currency and exchange rate risks and the series return is affected by the overall economic environment of the home-country. In the late 1990s, European countries started gearing towards the creation of the European Monetary Union (EMU). One of the main goals of the EMU is to have a single currency and one interest rate for member countries. As the member nations had to meet certain criteria in budget deficit, inflation, national debt, and unemployment, their stock markets have experienced some amount of volatility. The degree of this effect was impacted by each country's relative economic strength. Also, consolidation of West and East Germany added additional volatility to the German economy.

Next, I determine the mean-variance efficiency and indexing accuracy of closed-end country funds based on their market price and NAV returns. The empirical results are presented in Table 2. Average R-squared for closed-end country funds market price returns is 40.27% versus 67.73% for NAV returns. Closed-end country fund MP returns do not follow the local market as close as their NAV returns. The fact that NAV returns fit the single-factor model better is not surprising. Previous empirical research on market segmentation and international diversification documents that NAV and share prices are exposed to different risk factors.

Closed-end country fund market prices contain a U.S. market risk factor whereas, the NAVs are exposed to the home-country risk (e.g., Bailey and Lim (1992), Johnson, Schneeweis, and Dinning (1993), Chang, Eun, and Kolodny (1995), Russell (1998), Chandar and Patro (2000), Patro (2000)). The R-squared values based on closed-end country funds' MPs range from 6% for the Malaysia closed-end fund to 59% for the Mexico Equity and Income fund. The R-squared values based on their NAVs align between 51% for Austria fund to 92% for Swiss Helvetia fund. Also, the

Table 2

Single-factor Model: Closed-end Country Fund and MSCI Indices

$$R_{i,t} = \alpha_i + \beta_{f,t}R_{f,t} + e_{i,t,}$$

where $R_{i,t}$ is the return on security i at time t, $R_{f,t}$ is the return on the respective MSCI index at time t, $\beta_{f,t}$ is the coefficient on the corresponding country index, and $e_{i,t}$ is an error term

	MP return			NAV return		
Country	**α**	**β**	**R^2**	**α**	**β**	**R^2**
Australia	-0.0009 (0.606)	0.7684 (0.000)	39	-0.0012 (0.049)	0.9439 (0.000)	88
Austria	0.0025 (0.216)	0.6371 (0.000)	27	0.0022 (0.144)	0.8154 (0.000)	51
France	-0.0010 (0.508)	0.9604 (0.000)	57	-0.0011 (0.218)	0.9146 (0.000)	78
Germany	-0.0007 (0.752)	0.8561 (0.000)	40	-0.0021 (0.219)	1.1705 (0.000)	67
Italy	0.0003 (0.839)	0.7793 (0.000)	53	0.0002 (0.791)	0.8573 (0.000)	85
Japan	-0.0006 (0.833)	0.7272 (0.000)	29	-0.0002 (0.853)	0.7759 (0.000)	71
Malaysia	-0.0027 (0.584)	0.2431 (0.000)	6	-0.0049 (0.118)	0.5904 (0.000)	53
Mexico	-0.0030 (0.216)	0.8280 (0.000)	56	-0.0026 (0.315)	0.7394 (0.000)	49
Singapore	-0.0029 (0.301)	0.7454 (0.000)	40	-0.0012 (0.471)	0.6090 (0.000)	56
Spain	0.0002 (0.934)	0.7532 (0.000)	38	-0.0009 (0.571)	0.7653 (0.000)	55
Switzerland	-0.0007 (0.561)	0.7840 (0.000)	58	-0.0003 (0.643)	0.9544 (0.000)	92
Average		***0.7347***	***40.27***		***0.8306***	***67.73***

Note: p-values are reported in parenthesis. The H_0: $\beta_{f,t} = 1$ is rejected only for Germany fund NAV at 5% confidence level.

null hypothesis of the closed-end NAV systematic risk being equal to the market risk is rejected only for the Germany fund at a 5% confidence level. As I described earlier, the unification process of Western and Eastern Germany may add additional volatility to German equity market.

The empirical evidence presented in Tables 1 and 2 shows that WEBS indeed provide higher tracking accuracy of their benchmark index than closed-end country funds. This finding supports previous empirical research (e.g., Khorana, Nelling, and Trester (1998), Chang, Eun, and Kolodny (1995), and Russell (1998)) on market segmentation and international diversification, and documents that WEBS exhibit higher tracking accuracy of their underlying MSCI Index compared to closed-end country funds.

Also, my empirical findings validate earlier empirical research that NAV and market prices are exposed to different risk factors, and closed-end country fund market prices contain the U.S. market risk factor.

Diversification Ability of WEBS and Closed-end Country Funds. Next, I investigate, via the single-factor model, whether WEBS and closed-end country funds' returns depend on the U. S. market. Table 3 provides evidence on diversification benefits for WEBS relative to the S&P 500 Index. The explanatory power of the single-factor model for WEBS using S&P 500 Index as the benchmark index is lower (22%) relative to the home-country MSCI Index (61%). The estimated beta coefficient suggests that WEBS retain some exposure to the U.S. market risk and, thus, their performance depends on their underlying home-country market and the U.S. market performances. The null hypothesis that the U.S. risk factor for WEBS equals to the U. S. market risk is rejected at a 5% confidence level only for Mexico

WEB. The Mexican economy is heavily dependent on the health of the U.S. economy, since the United States is the biggest importer of Mexico's exports. Also in the past ten years, Mexico has suffered from a number of severe currency devaluation, and is experiencing domestic political unrest.

The examination of the beta coefficient for closed-end country funds, presented in Table 4, suggests that closed-end country funds market prices behave more as the S&P 500 Index, while their underlying values do not. Johnson, Schneeweis, and Dinning (1993) find that closed-end country fund market returns are more sensitive to U.S. stock market returns than their NAVs. Bodurtha, Kim, and Lee's (1995) empirical results show that closed-end country funds market prices co-move with the U.S. market, while their NAVs do not. Chandar and Patro (2000) find that closed-end country fund NAVs are more sensitive to local market returns than to global markets returns. My finding validates previous studies that question diversification abilities of closed-end country funds.

My investigation of the diversification abilities of WEBS and closed-end country funds is continued with the isolation of the "true" diversification benefits provided by WEBS and closed-end country funds using the two-factor model suggested by Chang, Eun, and Kolodny (1995). The empirical results presented in Table 5 show that even though WEBS provide some diversification for American investors (home country beta is .80), they, at the same time, retain substantial exposure to the U. S. market (WEBS' U.S. market beta is .78). Opposed to Khorana, Nelling, and Trester (1998) findings, I conclude that WEBS' diversification potential diminishes slightly over the years.

Table 3

Single-factor Model: WEBS and the S&P 500 Index

$$R_{i,t} = \alpha_i + \beta_{d,t}R_{d,t} + e_{i,t,}$$

where $R_{i,t}$ is the return on security i at time t, $R_{d,t}$ is the return on the S&P 500 Index at time t, $\beta_{d,t}$ is the coefficient on the S&P 500 Index, and $e_{i,t}$ is an error term

Country	**α**	**β**	**R^2**
Australia	-0.0028 (0.123)	0.4909 (0.000)	20
Austria	-0.0028(0.175)	0.4069 (0.000)	10
Belgium	-0.0016 (0.430)	0.4751 (0.000)	14
Canada	-0.0016 (0.582)	0.8872 (0.000)	28
France	0.0002 (0.907)	0.7307 (0.000)	39
Germany	-0.0004 (0.838)	0.7117 (0.000)	25
Hong Kong	-0.0032 (0.377)	1.1640 (0.000)	25
Italy	-0.0003 (0.893)	0.7091 (0.000)	21
Japan	-0.0015 (0.575)	0.4117 (0.001)	7
Malaysia	-0.0066 (0.272)	1.1949 (0.000)	11
Mexico	-0.0032 (0.364)	1.3287 (0.000)	33
Netherlands	-0.0017 (0.375)	0.6641 (0.000)	33
Singapore	-0.0049 (0.420)	1.2000 (0.000)	12
Spain	-0.0004 (0.856)	0.7264 (0.000)	28
Sweden	0.0014 (0.787)	0.8299 (0.000)	11
Switzerland	-0.0014 (0.505)	0.6259 (0.000)	26
United Kingdom	0.0001 (0.935)	0.6258 (0.000)	37
Average		***0.7755***	***22.35***

Note: p-values are reported in parenthesis. The H_0: $\beta_{d,t} = 1$ is rejected only for Mexico fund NAV at 5% confidence level.

Table 4

Single-factor Model: Closed-end Country Funds and the S&P 500 Index

$$R_{i,t} = \alpha_i + \beta_{d,t} R_{d,t} + e_{i,t,}$$

where $R_{i,t}$ is the return on security i at time t, $R_{d,t}$ is the return on the S&P 500 index at time t, $\beta_{d,t}$ is the coefficient on the U.S. market index, and $e_{i,t}$ is an error term

	MP return			NAV return		
Country	**α**	**β**	**R^2**	**α**	**β**	**R^2**
Australia	-0.00314 (0.085)	0.6466 (0.000)	27	-0.0017 (0.308)	0.3154 (0.000)	10
Austria	-0.0002 (0.932)	0.5611 (0.000)	17	0.0003 (0.886)	0.3692 (0.000)	9
France	-0.0004 (0.823)	0.7753 (0.000)	31	0.0002 (0.891)	0.5709 (0.000)	25
Germany	-0.0030 (0.208)	0.8193 (0.000)	26	-0.0013 (0.491)	0.4847 (0.000)	16
Italy	0.0010 (0.646)	0.6444 (0.000)	20	0.0018 (0.367)	0.5253 (0.000)	17
Japan	-0.0006 (0.895)	0.8270 (0.000)	10	0.0027 (0.288)	0.2258 (0.037)	2
Malaysia	-0.0058 (0.252)	0.6562 (0.002)	5	-0.0087 (0.049)	0.7925 (0.000)	8
Mexico	-0.0041 (0.205)	1.0847 (0.000)	25	-0.0025 (0.446)	0.7700 (0.000)	13
Singapore	-0.0056 (0.086)	0.9947 (0.000)	22	-0.1845 (0.447)	0.4682 (0.000)	10
Spain	0.0011 (0.663)	0.6611 (0.000)	17	0.0009 (0.677)	0.4907 (0.000)	13
Switzerland	-0.0015 (0.378)	0.6058 (0.000)	28	-0.0002 (0.898)	0.4714 (0.000)	19
Average		***0.7524***	***20.73***		***0.4986***	***12.91***

Note: p-values are reported in parenthesis. I fail to reject the H_0: $\beta_{d,t} = 1$ for all closed-end country funds at 5% confidence level.

The empirical results for closed-end country funds using the two-factor model are presented in Table 6. The closed-end country funds' market prices have a higher U. S. beta than the home country-beta (.74 vs. .63). The closed-end country funds' underlying assets have a higher home-country beta than the U. S. beta (.83 vs. .53). So the underlying asset base of the closed-end country funds displays the true diversification gains, indicating that there is no substitute for direct foreign investments.

These findings corroborate the argument of the recent research on diversification benefits achieved via exchange-listed mutual funds. At the same time, the results of the two-factor model for WEBS and closed-end country funds indicate WEBS' greater effectiveness as a substitute for direct foreign investments in economies that still contain cash flow barriers and restrictions on international investments.

Substitution Effect of WEBS Versus Closed-end Country Funds. Table 7 presents the change in average weekly trading volume for WEBS and closed-end country funds from April 1996 through December 1999 (after WEBS' listing on the AMEX) and from July 1993 through March 1996 (before WEBS' listing on the AMEX). The average weekly trading volume for WEBS is 41,000 shares. Singapore WEBS experiences the highest trading volume of 74,200 shares per week. The least actively traded WEB series was for Sweden, with an average weekly trading volume of 4,200 shares. The average weekly trading volume for Singapore fund before WEBS' inception was 176,500 shares and declines to 139,000 shares after March

Table 5

Two-factor Model: WEBS

$$R_{i,t} = \alpha_i + \beta^{US}{}_i R^{US}{}_{,t} + \beta^{F}{}_j R^{F}{}_{j,t} + e_{i,t}$$

where $R_{i,t}$ is the return on security i at time t, $R^{US}{}_t$ is the return on the US stock index (S&P 500), $R^{F}{}_{j,t}$ is the residual from a regression of the respective MSCI index returns for security on the S&P 500 returns, $\beta^{US}{}_i$, $\beta^{F}{}_j$ are coefficients, and $e_{i,t}$ is an error term

Country	α	β_{US}	$\beta_{home\text{-}country}$	Adj. R^2	CN	Durbin-Watson
Australia	-0.0028 (.009)	0.4909 (.000)	0.9008 (.000)	72	1.17196	2.64
Austria	-0.0028 (.016)	0.4069 (.000)	0.9452 (.000)	72	1.20555	2.70
Belgium	-0.0016 (.269)	0.4751 (.000)	0.8552 (.000)	56	1.22040	2.49
Canada	-0.0016 (.579)	0.8872 (.000)	0.0059 (.082)	28	1.14749	2.78
France	-0.0002 (.825)	0.7307 (.000)	0.9278 (.000)	83	1.20093	2.73
Germany	-0.0004 (.799)	0.7117 (.000)	0.7550 (.000)	52	1.18758	3.00
Hong Kong	-0.0032 (.206)	1.1640 (.000)	0.8373 (.000)	63	1.17904	2.79
Italy	-0.0003 (.830)	0.7091 (.000)	0.8768 (.000)	69	1.17905	2.74
Japan	-0.0015 (.200)	0.4117 (.000)	0.9418 (.000)	82	1.18353	2.92
Malaysia	-0.0066 (.190)	1.1949 (.000)	0.5787 (.000)	37	1.18353	2.57
Mexico	-0.0032 (.116)	1.3287 (.000)	0.9593 (.000)	77	1.19409	2.84
Netherlands	-0.0015 (.147)	0.6547 (.000)	0.8427 (.000)	80	1.14153	2.44
Singapore	-0.0049 (.302)	1.2000 (.000)	1.1122 (.000)	46	1.18693	2.79
Spain	-0.0004 (.691)	0.7264 (.000)	0.9108 (.000)	85	1.16862	2.85
Sweden	0.0014 (.778)	0.8299 (.000)	0.3340 (.000)	18	1.16299	2.80
Switzerland	-0.0009 (.475)	0.6078 (.000)	0.9170 (.000)	77	1.20341	2.41
United Kingdom	0.0001 (.898)	0.6528 (.000)	0.9562 (.000)	75	1.17789	2.86
Average		***0.7754***	***0.8033***	***63***		

Note 1: p-values are reported in parenthesis.

