International Diversification:

Benefits and Costs from a Mutual Fund Perspective

by
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Abstract

Recent weakness in the U.S. stock market and increasing size of the mutual fund industry has prompted the research spotlight to focus on international funds as investors continue to search for higher returns. While the international fund industry has remained a relatively small proportion of fund flows in the past several decades, growth in this area has increased tremendously. The 1990's were a great decade for the domestic markets, and optimal portfolios were highly skewed towards U.S. portfolios. However, with the tragedy of 9/11 and other recent corporate governance and financial scandals, the merits of international diversification have reemerged. This paper takes a look at the past 15 years and the relative benefits and costs of international diversification. A comprehensive analysis of correlation, performance ratios, and portfolio allocation is conducted. Correlations follow an upward trend as markets become more globalized with the advent of technology and communications equipment. The analysis also finds that over the long run, holding foreign funds can still be an advantage even if returns are lower than the U.S. market. Finally, optimal portfolios in the last 5 years contain both domestic and international stock, verifying the importance of maintaining a global portfolio notwithstanding the U.S. market run in the late 1990's.

Executive Summary

Over the past two decades, mutual funds have become the primary investment vehicle for small investors. Funds in the United States grew from USD 1.6 trillion in 1992 to 5.5 trillion in 1998, a 22.4 percent CAGR. The breadth of ownership has risen tremendously as well, with the proportion of U.S. households owning mutual funds growing from 6 percent in 1980 to 27 percent in 1992 and 50 percent in 2002. At the turn of the 21st century, the number of mutual funds in the United States exceeded the number of securities listed on the New York Stock Exchange. European counterparts also benefited from strong economies, with growth of mutual fund assets from USD 1 trillion in 1992 to 2.6 trillion in 1998 (17.7 percent CAGR). The paper will address the relative diversification costs and benefits of holding foreign assets, in the form of international equity mutual funds. The measures being analyzed include correlation, optimal portfolio allocation, and the effect of optimization on the Sharpe ratio. Given the relative newness of international mutual funds within the youthful fund industry, data collected on the last 15 years is realistic in gaining a broad sense of this sector. The time horizon gives us a good grasp of long-term trends, while keeping the sample set from becoming too sparse.

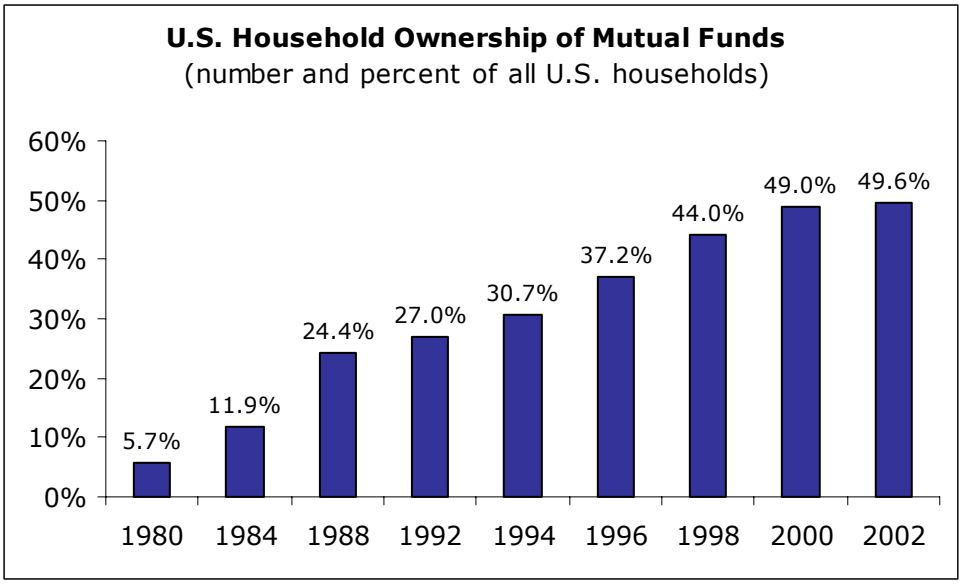
Hypotheses to be tested: 1. Average correlation of international mutual funds to the U.S. index should be significantly lower than the average U.S. mutual fund, 2. Correlation will tend to increase when looking at a breakdown of 5 year periods, as markets globalize, 3. Optimal portfolios should be heavily weighted in favor of international holdings in the last 5 years, while optimal portfolios will be primarily, if not 100% U.S. holdings in the 1990's (since the market run produced abnormal returns relative to the world indices), and 4. International diversification should make sense in the long run.