Note 2: According to the results of the paired sample t-test based on market prices $\beta^{US}{}_{WEB} \neq \beta^{US}{}_{CEF}$, $\beta^{F}{}_{WEB} \neq \beta^{F}{}_{CEF}$ for Australia, Austria, France, Germany, Japan, Italy, Malaysia, Mexico, Singapore, Spain, and Switzerland at 5% confidence level.

Note 3: Also, based on the results of the paired sample t-test based on net asset values $\beta^{US}{}_{WEB} \neq \beta^{US}{}_{CEF}$ for Australia, Austria, France, Germany, Japan, Italy, Malaysia, Mexico, Singapore, Spain, and Switzerland, and $\beta^{F}{}_{WEB} \neq \beta^{F}{}_{CEF}$ for Australia, Austria, France, Germany, Italy, Japan, Mexico, Singapore, and Spain at 5% confidence level.

Table 6

Two-factor Model: Closed-end Country Funds

$$R_{i,t} = \alpha_i + \beta^{US} R^{US}_{\ t} + \beta^{F}_{\ j} R^{F}_{j,t} + e_{i,t},$$

where $R_{i,t}$ is the return on security i at time t, $R^{US}_{\ t}$ is the return on the US stock index (S&P 500), $R^{F}_{j,t}$ is the residual from a regression of the respective MSCI index returns for security on the S&P 500 returns, β^{US}, $\beta^{F}_{\ j}$ are coefficients, and $e_{i,t}$ is an error term

Country	MP return						NAV return					
	α	β_{US}	$\beta_{home\text{-}country}$	Adj. R^2	CN	Durbin-Watson	α	β_{US}	$\beta_{home\text{-}country}$	Adj. R^2	CN	Durbin-Watson
Australia	-0.0031 (.042)	0.6466 (.000)	0.6154 (.000)	48	1.2073	2.41	-0.0017 (.005)	0.3154 (.000)	0.9611 (.000)	88	1.2205	2.03
Austria	-0.0002 (.925)	0.5611 (.000)	0.5299 (.000)	33	1.2072	2.10	0.0003 (.845)	0.3692 (.000)	0.7905 (.000)	51	1.2032	1.98
France	-0.0004 (.773)	0.7753 (.000)	0.8428 (.000)	58	1.2072	2.57	0.0002 (.799)	0.5710 (.000)	0.9446 (.000)	78	1.1989	2.18
Germany	-0.0020 (.371)	0.8550 (.000)	0.6823 (.000)	41	1.2073	2.17	-0.0009 (.616)	0.7529 (.000)	1.1849 (.000)	66	1.1995	2.64
Italy	0.0010 (.544)	0.6444 (.000)	0.7121 (.000)	54	1.2073	2.28	0.0018 (.037)	0.5253 (.000)	0.8628 (.000)	85	1.2072	1.87
Japan	-0.0033 (.258)	0.6363 (.000)	0.6766 (.000)	33	1.2073	2.26	-0.0014 (.300)	0.3086 (.000)	0.7652 (.000)	71	1.2185	2.49
Malaysia	-0.0061 (.221)	0.6429 (.003)	0.2073 (.002)	8	1.1925	2.24	-0.0087 (.006)	0.7925 (.000)	0.5659 (.000)	54	1.1925	2.20
Mexico	-0.0041 (.089)	1.0847 (.000)	0.7682 (.000)	58	1.2072	2.31	-0.0025 (.321)	0.7700 (.000)	0.7509 (.000)	49	1.2151	2.28
Singapore	-0.0056 (.039)	0.9947 (.000)	0.5792 (.000)	45	1.2032	2.44	-0.0018 (.273)	0.4682 (.000)	0.5865 (.000)	57	1.2143	2.48
Spain	.0011 (.612)	0.6611 (.000)	0.6800 (.000)	38	1.2073	2.05	0.0009 (.562)	0.4907 (.000)	0.7933 (.000)	55	1.2032	1.97
Switzerland	-0.0001 (.434)	0.5876 (.000)	0.6850 (.000)	61	1.1926	2.48	0.0005 (.404)	0.4708 (.000)	0.9695 (.000)	92	1.1926	2.39
Average		***0.7354***	***0.6344***	***43.36***				***0.5304***	***0.8341***	***67.82***		

P-value is indicated in parenthesis.

Table 7

Average Weekly Trading Volume (thousands of shares):
WEBS and Closed-end Country Funds

Country	WEBS	Closed-end country funds	
		07/93-4/96	4/96-12/99
Australia	15.6	247.6	246.9*
Austria	32.1	170.9	172.7*
Belgium	45.4	-	-
Canada	9.8	-	-
France	14.4	277.0	221.5*
Germany	27.0	174.6	201.7*
Hong Kong	58.5	-	-
Italy	25.8	129.8	159.8*
Japan	21.1	307.5	242.8*
Malaysia	10.8	217.8	212.8*
Mexico	20.1	352.6	213.2*
Netherlands	5.4	-	-
Singapore	74.2	176.5	139.0*
Spain	6.9	159.4	156.6*
Sweden	4.2	-	-
Switzerland	11.4	282.3	237.0*
United Kingdom	26.5	-	-
Average	***41.0***	***226.9***	***200.4***

Note: According to paired sample t-test the hypothesis that the mean volume before the WEBS' listing is different for closed-end country funds from the mean volume after WEBS' listing is accepted for Germany, Japan, Malaysia, Mexico, Singapore, and Switzerland.

* Significant at the five percent level.

1996. The paired-sample t-test results indicate that on average closed-end country funds experienced a statistically significant decline in mean weekly trading volume after WEBS' inception. In contrast to the earlier finding of Khorana, Nelling, and Trester (1998), I conclude that WEBS have experienced an increasing popularity among American investors as an international diversification tool compared to closed-end country funds.

Investigation of Intertemporal Patterns of the Interdependence among International Equity Markets. An increasing body of empirical research investigates intertemporal patterns of the interdependence among international stock markets. According to the market segmentation hypothesis, the growing globalization trends and foreign equity markets interdependence diminishes portfolio diversification benefits of international equity investments.

Following the empirical approach suggested by Makridakis and Whellwright (1974), Haney and Lloyd (1978), Watson (1980), and Cheung (1993), I use principal component analysis to examine the linkages between foreign equity markets and stability of these relationships for WEBS and closed-end country funds. Table 8 presents the empirical results of principal component analysis over four time periods: 1 year, 2 years, 3 years and 4 years. The empirical findings indicate that over a four year period, the interdependence among seventeen WEBS and the S&P 500 Index becomes more stable. In the first year, there are 6 principal components; however, the last three principal components have very marginal effects on the relationship between 18 equity markets (their eigenvalues are very small: 1.353, 1.106, and 1.067). Beginning in the second year, there are only three principal components that are common for all eighteen equity markets. Thus, the structural relationship among 18 equity markets has become more stable over a longer time horizon.

The investigation of an intertemporal relationship among closed-end funds NAV and the S&P 500 Index indicates that there were 4 principal components in 1996. As the time horizon increases to two and three years, the number of principal components decreases to 2. In the last period, which covers four years, the number of principal components increases to 3; however, the third principal component has a

Table 8

Principal Component Analysis: WEBS Returns
and Closed-end Country Funds NAV Returns

Component	Initial eignevalues					
	Total WEBS returns	Total CEF NAV returns	% of variance WEBS returns	% of variance CEF NAV returns	Cumulative % WEBS retuns	Cumulative % CEF NAV returns
1-year						
1	4.529	4.382	25.164	36.513	25.164	36.513
2	2.356	1.577	13.088	13.138	38.252	49.651
3	2.125	1.291	11.807	10.760	50.059	60.412
4	1.353	1.162	7.518	9.683	57.577	70.095
5	1.106		6.145		63.722	
6	1.067		5.930		69.652	
2 years						
1	8.962	4.423	49.789	36.855	49.789	36.855
2	2.010	1.867	11.165	15.558	60.953	52.412
3	1.236	1.256	6.864	10.471	67.818	62.883
3 years						
1	8.270	5.911	45.947	49.257	45.947	49.257
2	1.923	1.781	10.686	14.845	56.633	64. 102
3	1.111		6.172		62.804	
4 years						
1	8.090	5.332	44.946	41.017	44.946	41.017
2	1.838	1.569	10.213	12.067	55.158	53.083
3	1.088	1.053	6.043	8.101	61.201	61.184

low eigenvalue (1.053) and can be ignored. Based on the PCA results, I conclude that the number of principal components for closed-end country funds stays the same over four time periods. Thus, the relationship between closed-end country funds and the S&P 500 Index exhibits stability over a longer period of time.

Principal component analysis gives a good first indication about the stability of the relationship among foreign equity markets, but it does not provide an economic intuition to the explanation of the identified principal components. In order to acquire an insight for the driving forces of eighteen foreign equity markets, I employ factor analysis (FA).

Table 9 presents the results of factor analysis for WEBS and closed-end country funds. The empirical results confirm the principal component analysis finding that the intertemporal relationship between WEBS, closed-end country funds and the S&P 500 Index becomes more stable with time.

Empirical findings for WEBS and the S&P 500 Index presented in Table 10 indicate that 18 equity markets are loaded on three factors. Austria, Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and United Kingdom are loaded on "European market" factor. Australia, Canada, Hong Kong, Japan, Malaysia, and Singapore are loaded on "Asia-Pacific market" factor. And finally, USA and Mexico are loaded on "US market" factor. The empirical results validate previous empirical findings by Philippatos, Christofi and Christofi (1983), and Cheung and Ho (1991) that intertemporal relations between world equity markets and the U.S. market become more stable over time, which implies that constructing an ex-ante portfolio of longer duration using more extensive data sample carries less risk than those of shorter duration using less extensive time series data.

The empirical results from FA for closed-end country funds presented in Table 10 show that there are 2 common factors for eleven equity markets. Australia, Malaysia, Japan and Singapore are loaded on the "Asia-Pacific market" factor.

Table 9

Factor Analysis: WEBS Returns and Closed-end Country Funds NAV Returns

Component	Initial eigenvalues					
	Total WEBS returns	Total CEF NAV returns	% of variance WEBS returns	% of variance CEF NAV returns	Cumulative % WEBS returns	Cumulative % CEF NAV returns
1-year						
1	2.490	4.006	13.835	33.381	13.835	33.381
2	2.218	1.162	12.324	9.683	26.159	43.064
3	1.606	0.919	8.921	7.655	35.080	50.719
4	1.551	0.773	8.616	6.438	43.696	57.156
5	1.218		6.769		50.465	
6	0.956		5.313		55.778	
2 years						
1	5.910	4.002	32.833	33.354	32.833	33.354
2	3.355	1.513	18.641	12.608	51.474	45.962
3	1.792	0.746	9.957	6.216	61.430	52.178
3 years						
1	7.883	5.911	43.796	49.257	43.796	49.257
2	1.470	1.781	8.169	14.845	51.965	64.102
3	0.650		3.610		55.575	
4 years						
1	5.112	4.879	28.401	37.531	28.401	37.531
2	2.886	1.151	16.034	8.854	44.435	46.385
3	1.659	0.684	9.214	5.262	53.650	51.647

Austria, France, Germany, Italy, Spain, Switzerland, Mexico, and USA are loaded on the "US market" factor. Thus, factor analysis results indicate that American investors may achieve greater diversification benefits by including exchange-traded funds representing different geographical areas to their investment portfolio (e.g. Koch and Koch (1991)). At the same time, the PCA and FA results for the S&P 500 Index and closed-end country funds should be interpreted cautiously, since Belgium, Canada,

Hong Kong, Netherlands, Sweden, and United Kingdom do not have a corresponding closed-end country fund available to American investors.

Due to the fact that PCA and FA are not vigorous enough to test the stability of interdependence of foreign equity markets over time, I follow the approach of Ghosh, Saidi, and Johnson (1999) and use cointegration analysis to look for evidence of a long-term relationship between the U.S. and foreign equity markets. All the equity index series and closed-end country funds market prices and NAVs are tested for stationarity. The results of the weighted symmetric (WS), Dickey-Fuller (DF), and Phillips-Perron (PP) tests are shown in Tables 11 through 16.

The WEBS and closed-end country funds series demonstrate that each has a unit root in its first log differences. Since, it is established that each series is I(1), the next step is to test whether there exists a linear combination of two corresponding series that is I(0). If this is found, the two series are cointegrated. Results of the Johansen trace tests for cointegration are presented in Tables 17 and 18.

The cointegration results have been corrected for the finite sample size bias according to the correction suggested by Cheung, and Lai (1993) and Reimers (1993). The finite-sample correction multiples the Johansen test statistic by the scale factor

$$(T-pk)/T, \text{ where}$$

T is a sample size,

p is number of lags,

k is number of variables.

The asymptotic critical values obtained from Osterwald-Lenum (1992) are presented in Appendix B.

Table 10

Rotated Factor Matrix: WEBS Returns, Closed-end Country Funds NAV Returns, and the S&P 500 Index

WEBS/Closed-end Country funds	1 year						2 years			3 years			4 years		
	Factor						Factor			Factor			Factor		
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3
Australia: WEB	-0.02	-0.01	-0.12	0.70	0.16	0.25	0.183	0.554	0.235	0.236	0.557	0.271	0.235	0.535	0.283
Australia: CEF	0.33	0.86	0.00	-0.24			0.419	0.601	0.109	0.575	0.363		0.292	0.391	0.183
Austria: WEB	0.00	0.42	0.11	0.78	0.14	-0.12	0.676	0.246	0.011	0.663	0.238	0.018	0.642	0.221	0.004
Austria: CEF	0.47	0.29	0.00	0.28			0.638	0.000	0.122	0.782	0.000		0.587	0.122	0.187
Belgium: WEB	-0.19	0.22	0.58	-0.19	0.23	-0.07	0.772	0.255	-0.027	0.741	0.227	-0.004	0.743	0.221	0.018
Canada: WEB	0.29	0.05	0.68	0.23	-0.04	0.15	0.144	0.447	0.153	0.169	0.402	0.142	0.167	0.403	0.153
France: WEB	0.22	0.40	0.18	0.25	0.25	0.75	0.781	0.293	0.309	0.753	0.278	0.279	0.744	0.270	0.317
France: CEF	0.33	0.37	0.00	0.49			0.718	0.189	0.000	0.867	-0.214		0.795	0.193	0.000
Germany: WEB	0.06	0.60	0.10	0.08	-0.17	-0.03	0.833	0.247	0.207	0.798	0.281	0.202	0.785	0.272	0.221
Germany: CEF	0.60	0.11	0.13	0.26			0.707	0.437	0.000	0.756	-0.291		0.707	0.206	0.197
Hong Kong: WEB	0.04	0.52	0.08	0.07	0.43	0.18	0.142	0.706	0.285	0.168	0.708	0.215	0.150	0.651	0.206
Italy: WEB	-0.05	-0.03	0.05	0.13	0.54	0.06	0.702	0.052	0.370	0.581	0.037	0.407	0.536	0.085	0.399
Italy: CEF	0.15	0.83	0.29	0.46			0.514	0.000	0.170	0.701	-0.268		0.630	0.141	0.167
Japan: WEB	-0.01	0.76	0.14	0.13	0.13	0.11	0.281	0.663	-0.209	0.290	0.517	-0.079	0.302	0.499	-0.004
Japan: CEF	0.00	0.25	0.70	0.17			0.293	0.000	0.130	0.504	0.530		0.255	0.342	0.000
Malaysia: WEB	0.07	0.35	0.38	-0.33	0.36	0.04	0.257	0.547	0.110	0.148	0.533	0.096	0.149	0.533	0.096
Malaysia: CEF	0.60	0.26	0.34	-0.16			0.000	0.868	0.000	0.426	0.461		0.000	0.690	0.118
Mexico: WEB	0.08	0.43	0.43	-0.25	0.03	0.03	0.188	0.397	0.556	0.183	0.405	0.644	0.185	0.380	0.610
Mexico: CEF	0.44	0.00	0.53	-0.00			0.235	0.286	0.421	0.616	0.000		0.232	0.194	0.904
Netherlands	0.56	0.24	0.49	-0.05	0.02	0.03	0.769	0.364	0.190	0.760	0.331	0.216	0.747	0.316	0.267
Singapore: WEB	0.32	0.00	0.21	-0.01	0.47	-0.10	0.171	0.774	0.224	0.120	0.802	0.151	0.123	0.802	0.137
Singapore: CEF	0.22	-0.00	0.71	-0.19			0.000	0.750	0.359	0.626	0.415		0.177	0.716	0.178
Spain: WEB	0.45	-0.09	-0.06	0.23	0.37	0.03	0.775	0.240	0.305	0.750	0.219	0.345	0.728	0.219	0.370
Spain: CEF	0.50	0.12	0.41	0.40			0.807	0.000	0.000	0.921	-0.172		0.695	0.106	0.239
Sweden	0.62	0.17	0.32	0.11	0.08	-0.31	0.706	0.147	0.379	0.504	0.099	0.248	0.497	0.104	0.265
Switzerland: WEB	0.72	-0.08	0.01	0.04	-0.12	0.19	0.810	0.278	0.099	0.816	0.242	0.132	0.799	0.224	0.148
Switzerland: CEF	0.72	0.16	0.15	0.00			0.826	0.193	0.000	0.870	-0.136		0.766	0.199	0.000
United Kingdom: WEB	0.77	0.18	0.03	-0.17	0.18	-0.27	0.547	0.480	0.393	0.575	0.442	0.295	0.547	0.415	0.315
USA: WEB	0.45	-0.03	0.00	-0.49	-0.03	0.15	0.363	0.245	0.717	0.401	0.267	0.595	0.387	0.247	0.633
USA: CEF	-0.00	0.00	0.00	0.77			0.000	0.000	0.000	0.000	0.436		0.498	0.318	0.259

Table 11

Unit Root Test: WEBS Time Series

Time series	1 year			2 years			3 years			4 years		
	WS	DF	PP	WS	DF	PP	WS	DF	PP	WS	DF	PP
Australia	-1.625 (0.4182)	-1.933 (0.3167)	-6.666 (0.2988)	-0.662 (0.9275)	-2.551 (0.1036)	-8.504 (0.1941)	-2.531 (0.1458)	-2.315 (0.167)	-9.345 (0.1585)	-2.529** (0.0460)	-2.512 (0.1126)	-12.794 (0.1687)
Austria	-1.544 (0.4781)	-1.153 (0.6936)	-4.740 (0.4591)	-2.194 (0.1160)	-1.018 (0.7467)	-10.634 (0.1161)	-2.137 (0.1349)	-1.970 (0.2997)	-6.792 (0.2903)	-2.258* (0.0797)	-2.455 (0.1268)	-8.509 (0.1938)
Belgium	-0.647 (0.9305)	-1.159 (0.6906)	-2.908 (0.6689)	-0.054 (0.9875)	0.451 (0.9833)	-0.498 (0.9268)	1.014 (0.9995)	-1.855 (0.3536)	-3.526 (0.5935)	-0.624 (0.9348)	-0.398 (0.910)	-0.982 (0.888)
Canada	-1.145 (0.7515)	-1.012 (0.7488)	-2.171 (0.7597)	-0.337 (0.9713)	0.188 (0.9716)	-0.137 (0.9497)	-1.606 (0.4325)	-1.289 (0.6338)	-15.242 (0.0378)	-0.339 (0.9711)	-2.424 (0.1352)	-16.089** (0.0306)
France	-0.596 (0.9397)	-1.600 (0.4836)	-4.689 (0.4644)	-0.600 (0.9389)	0.005 (0.9626)	-2.319 (0.7418)	-0.436 (0.9617)	-1.286 (0.6355)	-2.088 (0.7697)	1.089 (0.9995)	-1.843 (0.3591)	-3.598 (0.5848)
Germany	-0.981 (0.8313)	-1.111 (0.7108)	-2.882 (0.6722)	-0.138 (0.9839)	-0.138 (0.9455)	-0.789 (0.9044)	-0.714 (0.9165)	-0.905 (0.7864)	-1.548 (0.8312)	0.098 (0.9920)	-1.029 (0.7426)	-3.550 (0.5906)
Hong Kong	-0.672 (0.9254)	-1.659 (0.4524)	-7.186 (0.2653)	-1.108 (0.7712)	-2.212 (0.2019)	-6.841 (0.2871)	-1.588 (0.4458)	-1.411 (0.5769)	-3.464 (0.6009)	-1.614 (0.4267)	-2.07 (0.2567)	-6.446 (0.3140)
Italy	-2.439 (0.1594)	-2.187 (0.2108)	-9.933 (0.1375)	-0.596 (0.9397)	-1.788 (0.3866)	-3.822 (0.5586)	-0.404 (0.9651)	-1.442 (0.5619)	-2.179 (0.7587)	-0.518 (0.9516)	-0.753 (0.8325)	-1.664 (0.8187)
Japan	-0.008 (0.9891)	-1.751 (0.4048)	-3.782 (0.5633)	-0.544 (0.9479)	-1.163 (0.6892)	-3.097 (0.6456)	-0.792 (0.8966)	-0.592 (0.8727)	-0.923 (0.8931)	-0.647 (0.9305)	-1.495 (0.5359)	-3.429 (0.6051)
Malaysia	-1.227 (0.7024)	-1.509 (0.5287)	-5.597 (0.3799)	0.149 (0.9931)	-3.445*** (0.0095)	-3.021 (0.6549)	-0.751 (0.9074)	-0.983 (0.7596)	-0.924 (0.8930)	-1.153 (0.7465)	-0.541 (0.8837)	-0.178 (0.9474)
Mexico	-2.776** (0.0225)	-2.621* (0.0885)	-14.729** (0.0428)	-0.656 (0.9287)	-0.862 (0.8003)	-2.421 (0.7293)	-1.793 (0.3036)	-1.824 (0.3688)	-5.222 (0.4129)	-1.458 (0.5421)	-2.404 (0.1406)	-9.819 (0.1413)
Netherlands	0.062 (0.9911)	-1.393 (0.5854)	-3.119 (0.6428)	-0.044 (0.9878)	0.222 (0.9734)	0.106 (0.9621)	-0.576 (0.9430)	-0.858 (0.8015)	-1.383 (0.8489)	-0.305 (0.9738)	-0.546 (0.8827)	-1.825 (0.8005)
Singapore	-0.389 (0.9665)	0.446 (0.9831)	0.769 (0.9849)	0.585 (0.9981)	-0.819 (0.8133)	-1.519 (0.8345)	-0.352 (0.9699)	-0.311 (0.9239)	-0.344 (0.9373)	-0.354 (0.9698)	-0.787 (0.8231)	-2.521 (0.7169)
Spain	1.569 (0.9999)	-2.775 (0.5797)	-5.772 (0.5895)	-0.184 (0.9816)	-0.421 (0.9066)	-0.929 (0.8925)	-0.608 (0.9377)	-1.225 (0.6629)	-2.069 (0.7719)	-0.106 (0.9854)	-0.219 (0.9362)	-1.715 (0.8129)
Sweden	-0.013 (0.9889)	-0.938 (0.7751)	-1.374 (0.8499)	-0.263 (0.9768)	0.776 (0.9912)	-8.686 (0.1855)	-1.178 (0.7321)	-0.949 (0.7713)	-4.031 (0.5347)	1.378 (0.9998)	-2.932 (0.0418)	-8.437 (0.1973)
Switzerland	-2.152 (0.1296)	-2.188 (0.2106)	-9.9304 (0.1376)	-0.096 (0.9858)	-1.129 (0.7035)	-1.9365 (0.7876)	-0.7522 (0.9071)	-0.981 (0.7603)	-1.725 (0.8119)	-0.879 (0.8699)	-0.675 (0.8529)	-1.235 (0.8638)
United Kingdom	0.519 (0.9977)	-1.694 (0.4339)	-2.956 (0.6629)	0.061 (0.9911)	-0.222 (0.9359)	-0.362 (0.9361)	-0.076 (0.9866)	-0.359 (0.9166)	-0.828 (0.9012)	0.101 (0.9920)	-0.372 (0.9147)	-0.596 (0.9197)

Note: *** Significant at one percent level. ** Significance at five percent level. * Significance at ten percent level.

Table 12

Unit Root Test: WEBS Time Series in the First Log Differences

Time series	1 year			2 years			3 years			4 years		
	WS	DF	PP	WS	DF	PP	WS	DF	PP	WS	DF	PP
Australia	-3.929* (0.0007)	-3.852* (0.0024)	-31.694* (0.0006)	-3.710* (0.0014)	-3.538* (0.0070)	-36.809* (0.0002)	-6.122* (0.0000)	-6.022* (0.0000)	-113.753* (0.0000)	-6.987* (0.0000)	-6.929* (0.0000)	-193.074* (0.0000)
Austria	-4.263* (0.0003)	-4.051* (0.0012)	-28.698* (0.0013)	-2.703* (0.0279)	-3.127* (0.0246)	-20.709* (0.0098)	-5.320* (0.0000)	-5.196* (0.0000)	-135.428* (0.0000)	-6.438* (0.0000)	-6.411* (0.0000)	-201.534* (0.0000)
Belgium	-3.891* (0.0000)	-3.675* (0.0000)	-49.493* (0.0000)	-3.133* (0.0046)	-4.250* (0.0005)	-36.949* (0.0001)	-3.380* (0.0037)	-6.499* (0.0000)	-136.644* (0.0000)	-3.850* (0.0009)	-7.468* (0.0000)	-204.242* (0.0000)
Canada	-2.887* (0.0163)	-2.702 (0.0737)	-26.289* (0.0024)	-3.719* (0.0013)	-3.563* (0.0065)	-35.763* (0.0002)	-7.637* (0.0000)	-7.526* (0.0000)	-167.213* (0.0000)	-8.333* (0.0000)	-8.332* (0.0000)	-245.788* (0.0000)
France	-3.578* (0.0020)	-3.450* (0.0094)	-39.388* (0.0000)	-3.100* (0.0086)	-2.858* (0.0504)	-27.880* (0.0016)	-5.975* (0.0000)	-6.042* (0.0000)	-139.839* (0.0000)	-7.616* (0.0000)	-8.050* (0.0000)	-206.195* (0.0000)
Germany	-3.531* (0.0024)	-3.274* (0.0160)	-35.723* (0.0002)	-3.076* (0.0093)	-4.271* (0.0005)	-30.187* (0.0009)	-6.064* (0.0000)	-6.170* (0.0000)	-132.189* (0.0000)	-7.690* (0.0000)	-8.269* (0.000)	-191.192* (0.000)
Hong Kong	-4.737* (0.0000)	-4.511* (0.0002)	-48.123* (0.0000)	-2.885* (0.0164)	-2.093 (0.2474)	-29.249* (0.0012)	-6.549* (0.0000)	-6.440* (0.0000)	-135.980* (0.0000	-6.938* (0.0000)	-6.859* (0.0000)	-204.602* (0.0000)
Italy	-3.472* (0.0028)	-3.162* (0.0129)	-38.178* (0.0001)	-3.827* (0.0009)	-3.592* (0.0059)	-26.426* (0.0001)	-6.488* (0.0000)	-6.408* (0.0000)	-118.379* (0.0000)	-7.303* (0.0000)	-7.524* (0.0000)	-187.278* (0.0000)
Japan	-1.113 (0.7688)	-1.033 (0.7408)	-28.517* (0.0014)	-3.066* (0.0003)	-3.135* (0.0240)	-31.326* (0.0006)	-6.479* (0.0000)	-6.364* (0.0000)	-146.212* (0.0000)	-6.253* (0.0000)	-6.140* (0.0000)	-237.126* (0.0000)
Malaysia	-3.921* (0.0007)	-3.727* (0.0037)	-35.445* (0.0002)	-2.306 (0.0857)	-2.165 (0.2165)	-34.655* (0.0002)	-3.641* (0.0017)	-3.613* (0.0055)	-150.22* (0.0000)	-4.525* (0.0001)	-4.450* (0.0002)	-220.04* (0.0000)
Mexico	-4.103* (0.0004)	-3.881* (0.0022)	-38.400* (0.0001)	-2.640* (0.0033)	-3.766* (0.0032)	-34.166* (0.0003)	-5.735* (0.0000)	-5.612* (0.0000)	-137.820* (0.0000)	-6.595* (0.0000)	-6.352* (0.0000)	-208.539* (0.0000)
Netherlands	-2.191 (0.1171)	-4.770* (0.0000)	-33.642* (0.0004)	-2.463* (0.0555)	-3.971* (0.0015)	-34.903* (0.0003)	-6.099* (0.0000)	-5.159* (0.0000)	-155.05* (0.0000)	-7.826* (0.0000)	-7.985* (0.0000)	-220.145* (0.0000)
Singapore	-3.011* (0.0112)	-2.773 (0.0622)	-37.181* (0.0001)	-3.069* (0.0095)	-2.837* (0.0531)	-40.869* (0.0000)	-6.737* (0.0000)	-6.629* (0.0000)	-138.263* (0.0000)	-5.514* (0.0000)	-5.734* (0.0000)	-213.998* (0.000)
Spain	-2.532* (0.0457)	-3.484* (0.0084)	-38.424* (0.0001)	-3.172* (0.0070)	-3.226* (0.0185)	-29.184* (0.0012)	-4.351* (0.0002)	-4.214* (0.0006)	-144.697* (0.0000)	-5.083* (0.0000)	-5.259* (0.0000)	-218.819* (0.0000)
Sweden	-4.092* (0.0004)	-3.953* (0.0017)	-33.731* (0.0004)	-3.672* (0.0015)	-3.758* (0.0034)	-36.414* (0.0001)	-7.415* (0.0000)	-7.430* (0.0000)	-171.332* (0.0000)	-7.996* (0.0000)	-8.093* (0.0000)	-248.646* (0.0000)
Switzerland	-3.449* (0.0031)	-3.237* (0.0179)	-36.364* (0.0002)	-3.382* (0.0038)	-3.234* (0.0180)	-29.953* (0.0009)	-7.039* (0.0000)	-6.919* (0.0000)	-114.973* (0.0000)	-8.546* (0.0000)	-8.448* (0.0000)	-188.437* (0.0000)
United Kingdom	-2.376* (0.0707)	-5.639* (0.0000)	-33.101* (0.0004)	-4.384* (0.0002)	-4.129* (0.0008)	-36.518* (0.0002)	-5.968* (0.0000)	-5.862* (0.0000)	-134.29* (0.0000)	-7.783* (0.0000)	-7.681* (0.0000)	-218.962* (0.0000)

Note: * Significance at ten percent level.

Table 13

Unit Root Test: Closed-end Fund Time Series
(based on NAV)

Time series	1 year			2 years			3 years			4 years		
	WS	DF	PP	WS	DF	PP	WS	DF	PP	WS	DF	PP
Australia	-2.151 (0.1301)	-2.271 (0.1817)	-7.815 (0.2292)	-0.467 (0.9582)	-2.982 (0.1366)	-9.743 (0.1440)	-1.374 (0.6041)	-1.506 (0.5307)	-3.355 (0.6140)	-1.818 (0.2881)	-1.540 (0.5136)	-4.425 (0.4916)
Austria	-1.866 (0.2596)	-1.642 (0.4612)	-8.296 (0.2042)	-0.540 (0.9485)	-0.358 (0.9168)	-0.946 (0.8909)	-1.941 (0.2185)	-1.701 (0.4308)	-4.881 (0.445)	-2.309 (0.1850)	-2.379 (0.1476)	-10.571 (0.1179)
France	-1.342 (0.6267)	-2.190 (0.2099)	-3.471 (0.6000)	-0.378 (0.9676)	0.188 (0.9716)	-6.225 (0.3300)	-1.254 (0.6858)	-1.479 (0.5438)	-3.967 (0.5419)	-0.579 (0.9424)	-1.851 (0.3555)	-6.477 (0.3112)
Germany	-1.518 (0.4974)	-1.787 (0.3869)	-1.911 (0.7905)	-1.197 (0.7210)	-0.899 (0.7882)	-2.756 (0.6878)	-1.867 (0.2586)	-1.735 (0.4131)	-7.656 (0.2379)	-2.204 (0.1131)	-1.993 (0.2897)	-9.451 (0.1545)
Italy	-1.807 (0.2949)	-1.606 (0.4805)	-5.529 (0.3857)	-0.554 (0.9465)	-1.252 (0.6511)	-3.710 (0.5716)	-0.551 (0.9468)	-1.388 (0.5879)	-2.413 (0.7302)	-0.456 (0.9595)	-0.984 (0.7590)	-1.835 (0.7993)
Japan	-0.291 (0.975)	-5.232*** (0.000)	-5.166 (0.4181)	-0.099 (0.9857)	-0.704 (0.8457)	-1.622 (0.8233)	-0.798 (0.8948)	-0.317 (0.9229)	0.0023 (0.9581)	-0.764 (0.9043)	-0.631 (0.8638)	-0.981 (0.8878)
Malaysia	-1.465 (0.5368)	-2.026 (0.2755)	-30.963*** (0.0007)	0.503 (0.9976)	-3.262** (0.0166)	-1.693 (0.8153)	-0.394 (0.9661)	-0.792 (0.8216)	-0.392 (0.9341)	-0.513 (0.9523)	0.035 (0.9613)	0.471 (0.9766)
Mexico	-1.614 (0.4263)	-1.390 (0.5869)	-9.905 (0.1384)	-0.464 (0.9585)	-0.758 (0.8309)	-2.117 (0.7662)	-1.194 (0.7229)	-1.983 (0.2941)	-4.826 (0.4506)	-1.806 (0.2952)	-1.487 (0.5402)	-3.618 (0.5824)
Singapore	-1.955 (0.2115)	-1.624 (0.4708)	-4.301 (0.5049)	-0.069 (0.9869)	-2.730 (0.0689)	-3.004 (0.6571)	-0.777 (0.9009)	-0.564 (0.8790)	-0.572 (0.9214)	-1.012 (0.818)	-0.573 (0.8768)	-0.831 (0.9009)
Spain	1.613 (0.9999)	-3.319 (0.4140)	-5.100 (0.4242)	-0.001 (0.9893)	-0.359 (0.9167)	-0.646 (0.9159)	-0.634 (0.9329)	-0.969 (0.7644)	-1.962 (0.7846)	-1.431 (0.5617)	-1.142 (0.6979)	-2.977 (0.6604)
Switzerland	-1.810 (0.2927)	-2.563 (0.1008)	-12.364* (0.0762)	-0.293 (0.9747)	-1.283 (0.6369)	-2.461 (0.7244)	-0.989 (0.8277)	-1.265 (0.6449)	-2.117 (0.7662)	-1.225 (0.7041)	-0.924 (0.7801)	-1.799 (0.8035)

Note: *** Significance at one percent level. ** Significant at five percent level. * Significant at ten percent level.

Table 14

Unit Root Test: Closed-end Fund Time Series
(based on MP)

Time series	1 year			2 years			3 years			4 years		
	WS	DF	PP	WS	DF	PP	WS	DF	PP	WS	DF	PP
Australia	-1.868 (0.2583)	-1.788 (0.3823)	-8.640 (0.1876)	0.009 (0.9917)	-4.187*** (0.0007)	-4.665 (0.4668)	-1.045 (0.8027)	-1.350 (0.6060)	-3.647 (0.5790)	-1.651 (0.3998)	-1.331 (0.6147)	-4.112 (0.5256)
Austria	-2.985 (0.1122)	-1.933 (0.3165)	-23.272*** (0.0051)	0.059 (0.9910)	-0.366 (0.9156)	-5.757 (0.3667)	-1.788 (0.3064)	-1.606 (0.4808)	-4.257 (0.5097)	-1.969 (0.2044)	-2.074 (0.2550)	-10.286 (0.1263)
France	-1.410 (0.5777)	-2.283 (0.1776)	-8.200 (0.2090)	-0.664 (0.9272)	0.872 (0.9927)	-6.639 (0.3006)	-1.152 (0.7472)	-1.517 (0.5252)	-4.311 (0.5039)	-0.628 (0.9339)	-1.743 (0.4089)	-6.508 (0.3096)
Germany	-1.348 (0.6224)	-1.652 (0.4558)	-2.186 (0.7579)	-1.278 (0.6702)	-0.512 (0.8897)	-2.599 (0.7073)	-1.853 (0.2667)	-1.569 (0.4987)	-6.075 (0.3414)	-2.234 (0.1044)	-1.999 (0.2870)	-9.125 (0.1671)
Italy	-2.228 (0.1062)	-2.044 (0.2674)	-9.755 (0.1435)	-1.393 (0.5903)	-2.012 (0.2812)	-8.952 (0.1742)	-0.751 (0.9074)	-1.559 (0.5039)	-3.513 (0.5949)	-0.867 (0.8741)	-1.308 (0.6257)	-2.550 (0.7133)
Japan	-0.112 (0.9847)	-0.678 (0.8524)	-2.857 (0.6753)	-0.194 (0.9811)	-1.082 (0.7222)	-1.737 (0.8105)	-0.634 (0.9329)	-0.285 (0.9276)	-0.606 (0.9189)	-0.884 (0.8684)	-0.521 (0.8878)	-1.972 (0.7834)
Malaysia	-1.872 (0.2557)	-1.517 (0.5249)	-28.452*** (0.0014)	0.832 (0.9991)	-3.042** (0.0311)	-1.915 (0.7901)	0.247 (0.9949)	-0.388 (0.9121)	-0.611 (0.9185)	-0.219 (0.9796)	0.085 (0.9650)	0.364 (0.9728)
Mexico	-2.148 (0.1309)	-2.087 (0.2497)	-16.737 (0.0261)	-1.113 (0.7688)	-0.822 (0.8126)	-3.146 (0.6396)	-0.941 (0.8476)	-1.865 (0.3488)	-4.835 (0.4497)	-1.637 (0.4095)	-1.288 (0.6345)	-3.777 (0.5637)
Singapore	-0.676 (0.9246)	-0.603 (0.8704)	-0.993 (0.887)	0.258 (0.9950)	-0.531 (0.8859)	-2.707 (0.6340)	-0.363 (0.9689)	-0.319 (0.9227)	-0.529 (0.9246)	-0.756 (0.9061)	-0.310 (0.9240)	-0.364 (0.9359)
Spain	0.624 (0.9983)	-2.541 (0.1059)	-6.209 (0.3312)	-0.005 (0.9892)	-0.965 (0.7659)	-1.378 (0.8494)	-0.432 (0.9622)	-0.970 (0.7639)	-2.346 (0.7385)	-1.061 (0.7954)	-0.868 (0.7985)	-3.373 (0.6118)
Switzerland	-0.708 (0.9176)	-1.615 (0.4754)	-6.118 (0.3381)	-0.514 (0.9521)	-1.304 (0.6272)	-3.537 (0.5922)	-1.262 (0.6802)	-1.742 (0.4096)	-2.968 (0.6615)	-1.469 (0.5335)	-1.147 (0.6958)	-2.816 (0.6804)

Note: *** Significance at one percent level. ** Significant at five percent level. * Significant at ten percent level.

Table 15

Unit Root Test: Closed-end Fund Time Series in the First Log Difference (based on NAV)

Time series	1 year			2 years			3 years			4 years		
	WS	DF	PP	WS	DF	PP	WS	DF	PP	WS	DF	PP
Australia	-3.104* (0.0085)	-1.327 (0.6167)	-30.327* (0.0008)	-4.657* (0.0000)	-2.177 (0.2147)	-32.202* (0.0005)	-5.941* (0.0000)	-5.824* (0.0000)	-117.04* (0.0000)	-7.803* (0.0000)	-7.726* (0.0000)	-191.977* (0.0000)
Austria	-4.060* (0.0005)	-3.820* (0.0027)	-34.964* (0.0003)	-3.633* (0.0018)	-4.051* (0.0012)	-29.966* (0.0009)	-4.947* (0.0000)	-4.819* (0.0000)	-122.86* (0.0000)	-4.463* (0.0000)	-7.627* (0.0000)	-196.101* (0.0000)
France	-3.026* (0.0108)	-3.045* (0.0309)	-41.941* (0.0000)	-3.581* (0.0021)	-3.362* (0.0123)	-27.665* (0.0017)	-6.331* (0.0000)	-6.276* (0.0000)	-133.90* (0.0000)	-7.566* (0.0000)	-7.703* (0.0000)	-215.117* (0.0000)
Germany	-2.961* (0.0130)	-3.899* (0.0020)	-34.407* (0.0003)	-3.128* (0.0079)	-2.890* (0.0464)	-36.942* (0.0001)	-6.386* (0.0000)	-6.341* (0.0000)	-162.15* (0.0000)	-8.039* (0.0000)	-8.122* (0.0000)	-227.914* (0.0000)
Italy	-3.593* (0.0020)	-3.346* (0.0129)	-34.427* (0.0003)	-3.803* (0.0011)	-3.586* (0.0060)	-38.541* (0.0001)	-6.472* (0.0000)	-6.383* (0.0000)	-114.26* (0.0000)	-7.196* (0.0000)	-7.161* (0.0000)	-190.409* (0.0000)
Japan	-3.688* (0.0015)	-4.922* (0.0000)	-45.306* (0.0000)	-2.817* (0.0199)	-3.816* (0.0027)	-28.279* (0.0014)	-4.168* (0.0003)	-5.324* (0.0000)	-153.30* (0.0000)	-4.501* (0.0001)	-4.526* (0.0001)	-255.53* (0.0000)
Malaysia	-1.854 (0.2662)	-3.994* (0.0014)	-39.744* (0.0000)	-3.216* (0.0061)	-2.665* (0.0803)	-27.724* (0.0017)	-3.956* (0.0007)	-3.913* (0.0019)	-160.12* (0.0000)	-4.468* (0.0001)	-4.392* (0.0003)	-235.629* (0.0000)
Mexico	-3.518* (0.0025)	-4.523* (0.0002)	-36.158* (0.0002)	-4.055* (0.0005)	-3.841* (0.0025)	-43.720* (0.0000)	-6.199* (0.0000)	-6.076* (0.0000)	-143.34* (0.0000)	-3.408* (0.0034)	-3.752* (0.0034)	-198.318* (0.0000)
Singapore	-3.306* (0.0047)	-3.480* (0.0085)	-36.468* (0.0001)	-2.382* (0.0696)	-2.116 (0.2381)	-42.951* (0.0000)	-5.402* (0.0000)	-5.271* (0.0000)	-118.13* (0.0000)	-5.977* (0.0000)	-5.913* (0.0000)	-192.421* (0.0000)
Spain	-3.195* (0.0066)	3.739* (0.0036)	-34.907* (0.0003)	-3.076* (0.0093)	-3.189* (0.0205)	-29.026* (0.0012)	-4.216* (0.0003)	-4.084* (0.0010)	-142.91* (0.0000)	-6.824* (0.0000)	-6.962* (0.0000)	-168.913* (0.0000)
Switzerland	-3.175* (0.0069)	-3.230* (0.0183)	-36.788* (0.0001)	-3.266* (0.0053)	-3.058* (0.0297)	-32.232* (0.0005)	-6.598* (0.0000)	-6.555* (0.0000)	-122.68* (0.0000)	-7.986* (0.0000)	-8.049* (0.0000)	-196.316* (0.0000)

Note: * Significance at ten percent level.

Table 16

Unit Root Test: Closed-end Fund Time Series in the First Log Difference (based on MP)

Time series	1 year			2 years			3 years			4 years		
	WS	DF	PP	WS	DF	PP	WS	DF	PP	WS	DF	PP
Australia	-4.471*	-4.230*	-30.491*	-2.746*	-2.784*	-26.523*	-6.708*	-6.664*	-117.250*	-8.178*	-8.088*	-210.977*
	(0.0001)	(0.0006)	(0.0008)	(0.0246)	(0.0605)	(0.0023)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Austria	-2.702*	-6.032*	-43.062*	-3.713*	-3.809*	-31.356*	-5.116*	-5.976*	-130.059*	-6.127*	-8.281*	-164.188*
	(0.0280)	(0.0000)	(0.0000)	(0.0014)	(0.0028)	(0.0007)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
France	-3.422*	-3.647*	-35.746*	-2.593*	-2.717*	-21.247*	-6.444*	-6.491*	-136.551*	-7.666*	-7.836*	-229.392*
	(0.0033)	(0.0049)	(0.0002)	(0.0382)	(0.0711)	(0.0085)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Germany	-3.102*	-3.405*	-29.216*	-3.834*	-3.116*	-35.395*	-7.235*	-7.204*	-132.535*	-8.731*	-8.736*	-196.86*
	(0.0086)	(0.0108)	(0.0011)	(0.0037)	(0.0254)	(0.0002)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Italy	-3.892*	-3.625*	-25.049*	-3.804*	-3.657*	-35.324*	-6.612*	-6.487*	-111.535*	-7.667*	-7.585*	-184.128*
	(0.0008)	(0.0053)	(0.0033)	(0.0011)	(0.0047)	(0.0002)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Japan	-4.004*	-4.314*	-38.620*	-3.740*	-3.538*	-31.622*	-6.738*	-6.816*	-131.533*	-7.889*	-7.784*	-211.009*
	(0.0005)	(0.0004)	(0.0001)	(0.0012)	(0.0070)	(0.0006)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Malaysia	-2.726*	-2.921*	-46.594*	-2.971*	-2.729*	-32.668*	-6.263*	-6.305*	-153.642*	-7.338*	-7.367*	-219.185*
	(0.0261)	(0.0429)	(0.0000)	(0.0127)	(0.0691)	(0.0004)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Mexico	-3.791*	-3.787*	-43.541*	-2.697*	-3.637*	-29.788*	-6.344*	-6.219*	-170.418*	-6.573*	-6.588*	-230.783*
	(0.0011)	(0.0030)	(0.0000)	(0.0283)	(0.0058)	(0.0010)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Singapore	-3.611*	-3.542*	-37.456*	-2.881*	-2.627*	-44.634*	-5.255*	-5.144*	-165.948*	-6.277*	-6.167*	-250.674*
	(0.0018)	(0.0069)	(0.0001)	(0.0165)	(0.0875)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Spain	-2.822*	-4.919*	-34.041*	-2.900*	-3.695*	-29.555*	-4.947*	-4.414*	-141.043*	-7.602*	-8.065*	-180.802*
	(0.0196)	(0.0000)	(0.0003)	(0.0156)	(0.0042)	(0.0010)	(0.0000)	(0.0002)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Switzerland	-3.696*	-2.259	-25.139*	-3.172*	-3.383*	-31.095	-5.987*	-6.141*	-103.93*	-8.063*	-8.133*	-173.857*
	(0.0014)	(0.1856)	(0.0032)	(0.0070)	(0.0115)	(0.0007)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Note: * Significance at ten percent level.

Table 17

Cointegration Test: WEBS Time Series

Time series	1 year		2 years		3 years		4 years	
	H_0: r=0	H_1: r<=1	H_0: r=0	H_1: r<=1	H_0: r=0	H_1: r<=1	H_0: r=0	H_1: r<=1
Australia	0.5058 (4)	3.7414	3.8998 (1)	14.3400	0.9459 (2)	15.8061	0.2827 (2)	8.3746
Austria	2.9922 (0)	8.2402	0.7236 (0)	10.6102	1.2382 (3)	9.6409	0.5474 (1)	6.364
Belgium	2.9037 (1)	8.3815	1.5629 (3)	7.3987 (1)	3.6327 (1)	9.2338	0.3314 (1)	5.4676
Canada	1.8715 (3)	15.0301	2.6466 (2)	10.0459 (2)	1.2504 (2)	11.2031	0.3732 (3)	9.1644
France	2.8509 (2)	14.7706	1.3179 (2)	11.1509	1.8853 (1)	8.4622	2.0179 (1)	9.1161
Germany	2.6112 (0)	7.4015	0.0515 (0)	4.8240	0.7798 (0)	13.0354	0.9049 (1)	5.8485
Hong Kong	3.6921* (0)	34.7099*	0.7860 (0)	8.6177	1.0897 (0)	7.4838	0.0241 (1)	6.6842
Italy	1.3291 (4)	6.4007	0.0656 (0)	7.2570	1.5870 (0)	8.7102	0.5006 (1)	5.2026
Japan	0.4167 (1)	7.9083	2.1343 (0)	7.6008	0.0000 (2)	11.3283	0.0030 (1)	10.6581
Malaysia	3.3017 (0)	9.9566	6.4740 (4)	16.0387	0.8537 (0)	8.9015	0.0000 (1)	6.4172
Mexico	3.2311 (2)	14.9851	1.1070 (0)	9.6448	1.5041 (0)	8.4542	0.2018 (2)	7.6287
Netherlands	3.4931** (0)	16.6208**	1.1720 (2)	11.040	0.5708 (4)	14.7144	0.4874 (1)	4.9164
Singapore	0.2182 (0)	6.4856	1.4081 (2)	7.6626	0.0279 (0)	11.5066	0.0065 (1)	13.4564
Spain	3.1397** (0)	20.8550**	0.65945 (1)	14.9761	0.6566 (1)	7.1751	0.7611 (1)	4.3005
Sweden	2.3157 (4)	6.2928	0.6438** (2)	24.2602**	0.2517** (1)	17.6566**	1.1081** (1)	22.1158**
Switzerland	2.8060 (1)	6.3177	1.3446 (0)	7.2526	0.8484 (1)	11.8827	0.5042 (1)	6.1996
United Kingdom	3.0983 (2)	10.8329	0.6307 (2)	10.2643	0.6994 (1)	10.0922	0.8599 (2)	6.9360

Note: ** Significant at five percent level. Cointegration results are adjusted for finite sample. The asymptotic critical values are presented in the Appendix B. The proper lags are determined by the AIC procedure provided that the errors are also white-noise. These lags are listed in brackets. Other reasonable (with serially uncorrelated residuals) lags gave similar results. The higher order autocorrelation of residuals has been checked with Lagrange Multiplier Test.

Table 18

Cointegration Test: Closed-end Country Funds Time Series

Time series	1 year		2 years		3 years		4 years	
	H_0: r=0	H_1: r<=1	H_0: r=0	H_1: r<=1	H_0: r=0	H_1: r<=1	H_0: r=0	H_1: r<=1
Australia	1.44063 (4)	4.39120	3.6566 (1)	15.4001	2.5222 (2)	11.5553	2.4805 (2)	11.1315
Austria	0.4960** (0)	18.8130**	0.6825** (1)	18.4384**	0.4626** (1)	18.1900**	2.7634** (0)	19.81777**
France	3.5671 (4)	12.9593	4.6780** (0)	44.8848**	2.6694** (0)	38.6760**	3.3147** (1)	23.8123**
Germany	1.2768 (2)	5.3744	1.2170 (4)	10.8569	2.6075** (1)	16.5525**	3.8387** (0)	25.0876**
Italy	0.3941 (1)	12.1663	1.6401* (0)	14.2613*	1.3282** (1)	16.2224**	0.5953** (2)	17.3644**
Japan	2.1864 (0)	13.4528	2.6109 (2)	12.2641	0.1671 (2)	14.7000	0.7341** (2)	18.3744**
Malaysia	3.4797** (0)	41.1801**	2.0767** (0)	21.0935**	0.1913** (0)	15.2723**	0.3861** (0)	18.1244**
Mexico	0.2262 (2)	4.5520	1.1385** (1)	23.3840**	2.2252** (2)	17.7344**	2.0469** (3)	15.65**
Singapore	0.1522 (0)	4.7405	1.2712 (1)	13.3554	0.2539 (2)	9.2433	0.0300 (1)	11.8901
Spain	3.6369** (0)	30.6993**	6.1397** (0)	20.4830**	0.3322 (1)	10.1717	1.0792 (3)	3.8485
Switzerland	0.9410 (1)	13.3748	2.6324 (2)	13.1307	0.4702 (4)	14.5585	0.6519** (1)	17.1920**

Note: ** Significant at five percent level. * Significant at ten percent level.
Cointegration results are adjusted for finite sample.
The asymptotic critical values are presented in the Appendix B.
The proper lags are determined by the AIC procedure provided that the errors are also white-noise. These lags are listed in brackets. Other reasonable (with serially uncorrelated residuals) lags gave similar results. The higher order autocorrelation of residuals has been checked with Lagrange Multiplier Test.

Table 17 presents the results of the cointegration test for WEBS time series. The null hypothesis of no cointegration is rejected for Hong-Kong and Sweden WEBS time series over all four time periods, and for Netherlands and Spain index time series over the 1-year period. However, these results should be interpreted cautiously due to a small sample period (33 observations). The empirical results support previous literature on foreign market integration that documents that the Hong Kong equity market appears to have a long-run equilibrium relationship with the U.S. market (e.g., Cheung and Mak (1992), Blackman, Holden and Thomas (1994), Ghosh, Saidi, and Johnson (1999)). Also, the empirical results indicate the presence of a cointegration vector between Sweden and the U. S. equity markets. However, three Asian-pacific markets, nine European markets, and the Canadian and Mexican equity markets are found to be segmented from the U. S. market. This finding validates the argument of potential gains to American investors from international diversification by employing exchange-traded funds and by investing in different geographical regions that exhibit less interdependence (e.g., Lessard (1973), Koch and Koch (1991), Speidell and Sappenfield (1992), Frans A. de Roon, Nijam, and Weker (2000), Anderson, Coleman, Frohlich, and Steagall (2000)).

Table 18 shows that the null hypothesis of no co-integration between closed-end country fund's NAV, determined in its home country equity market, and its price, determined in the U. S. market, cannot be rejected for Austria, France, Germany, Italy, Japan, Malaysia, Mexico, and Switzerland. The results of cointegration tests provide evidence that the equity markets of most European countries, one emerging country (Malaysia), and Japan and Mexico are sufficiently integrated with the U.S. market. On the other hand, Singapore and Spain markets are found to be segmented from the

U. S. market. This finding validates previous empirical results that question diversification benefits of closed-end country funds (e.g., Bonser-Neal, Brauer, Neal, and Wheatley (1990), Chang, Eun, Kolodny (1995), Patro (2000), Chen, Lee, and Rui (2000)).

Table 19 presents the cointegration vector for each of the countries that are found to be cointegrated with the U.S. market. I examine the sign and the absolute value of the cointegration vector for each of the countries that exhibit intertemporal relationship with the U.S. market.

The sign of the cointegration vector for closed-end country funds for Austria, France, Germany, Italy, Japan, Malaysia, Mexico and Switzerland is negative. However, the absolute values of the cointegration vector vary over countries and times. A decreasing intertemporal interdependence with the U.S. market is observed for Austrian, Italian, German, Mexican and French markets. Thus, the empirical evidence suggests that an investor should not only look at whether there is an intertemporal relationship between foreign and the U.S. equity markets but also identify the strength of this relationship for a possibility of achieving some diversification gains from investing abroad via closed-end country funds.

The sign of the cointegration vector for Sweden WEB is negative. The absolute value of the cointegration vector diminishes over the four years period from -3.16866 for one year to -2.07695 for four years. Based on the empirical findings, the rest of the WEBS do not appear to exhibit intertemporal interdependence with the U.S. equity market. Thus, the empirical inference of cointegration analysis strengthens my previous inference that exchange-traded funds provide American investors with greater international diversification potential compared to closed-end country funds.

Table 19

Cointegration Vector for WEBS and Closed-end Country Funds Time Series

Country	1 year	2 years	3 years	4 years
Closed-end country funds				
Austria	-0.61616**	-0.78306**	-1.04787**	-1.02834**
France	-	-0.71745**	-0.87832**	-0.95076**
Germany	-	-	-1.01034**	-0.98265**
Italy	-	-	-0.79913**	-0.83372**
Japan	-	-	-	-0.90160**
Malaysia	-1.05073**	-0.77864**	-0.73965**	-0.75644**
Mexico	-	-0.72822**	-0.77056**	-0.80987**
Switzerland	-	-	-	-0.76051**
WEBS				
Sweden	-	-3.16866**	-2.94632**	-2.07695**

Note: ** Significant at five percent level.

Risk Analysis of WEBS and Closed-end Country Funds. Finally, the last objective of this study is to examine the determinants of WEBS and closed-end country funds performance. Test of WEBS and closed-end country fund performance that employ systematic risk, measured by standard deviation, and total risk, measured by coefficient of variation, and asset size, expense ratios, risk and portfolio turnover. The empirical results obtained from time-series cross-sectional regression analysis developed by Fuller-Battese (1974) are presented in Table 20. The regression analysis has been performed for four years: 1996, 1997, 1998, and 1999 for WEBS and closed-end country funds.

Model 1 estimates WEBS and closed-end country fund systematic risk as a function of total assets, expense ratio, turnover ratio, and return. WEBS' 1998 estimated expense ratio coefficient is consistent with the hypothesis that WEBS incur

Table 20

Analysis of WEBS and Closed-end Country Funds Performance
in the Capital-asset Pricing Model Framework

Model 1: Risk (std. dev.) = f (Total assets, Expense ratio, Turnover ratio, Return): WEBS and closed-end country funds

Model 2: Risk (CV) = f (Total assets, Expense ratio, Turnover ratio, Return): WEBS and closed-end country funds

	WEBS						Closed-end country funds					
Year	**Total Assets**	**Expense ratio**	**Turnover ratio**	**Return**	**R-squared**	**CN**	**Total Assets**	**Expense ratio**	**Turnover ratio**	**Return**	**R-squared**	**CN**
1996	-0.0005 (0.846)	-0.4084 (0.375)	0.0030 (0.797)	0.0034 (0.862)	23	24	-0.0007 (0.245)	0.1493 (0.914)	-0.0033** (0.046)	0.0002 (0.940)	43	19
1997	0.0009 (0.612)	0.3621 (0.505)	-0.0037 (0.547)	0.0096** (0.021)	43	36	-0.0001 (0.843)	-0.0019 (0.862)	-0.0002 (0.790)	0.0006 (0.661)	15	7
1998	-0.0004 (0.589)	-0.9252* (0.096)	0.0259 (0.322)	0.088*** (0.000)	74	32	-0.0001 (0.754)	0.0121 (0.721)	-0.0002 (0.807)	0.0038 (0.134)	26	8
1999	-0.0676 (0.365)	0.82992 (0.805)	0.0711*** (0.007)	0.4800*** (0.000)	94	26	-0.0006 (0.342)	-0.0376 (0.287)	-0.0004 (0.523)	0.0044** (0.058)	61	13
1996	0.0754*** (0.001)	-2.5631 (0.419)	0.0578 (0.475)	0.0973 (0.483)	67	24	0.0253 (0.842)	13.0346 (0.682)	-0.0514 (0.870)	0.1945 (0.796)	13	19
1997	0.0819*** (0.000)	1.3620 (0.757)	0.0124 (0.802)	0.0009 (0.974)	78	36	-0.0173 (0.944)	0.7633 (0.192)	-0.0273 (0.352)	0.1697** (0.035)	54	7
1998	0.0415*** (0.000)	-5.1319 (0.284)	-0.0003 (0.990)	0.0606*** (0.000)	88	32	0.0126 (0.908)	0.1059 (0.990)	-0.0660 (0.749)	0.0466 (0.931)	6	8
1999	-0.4781*** (0.013)	-8.9740 (0.256)	-0.1174** (0.038)	0.0349 (0.653)	40	26	-0.0029 (0.998)	0.1331 (0.987)	-0.0181 (0.904)	0.0524 (0.911)	7	13

Note: *** Significant at one percent level. ** Significant at five percent level. * Significant at ten percent level.
The model was checked for heteroskedasticity using Park test.

lower costs compared to traditional equity mutual funds. The theoretical implication of this finding is that exchange-traded funds have a complete information set, which allows them to be more operationally efficient compared to actively managed traditional equity mutual funds. According to Dellva and Olson's (1998) and Malhotra and McLeod's (1997) empirical evidence, American investors should invest in mutual funds that minimize expenses since additional fund expenses do not provide investors with economic benefit on a risk-adjusted performance basis.

The estimated regression coefficient for WEBS return is positive and statistically significant for three time periods (1997, 1998, and 1999), and for closed-end country return for two periods (1998 and 1999). This empirical result is consistent with the previous empirical conclusion of Droms and Walker (1994) who find that the estimated coefficient of return is significant and positive. This finding is consistent within the context of risk/return relationship of the capital asset pricing model (CAPM).

Also, in 1999 the estimated coefficient of WEBS' turnover ratios is positive and significantly different from zero indicating that exchange-traded funds with a high turnover ratio exhibit higher degree of risk. At the same time, the estimated turnover ratio coefficient for closed-end country funds is negative and significantly different from zero for 1996. Thus, closed-end country funds with a lower turnover ratio do not increase investment risk exposure compared to exchange traded funds.

Model 2 estimates WEBS and closed-end country fund total risk, measured by coefficient of variation (CV), as a function of total assets, expense ratio, turnover ratio, and return. The estimated coefficient for Total assets is significantly different from zero for WEBS. However, the sign of the estimated coefficient changes from positive

in 1996 through 1998 to negative in 1999, suggesting that in the earlier years WEBS enjoyed economies of scale and in 1999 WEBS became "too big to manage". Also, the estimated coefficient of WEBS turnover ratio is negative and significantly different from zero, indicating that WEBS with a lower turnover ratio minimize their total risk exposure.

Finally, the estimated coefficient for WEBS and closed end country returns is positive and significantly different from zero for 1997 and 1998 respectively, which validates the hypothesized positive risk/return tradeoff in the context of the capital asset pricing model (CAPM). Overall, Models 1 and 2 have a higher explanatory power for WEBS compared to closed-end country funds, suggesting future research to determine whether there are other performance variables that affect closed-end country funds' risk exposure.

My findings for performance comparison of WEBS and closed-end country funds are consistent with other research, showing that there is no perfect substitute for direct foreign equity investments. At the same time, by adding WEBS to their portfolio, American investors achieve greater wealth gains than if they utilize closed-end country funds.

Since March 1996, American investors have manifested their investment preferences by switching from closed-end country funds to WEBS in achieving desired international portfolio diversification. I also find evidence in support of the hypothesis of interdependence among international stock markets. Such evidence, based on PCA, FA and cointegration analysis, substantiates previous empirical research of substantial interdependence of closed-end country funds' net assets and the S&P 500 Index over a longer time period. Thus, American investors choosing closed-

end country funds to attain their diversification goals do not obtain the desired portfolio gains due to the interdependence between international stock markets. However, the equity market interdependence over time is marginal for WEBS, suggesting that American investors may reduce their risk exposure and obtain diversification benefits by utilizing exchange-traded funds as a vehicle for international diversification.

Finally, I obtain evidence that WEBS, compared to closed-end country funds, provide investors with a rate of return minimizing their risk exposure and efficiently utilizing their information and asset resources by minimizing their operation expenses. Thus, wealth-maximizing, rational market participants should add exchange-traded funds to their investment portfolio in order to achieve desired investment goals, which are compatible with their risk preferences and are comparable substitutes for more expensive direct foreign investment.

Essay Two

SPDRs and DIAMONDS

The data sample includes weekly returns for SPDRs, MidCap SPDRs from May 1995 through December 24, 1999, sectors specific SPDRs and DIAMONDS from January 1998 through December 24, 1999, and traditional equity index mutual funds for the corresponding time periods (the list of traditional index mutual funds and ETFs is presented in Appendix C). The weekly prices for SPDRs and DIAMONDS are obtained from the *Bloomberg Financial Services database.* The sample size of traditional index mutual funds is identified from the *MorningStar database*, the *Yahoo-finance web-site*, and traditional index mutual fund web-sites. The weekly

prices for traditional index mutual funds are gathered from the *Yahoo-finance web-site.* The macroeconomic data is obtained from the *DRI database.*

Comparison of Risk-return Characteristics of Exchange-traded and Traditional Index Funds. First, I compare risk and return characteristics of exchange-traded and a traditional index mutual fund. Empirical results presented in Table 21 indicate that, on average, ETFs outperform traditional index mutual funds (average weekly return for exchange-traded funds is 0.2208% versus 0.0044% for traditional index mutual funds). The best performers among ETFs series are technology SPDRs, SPDRs, DIAMONDS, and industrial sector SPDRs, (average weekly return is 0.8632%, 0.4684%, 0.4680%, 0.4403%). Among laggers were consumer staples SPDRs, financial SPDRs, and utilities SDPRs (average weekly return is -0.3559%, -0.1860%, and -0.1567%).

Traditional index mutual funds best performers are the S&P 500 Index and the DJIA index mutual funds (average weekly return is 0.3871% and 0.3180%). The worst performers among traditional index mutual funds are financial, consumer staples, cyclical/transportation sector index mutual funds (average weekly return is -0.3425%, -0.2850%, and -0.2425%). It appears that both ETFs and traditional index mutual funds that specialize in consumer staples, utilities and financial industries underperform the underlying market Index between January 1998 and December 1999. The observed underperformance of consumer staples industry, that is characterized by food, pharmaceutical, personal care, and soft drinks, can be attributed to a number of law-suits against "big tobacco" companies that resulted in hefty settlements that five companies must pay various states over the next twenty years.

Table 21

Exchange-traded Funds and Traditional Index Mutual Funds:
Mean and Standard Deviation[1]

Exchange-traded and traditional equity mutual funds	**Mean return**		**Standard deviation**	
	Exchange-traded funds	**Traditional index mutual funds**	**Exchange-traded funds**	**Traditional index mutual funds**
SPDRs/S&P 500 index funds	0.4684	0.3871	0.0248	0.0252
MidCap SPDRs/S&P 400 index funds	0.3385	0.1272	0.0259	0.0311
Basic industries SPDRs	0.1200	-	0.0382	-
Consumer services SPDRs	0.2595	-0.0065	0.0277	0.0283
Consumer staples SPDRs	- 0.3559	-0.2850	0.0303	0.0390
Cyclical/Transportation SPDRs	0.1919	-0.2425	0.0324	0.0577
Energy SPDRs	0.1987	0.2072	0.0365	0.0279
Financial SPDRs	-0.1860	-0.3425	0.0415	0.0389
Industrial SPDRs	0.4403	-0.1420	0.0750	0.0234
Technology SPDRs	0.8632	-	0.0372	-
Utilities SPDRs	- 0.1567	-0.0650	0.0221	0.0188
Diamonds	0.4680	0.3180	0.0266	0.0265
Average	***0.2208***	***0.0044***	***0.0349***	***0.0317***

[1] Weekly mean and standard deviation for SPDRs, MidCap SPDRs and corresponding traditional index mutual funds are from May 1995 through December 24, 1999. Weekly mean and standard deviation for sector specific SDPRs, DIAMONDS and corresponding traditional index mutual funds are from January 1998 through December 24, 1999.

In the past three years, the utilities industry and thus companies within this industry experienced full or partial deregulations. The deregulation opened utility companies to greater competition and permitted companies to diversify outside their original geographic regions and their core lines of business. However, some utility companies may be forced to defend their traditional business and thus become less profitable. Also, utility companies are very sensitive to changes in safety and fuel conservation regulations, environmental compliance, as well as market price fluctuations on natural gas that may adversely affect their operating costs. In the last five years, the U. S. Congress has passed environmental laws that seek to decrease the ozone hole. Also, in the past three years, the market price of natural gas and oil has experienced great volatility.

The financial industry is a subject to extensive governmental regulations. The profitability of companies in the financial industry is largely dependent on the availability and cost of capital funds, and is sensitive to fluctuations in interest rates. Also, credit losses resulting from financial difficulties of borrowers may negatively impact the performance of the whole sector. The default of Russian government on its foreign debt and devaluation of its currency in August 1998, the economic crisis in the Pacific Rim region, and consolidation trends in the financial industry due to the recent reversion of Glass-Steagall Act, that eliminates the separation between commercial and investment banking business, may cause a significant impact on the overall sector performance.

I find that the average weekly risk exposure of ETFs is similar to traditional index mutual funds (0.0349 vs. 0.0317). The most volatile among ETFs are industrial SPDRs (standard deviation is 0.0750). Industrial sector SPDRs invest in companies

that are involved in the development of industrial products, including construction equipment, waste management services, and industrial machinery products. The performance of this sector may experience a negative impact from the economic downturn in Asia-Pacific countries, and depreciation of the purchasing power in European countries due to the weakness of their currencies and euro compared to the U.S. dollar.

Most of the traditional index funds bear similar risk exposure (weekly standard deviation is around 0.03 or less), except for cyclical/transportation industry (weekly standard deviation is 0.0577). The overall sector performance is closely tied to the domestic and international macroeconomic environment, industry competition, changes in demographics, consumer tastes and consumer confidence. Thus, I conclude that obtained empirical results validate Howe and Pope's (1993) finding that sector specific mutual funds may increase investor's risk exposure.

Mean-variance Efficiency and Indexing Accuracy of Exchange-traded and Traditional Index Funds. Next, I examine the mean-variance efficiency and indexing accuracy of ETFs and traditional index mutual funds. Table 22 documents the mean-variance efficiency and indexing accuracy of SPDRs, MidCap SPDRs, sector specific SPDRs, DIAMONDS, and traditional index mutual funds. The R-squared values from this model for exchange-traded funds indicate that the series exhibit lower tracking error before expenses compared to traditional index mutual funds (mean R-squared is 69.25% vs. 61.70%). MidCap SPDRs, energy SPDR, and DIAMONDS provide investors with the highest index tracking effectiveness (R-squared values are 96%, 97%, and 98%). The lowest underlying index mimicking

abilities are exhibited by utilities, cyclical/transportation, and industrial SPDRs (R-squared values are 27%, 46% and 41%).

Based on the empirical results for traditional index mutual funds, investors can achieve the greatest diversification benefits using index funds that track the S&P 500 Index, utilities, energy, and industrial S&P Indices (R-squared values are 97%, 85%, 83% and 82%). The empirical findings substantiate the null hypothesis that ETFs provide investors with marginally greater index tracking accuracy and diversification benefits compared to traditional index mutual funds. Surprisingly, a number of sector-specific traditional index funds (cyclical/transportation and consumer staples) have much smaller explanatory power for the return generating process than the rest of traditional index funds.

The results for the utilities, industrial, and cyclical SPDRs indicate that these series do not provide investment before expenses results that correspond generally to the price and dividend yield performance of their underlying market Index. The tracking error of these ETFs may be explained by the difference in portfolio investment techniques employed by the S&P's and SPDR's managers, and the composition of each of the investment portfolio. As I stated in the background information, the market Index invests 100% of its assets in equity market. According to ETFs' Prospectus (2000), each security normally invests at least 95% of its total assets in common stocks that comprise the relevant select sector Index. At the same time, each of the ETFs may invest its remaining assets in other relevant market instruments ranging from money market securities, stocks that are in the relevant market but not in the relevant select sector Index to exchange-traded stock index futures and options on futures. Also, there may be instances where a stock in the

Table 22

Single-factor Model for Exchange-traded Funds, Traditional Index Funds and the Underlying Indices

$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}$,

where $R_{i,t}$ is the weekly return on fund i at time t, $R_{m,t}$ is the return on the respective market index at time t, β_i is the coefficient on the index, and $\varepsilon_{i,t}$ is an error term.

Exchange-traded funds	**Intercept**	β_i	R^2	**Traditional index mutual funds**	**Intercept**	β_i	R^2
SPDRs	0.006 (0.463)	0.870*** (0.000)	0.70	S&P 500 index mutual funds	-0.000** (0.013)	1.001*** (0.000)	0.97
MidCap SPDRs	0.006 (0.877)	1.131*** (0.000)	0.96	S&P 400 index mutual funds	-0.001 (0.242)	0.843** (0.000)	0.50
Basic industries SPDRs	-0.003 (0.964)	0.402*** (0.003)	0.55	-	-	-	-
Consumer services SPDRs	0.021 (0.425)	0.712*** (0.000)	0.59	Consumer services index mutual funds	-0.001 (0.640)	0.804*** (0.000)	0.43
Consumer staples SPDRs	-0.008 (0.723)	1.159*** (0.000)	0.77	Consumer staples index mutual fund	-0.006 (0.357)	0.843*** (0.003)	0.18
Cyclical/Transportation SPDRs	0.047 (0.187)	0.591*** (0.000)	0.46	Cyclical/Transportation index mutual funds	0.000 (0.863)	0.396*** (0.002)	0.06
Energy SPDRs	-0.002 (0.816)	0.939*** (0.000)	0.97	Energy index mutual fund	0.002 (0.216)	0.681*** (0.000)	0.83
Financial SPDRs	-0.003 (0.356)	0.874*** (0.000)	0.80	Financial index mutual funds	-0.004** (0.035)	0.785*** (0.000)	0.74
Industrial SPDRs	0.033 (0.762)	0.369* (0.051)	0.41	Industrial index mutual fund	-0.002 (0.702)	0.870*** (0.000)	0.82
Technology SPDRs	-0.007 (0.738)	0.787*** (0.000)	0.85	Technology index mutual fund	-	-	-
Utilities SPDRs	0.003 (0.903)	0.569*** (0.000)	0.27	Utilities index mutual fund	-0.001 (0.643)	0.943*** (0.000)	0.85
Diamonds	-0.000 (0.984)	1.015*** (0.000)	0.98	Dow Jones Industrial Average index mutual fund	-0.001 (0.588)	0.811*** (0.000)	0.79
Average		***0.784***	***69.25***	Average		***0.798***	***61.70***

Note: p-values are reported in parenthesis. *** Significant at one percent. ** Significant at five percent. * Significant at ten percent.

the applicable ETFs series is not held in the same weighting as in the select sector Index. In certain instances, the advisor may choose to overweight a stock, purchase securities not included within the relevant sector select Index, which the advisor believes are appropriate substitutes, or utilize various combinations of other available investment techniques in seeking to accurately track the benchmark sector select Index.

Furthermore, over time, the stock holding of each exchange-traded fund series may be rebalanced to reflect changes in the composition of its relevant Index due to mergers, acquisitions or a company's removal from the underlying S&P Index. In this case, the fund would incur transaction costs and other expenses as a result of rebalancing.

The estimated beta coefficient for ETFs range from 0.37 for industrial SPDRs to 1.13 for MidCap SPDRs. On average, the estimated beta coefficient for ETFs is 0.784.

I fail to reject the null hypothesis that ETF's beta equals one for all series except consumer staples SPDRs at a 5% confidence level. Since, consumer staples SPDRs invest in tobacco, food products, personal care, pharmaceutical, and soft drinks companies, they may be exposed to greater market risk due to a number of class-action lawsuits faced by "big-tobacco" companies in the last three years. The traditional index mutual funds risk exposure is comparable with the overall market risk, thus I fail to reject the null hypothesis that the traditional index mutual funds beta equals one for all traditional index mutual funds. The estimated beta coefficient for traditional index mutual funds ranges from 1.001 for the S&P 500 Index fund to 0.396 for the cyclical/transportation index mutual fund. However, on average, the estimated beta

coefficient for traditional index mutual funds equals 0.798. Thus, I conclude that exchange-traded funds are less sensitive to market risk factors compared to traditional index mutual funds, and at the same time ETFs provide investors with a comparable risk-return trade-off.

Return Variation of Exchange-traded and Traditional Index Mutual Funds as a Function of Macroeconomic Variables. The main objective of sector-specific index funds is to invest in a particular industry. Since, each industry exhibits a different degree of interdependence with the economy, American investors may use sector-specific funds to hedge against certain economic risk factors, thus diminishing their systematic risk exposure.

I examine whether exchange-traded funds provide American investors with greater benefits to hedge against certain macroeconomic risk factors compared to traditional index mutual funds. The results of factor analysis for ETFs series and traditional index mutual funds are presented in Table 23 through Table 26.

Factor analysis indicates that ETF's return variation is primarily explained by three factors. These factors account for 52.514% of total variation in ETF' return. Also, there are four main factors that explain the variation in traditional index funds return, which account for 17.008% of total variation.

I try to gain economic understanding about macroeconomic variables that cause variation in ETF's and traditional index funds' returns using regression model suggested by Khorana and Nelling (1997). The results of the regression analysis for exchange-traded funds are presented in Table 27. Based on the empirical evidence, I validate Khorana and Nelling's (1997) empirical finding that, similarly to sector

specific traditional mutual funds, variation of some ETFs' returns is affected by the performance of the U.S. market, which is proxied by the S&P 500 Index. The estimated coefficient is positive and significant for the three ETFs series (SPDRs, basic industries SPDRs, and Energy SPDRs).

The second factor that especially affects the variation of basic industries and energy S&P exchange-traded fund return is the change in consumer expectations that reflect consumers' outlook on the economy. The estimated coefficients are negative and significant (-0.062 for basic industries service and -0.007 for energy service). The explanation for the third factor is less clear. It appears that ETFs' return variations are also affected by the term structure of interest rates. Thus, I validate Khorana and Nelling's (1997) finding that some sector specific funds provide investors with a desired hedge against certain macroeconomic factors. Furthermore, based on the empirical evidence, I conclude that American investors have a choice between investing in sector specific index funds, ETFs or combination of both to achieve hedging benefits against particular macroeconomic risk factors.

Based on the empirical results shown in Table 28, which represent the regression analysis results for traditional index funds, I conclude that one of the factors responsible for variation in securities return, similarly to the ETFs, is the market performance proxied by the S&P 500 Index. The estimated index return coefficients are positive and significant for most of the traditional index mutual funds. However, as I analyze each of sector specific traditional index funds, the economic intuition for the second, third, and fourth explanatory factor varies. For example, the S&P 500, MidCap, financial sector, and utilities traditional index funds' return also depend on consumer inflationary expectations. Also, MidCap, consumer services,

Table 23

Factor Analysis of Weekly Returns of Exchange-traded Funds

Factor	Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	3.482	29.016	29.016
2	1.563	13.024	42.040
3	1.257	10.474	52.514
4	0.673	5.607	58.121

Table 24

Factor Analysis of Weekly Returns of Traditional Index Mutual Funds

Factor	Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	0.709	7.091	7.091
2	0.564	5.636	12.727
3	0.291	2.905	15.632
4	0.138	1.376	17.008

Table 25

Factor Matrix of Weekly Returns of Exchange-traded Funds

iShares	Factor			
	1	2	3	4
SPDRs	0.306	0.012	0.222	0.183
MidCap SPDRs	0.548	0.634	-0.328	0.102
Basic industries SPDRs	0.496	-0.042	0.803	0.132
Consumer services SPDRs	0.705	0.247	-0.084	-0.171
Consumer staples SPDRs	0.695	0.156	-0.027	-0.310
Cyclical/Transportation SPDRs	0.813	0.058	-0.085	-0.196
Energy SPDRs	0.241	-0.089	0.471	0.045
Financial SPDRs	0.587	-0.754	-0.102	-0.148
Industrial SPDRs	0.150	0.069	0.163	-0.046
Technology SPDRs	0.684	0.187	-0.392	0.032
Utilities SPDRs	-0.059	0.920	0.129	-0.079
Diamonds	0.552	0.029	0.107	0.150

Table 26

Factor Matrix of Weekly Returns of Traditional Index Mutual Funds

Traditional index mutual fund	Factor			
	1	2	3	4
S&P 500 index mutual funds	0.633	0.067	-0.181	0.052
S&P 400 index mutual funds	0.085	0.499	0.199	0.018
Consumer services index mutual funds	-0.008	0.018	0.092	-0.019
Consumer staples index mutual fund	0.051	-0.038	-0.013	0.426
Cyclical/Transportation index mutual funds	0.006	0.388	0.053	-0.018
Energy index mutual fund	-0.067	0.146	0.471	-0.049
Financial index mutual funds	-0.022	0.006	-0.092	0.311
Industrial index mutual fund	0.006	0.388	0.053	-0.018
Utilities index mutual fund	0.159	0.052	-0.005	0.131
Dow Jones Industrial Average index mutual fund	0.248	0.018	-0.013	0.022

Table 27

Exchange-traded Funds Returns and Fundamental Economic Variables

$$Rt = b_0 + b_1Ret_t + b_2CPI_t + b_3\,CEI_t + b_4TB3MO_t + b_5CSPREAD_t + b_6TSPRD_t + + b_7DIVYLD_t + b_8INDPROD_t\text{, where}$$

Rt is the return on the security over period *t*, Ret_t is the return on the S&P Index, CPI_t is the percent change in the U.S. Consumer Price Index, CEI_t is the percent change in the U.S. Index of Consumer Expectation, obtained by Conference Board Inc., $TB3MO_t$ is the yield on three-month Treasury Bills, $CSPREAD_t$ is the difference in yields on long-term corporate bonds and long-term government bonds, $TSPRD_t$ is the difference in yields on long-term government bonds and three-month Treasury bills, $DIVYLD_t$ is the dividend yield on the CRSP value-weighted index, $INDPROD_t$ is the percent change in industrial production.

iShares	Index return	CPI	CEI	TB3MO	CSPREAD	TSPRD	DIVYLD	INDPROD	Adj. R^2
SPDRS	0.045*	-0.003	0.000	-0.010	-0.177	0.012	-0.029	0.018	0.01
	(0.094)	(0.332)	(0.617)	(0.279)	(0.915)	(0.223)	(0.453)	(0.129)	
MidCap SPDRS	1.171	-0.006*	0.000	-0.088	0.043	0.014	-0.067*	0.014	0.01
	(0.962)	(0.076)	(0.996)	(0.365)	(0.998)	(0.164)	(0.092)	(0.247)	
Basic industries SPDRS	3.647*	-0.021	-0.062***	0.041	1.052	-0.062	-0.058	0.001	0.09
	(0.062)	(0.346)	(0.008)	(0.596)	(0.859)	(0.227)	(0.780)	(0.799)	
Consumer services SPDRS	-0.482	-0.013	-0.001	0.009	-3.968	-0.013	-0.199	0.005	0.05
	(0.746)	(0.447)	(0.460)	(0.880)	(0.391)	(0.746)	(0.223)	(0.217)	
Consumer staples SPDRS	-0.744	-0.012	-0.002	-0.037	-4.823	0.062	-0.161	0.011**	0.01
	(0.640)	(0.509)	(0.360)	(0.568)	(0.330)	(0.144)	(0.354)	(0.020)	
Cyclical/ Transportation SPDRS	-0.613	-0.020	-0.002	0.052	-6.830	-0.024	-0.056	0.006	0.06
	(0.726)	(0.325)	(0.262)	(0.465)	(0.212)	(0.600)	(0.769)	(0.212)	
Energy SPDRS	3.586**	-0.046**	-0.007***	0.107	2.922	-0.097**	0.050	0.004	0.25
	(0.035)	(0.020)	(0.000)	(0.117)	(0.569)	(0.032)	(0.781)	(0.428)	
Financial SPDRS	-2.562	-0.009	-0.004	-0.044	-6.640	0.042	-0.195	0.009	0.05
	(0.245)	(0.736)	(0.177)	(0.624)	(0.329)	(0.469)	(0.414)	(0.126)	
Industrial SPDRS	0.722	-0.028	-0.005	0.055	-3.471	-0.041	0.018	0.004	0.02
	(0.865)	(0.577)	(0.351)	(0.752)	(0.791)	(0.712)	(0.968)	(0.759)	
Technology SPDRS	-3.218	-0.011	0.000	0.020	-2.117	-0.031	-0.295	0.003	0.00
	(0.105)	(0.642)	(0.999)	(0.802)	(0.726)	(0.551)	(0.169)	(0.644)	
Utilities SPDRS	-0.649	-0.015	-0.001	0.057	-4.423	-0.014	-0.027	0.001	0.03
	(0.582)	(0.266)	(0.302)	(0.240)	(0.229)	(0.625)	(0.833)	(0.719)	
Diamonds	0.150	-0.013**	-0.000	-0.05	-0.733	0.021	-0.101	0.005***	0.05
	(0.791)	(0.068)	(0.450)	(0.680)	(0.818)	(0.161)	(0.118)	(0.007)	

Note: p-values are reported in parenthesis.
*** Significant at one percent. ** Significant at five percent. * Significant at ten percent.

Table 28

Sector Specific and Dow Jones Industrial Average Traditional Index Fund Returns and Fundamental Economic Variables

$$Rt = b_0 + b_1Ret_t + b_2CPI_t + b_3\ CONSEXP_t + b_4TB3MO_t + b_5TERMSPRD_t + b_6CORPSPRD_t + + b_7DIVYLD_t + b_8INDPROD_t, \text{ where}$$

Rt is the return on the security over period *t*, Ret_t is the return on the S&P Index, CPI_t is the percent change in the U.S. Consumer Price Index, $CONSEXP_t$ is the percent change in the U.S. Index of Consumer Expectation, obtained by Conference Board Inc., $TB3MO_t$ is the yield on three-month Treasury Bills, $TERMSPRD_t$ is the difference in yields on long-term government bonds and three-month Treasury bills, $CORPSPRD_t$ is the difference in yields on long-term corporate bonds and long-term government bonds, $DIVYLD_t$ is the dividend yield on the CRSP value-weighted index, $INDPROD_t$ is the percent change in industrial production.

Traditional index mutual funds	Index return	CPI	CEI	TB3MO	CSPREAD	TSPRD	DIVYLD	INDPROD	Adj. R^2
S&P index mutual funds	1.001*** (0.000)	-0.000 (0.734)	0.000*** (0.000)	-0.001 (0.208)	0.169* (0.067)	0.001 (0.299)	0.001 (0.542)	-0.000 (0.687)	0.97
MidCap index mutual funds	0.125 (0.102)	-0.003 (0.383)	-0.002*** (0.004)	-0.015* (0.083)	-4.242** (0.019)	0.027*** (0.005)	-0.060 (0.146)	0.002* (0.082)	0.07
Consumer services index mutual funds	0.570*** (0.000)	0.006 (0.458)	-0.000 (0.815)	-0.040** (0.012)	-4.926 (0.218)	0.061*** (0.002)	0.165** (0.048)	0.000 (0.926)	0.25
Consumer staples index mutual funds	0.554** (0.026)	-0.007 (0.673)	-0.001 (0.773)	-0.055 (0.593)	-5.960 (0.379)	0.069* (0.097)	0.289 (0.202)	0.002 (0.748)	0.12
Cyclical/Transportation index mutual funds	0.254 (0.112)	-0.008 (0.416)	-0.002 (0.109)	-0.005 (0.773)	-1.982 (0.676)	-0.001 (0.962)	-0.140 (0.150)	0.002 (0.570)	0.004
Energy index mutual fund	0.459*** (0.000)	-0.011* (0.082)	-0.000 (0.953)	0.020* (0.095)	7.089** (0.023)	-0.021 (0.144)	-0.098 (0.124)	-0.002 (0.335)	0.16
Financial index mutual funds	0.326*** (0.002)	0.002 (0.768)	-0.002** (0.012)	-0.027** (0.033)	-7.770** (0.013)	0.036** (0.013)	-0.016 (0.780)	0.002 (0.230)	0.13
Industrial index mutual fund	0.502*** (0.002)	0.014 (0.325)	-0.004 (0.166)	0.049 (0.410)	13.249* (0.069)	-0.031 (0.426)	-0.237 (0.117)	-0.010** (0.049)	0.57
Utilities index mutual fund	0.186*** (0.009)	-0.004 (0.393)	-0.002*** (0.002)	-0.001 (0.942)	-0.463 (0.822)	0.005 (0.634)	-0.024 (0.575)	-0.001 (0.417)	0.17
DJIA index mutual fund	0.236** (0.028)	-0.007 (0.416)	-0.001 (0.101)	-0.004 (0.761)	-1.649 (0.602)	0.003 (0.845)	-0.112* (0.086)	0.002 (0.404)	0.08

Note: p-values are reported in parenthesis. *** Significant at one percent. ** Significant at five percent. * Significant at ten percent.

depend on consumer inflationary expectations. Also, MidCap, consumer services, energy, financial, and industrial traditional index mutual funds' return generating process depends on the term structure of interest rates. This empirical finding suggests that investors, in order to hedge against certain macroeonomic risk factors, can utilize sector specific traditional index mutual funds, as well as exchange-traded funds. However, the explanatory power of traditional index mutual funds model is greater compared to the ETFs model. So, there may be other macroeconomic factors that are not included in the model that account for variations in ETFs return. The potential explanation of the fourth factor is less obvious for traditional index mutual funds.

I study the performance, diversification and hedging abilities of ETFs (also known as SPDRs, MidCap SPDRs, sector specific SPDRs, and Diamonds) and their rivals traditional index mutual funds. I document that the average weekly ETFs' returns over the sample period are higher than the returns for the corresponding traditional index mutual funds. I also find that exchange-traded funds exhibit higher price and dividend yield tracking accuracy of their underlying Index compared to the index tracking accuracy shown by traditional index mutual funds.

Further, I document that certain specialty ETFs and traditional index mutual funds may serve as a valuable hedging instrument against certain macroeconomic risk factors. Thus, investors should include these investment instruments in their portfolio. It appears that on a risk-return basis, investors would obtain greater performance and diversification gains by employing newly introduced exchange-traded funds compared to traditional index mutual funds.

CHAPTER 5

CONCLUSION, STUDY LIMITATIONS AND POTENTIAL FOR FURTHER RESEARCH

The purpose of this study is twofold. The first objective is to conduct an inquiry into the diversification benefits of exchange-traded funds (WEBS, SPDRs, and DIAMONDS). The second objective is to examine whether the exchange-traded funds (WEBS, SPDRs, and DIAMONDS) exhibit superior performance compared to closed-end country funds and traditional index mutual funds.

I document that, since March 1996, American investors manifest their investment preferences towards WEBS as a substitute for closed-end country funds and a tool to achieve desired international portfolio diversification. Even though there is no perfect substitute for direct foreign investment, WEBS exhibit superior market performance and diversification gains compared to closed-end country funds.

While I find that WEBS satisfy their objectives of following their home indices, the two-factor model I employ documents that, although WEBS provide American investors with diversification benefits, they also maintain some risk exposure to the U.S. market. However, WEBS' U.S. market exposure is marginal compared to the U.S. market risk exposure of closed-end country funds. Further, I

document that closed-end country funds' market prices retain strong U.S. market beta estimates, while their net asset values have a strong estimated home-country beta.

My study contributes to the stream of empirical research investigating the intertemporal relationship of world equity markets. I find that over one, two, three, and four year periods, WEBS' performance is less dependent on the performance of the U.S. market than closed-end country funds. Thus, I conclude, despite the growing interdependence of world equity markets, American investors are still able to achieve desired portfolio diversification benefits by including WEBS in their international portfolio.

Finally, the empirical evidence indicates that WEBS efficiently utilize their information and asset resources, and decrease their operation expenses compared to closed-end country funds. Thus, utility-maximizing market participants should add WEBS to their portfolio in order to achieve desired investment goals cohesive with their risk preferences as a substitute for more expensive direct foreign investment.

The second essay documents the performance, diversification and hedging abilities of exchange-traded funds (SPDRs, MidCap SDPRs, sector specific SPDRs, and DIAMONDS) and their rivals traditional index mutual funds. I find that average weekly ETFs' returns over the sample period are higher than the returns for the corresponding traditional index mutual funds. Furthermore, I document that exchange-traded funds exhibit higher price and dividend yield tracking accuracy of their underlying index than do traditional index mutual funds.

In addition to their greater tracking accuracy, exchange-traded funds provide investors with valuable hedging benefits against certain macroeconomic risk factors. It appears that on a risk-return basis, investors would accomplish greater performance

and diversification gains by employing newly introduced exchange-traded funds compared to their rivals – traditional index mutual funds.

One of the main limitations of this study is the size of the data sample. ETFs were first introduced in April 1993. At the end of year 2000, there are slightly more than fifty exchange-traded funds (now also called ETFs) traded on the AMEX. Further research may be able to increase the data sample of exchange-traded funds, and expand the diversity of these investment vehicles that are continuously offered to American investors.

Another limitation of this empirical investigation is that exchange-traded funds' diversification benefits and performance gains are tested during the unprecedented U.S. economic expansion. The validity of my empirical findings should be ratified during different stages of an economic business cycle.

I do not identify the complete sample of closed-end country funds and traditional index funds that are available to American investors. This shortcoming could be overcome by using a different database.

It would be interesting to see how transaction costs in redeeming and/or creating units in the exchange-traded funds affect their ability to mimic the underlying index. Also, another issue that could be further explored is whether the particular sampling techniques that are employed by fund and index managers affect the tracking accuracy of exchange-traded funds. However, the empirical investigation into the market microstructure issues of ETFs may be adversely affected by the property rights of Morgan Stanley Co. and the Standards & Poors.

APPENDIX A

LIST OF WEBS AND CLOSED-END COUNTRY FUNDS

APPENDIX A

List of WEBS and Closed-end Country Funds, and the Corresponding MSCI Index

WEBS	Closed-end country fund	Morgan Stanley Capital International Index
Australia	First Australia Fund	MSCI Australia
Austria	Austria Fund	MSCI Austria
Belgium	-	MSCI Belgium
Canada	-	MSCI Canada
France	France Growth Fund	MSCI France
Germany	Germany Fund	MSCI Germany
Hong Kong	-	MSCI Hong Kong
Italy	Italy Fund	MSCI Italy
Japan	Japan Equity Fund	MSCI Japan
Malaysia	Malaysia Fund	MSCI Malaysia
Mexico	Mexico Equity and Income Fund	MSCI Mexico
Netherlands	-	MSCI Netherlands
Singapore	Singapore Fund	MSCI Singapore
Spain	Spain Fund	MSCI Spain
Sweden	-	MSCI Sweden
Switzerland	Swiss Helvetia Fund	MSCI Switzerland
United Kingdom	-	MSCI United Kingdom

APPENDIX B

ASYMPTOTIC CRITICAL VALUES

APPENDIX B

Asymptotic critical values (Osterwald-Lenum (1992))

Statistical model in regression form: $Y_i = \alpha\beta' X_{t-k} + \mu$

	Trace			Maximal Eigenvalue		
$p-r$	1%	5%	10%	1%	5%	10%
1	6.65	3.76	2.69	6.65	3.76	2.69
2	20.04	15.41	13.33	18.63	14.07	12.07

APPENDIX C

LIST OF EXCHANGE-TRADED FUNDS AND TRADITIONAL INDEX MUTUAL FUNDS

APPENDIX C

List of Exchange-traded Funds Series and Traditional Index Mutual Funds, and Their Underlying Index

Exchange-traded funds	Traditional index mutual funds	**Underlying Index**
SPDRS	Advantus Index 500 Fund, Dreyfus S&P 500 Index Fund, Dreyfus Laurel S&P 500 Index Fund, E-Trade S&P 500 Index Fund, GE Institutional S&P 500 Index Fund, Mason Street S&P 500 Index Fund, Merrill Lynch S&P 500 Index Fund, Morgan Stanley Dean Witter S&P 500 Index Fund, Munder S&P 500 Index Fund, Smith Barney Investment S&P 500 Index Fund, Spartan S&P 500 Index Fund, SSGA S&P 500 Index Fund, St. Clair Inc. Munder S&P 500 Index Fund, Strong Equity S&P 500 Index Fund, Vanguard S&P 500 Index Fund	S&P 500
MidCap SPDRS	Dreyfus MidCap Index Fund, Vanguard MidCap Index Fund.	S&P 400
Sector specific SPDRS	**Sector specific traditional index funds**	
Consumer services SPDRS	Fidelity Select Air Transportation, Fidelity Consumer Industries, Icon Industrials	S&P consumer goods
Consumer staples SPDRS	Icon Leisure and Consumer Staples	S&P consumer staples
Cyclical/Transportation SPDRS	Fidelity Select Environmental Services Index Fund, Fidelity Select Chemical Index Fund, Fidelity Construction and Housing Index Fund	S&P cyclical/ transportation
Energy SPDRS	American Gas Index Fund	S&P energy
Financial SPDRS	Hancock regional Bank Fund, Rydex Banking Fund	S&P financial
Industrial SPDRS	Fidelity Select Industrial Index Fund	S&P industrial
Utilities SPDRS	Galaxy II Utility Index Fund	S&P utilities
Diamonds	Strong Dow 30 Value Index Fund	DJIA

Note: I am unable to identify traditional index mutual fund that invests in basic industries and technology sector, and track corresponding S&P Index.

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