For the 15 year funds, data shows that indeed mutual funds holding international stock have a much lower correlation with the S&P index than any domestic mutual fund, with an average of 0.68. At a par level between international and domestic holdings for 15 year proportions, it is seen that an optimal portfolio contains 20% of international holdings and 80% of domestic holdings. This portfolio weighs heavier on the U.S. index since the data does not include the recent weakness in the U.S. market (from 2000-2003). Thus, when more recent data is inputted, portfolio weightings become far more skewed toward international indexes. From 1999-2003, international funds performed far superior to the U.S. proxy, with 87% optimal weighting for the 15 year funds and 100% weighting for the randomly selected funds.

Based on the research, the four hypotheses were proven to be correct. Data continues to prove the importance of international diversification through mutual fund returns. Theoretical optimal portfolios show that even with lower returns, it is possible and advantageous to hold international investments. However, the U.S. in the 1990's made a disproportionate run in the stock market possibly skewing long-term results and trends. Further studies with longer-term focus would uncover true benefits of diversification over time. Also, isolating the factors in the trends in correlation is necessary to ensure international diversification continues to be a net gain.

Introduction

Over the past two decades, mutual funds have become the primary investment vehicle for small investors. Funds in the United States grew from USD 1.6 trillion in 1992 to 5.5 trillion in 1998, a 22.4 percent CAGR. The breadth of ownership has risen tremendously as well, with the proportion of U.S. households owning mutual funds growing from 6 percent in 1980 to 27 percent in 1992 and 50 percent in 2002. At the turn of the 21st century, the number of mutual funds in the United States exceeded the number of securities listed on the New York Stock Exchange. European counterparts also benefited from strong economies, with growth of mutual fund assets from USD 1 trillion in 1992 to 2.6 trillion in 1998 (17.7 percent CAGR). Compared to direct investments in individual stocks and bonds, mutual funds offer the advantages of liquidity and diversification at a relatively low cost. With the median national fund industry being only twenty-two years old, the mutual fund industry is one of the most successful recent innovations in the finance world. Despite the youthfulness of the industry, worldwide, mutual funds already hold over $11.7 trillion in assets.

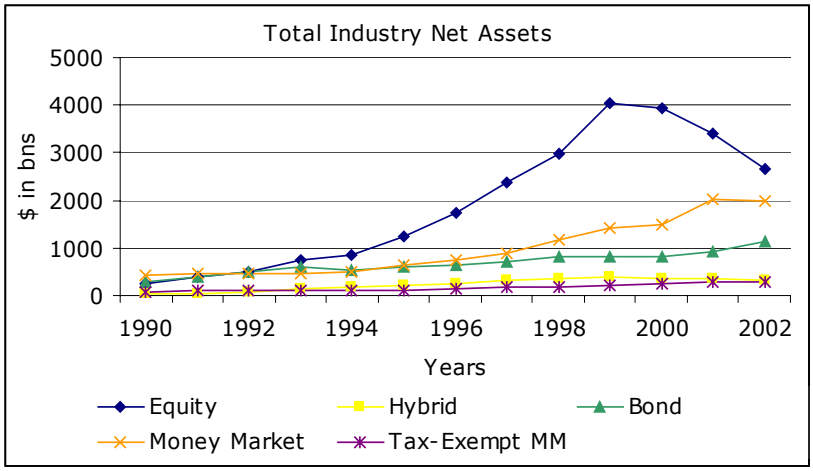


	1980	1984	1988	1992	1994	1996	1998	2000	2002
Millions of US Households	4.6	10.2	22.2	25.8	30.2	36.8	44.4	51.7	54.2

Source: Investment Company Institute

The United States has especially gained momentum with the rally of the markets in the mid to late 1990's, and many investors had more discretionary wealth to invest. This has been matched with a respective growth in the number and size of funds offered within the country. At the end of 2002, the number of open-end funds offered in the United States numbered at approximately 8,300, a far larger number than the 6,800 in existence just five years back.

As this burgeoning continues, the aspect of international diversification becomes hugely important, as investors continue to search for higher returns and lower risk on any level. The primary focus of this paper is on equity mutual funds, specifically international equity mutual funds. Equity funds are by far the largest form of mutual fund, especially in more developed countries such as the United States. More importantly, equity funds are most sensitive to management expertise and knowledge, in addition to the subsequent diversification decisions made on behalf of the funds' constituents.

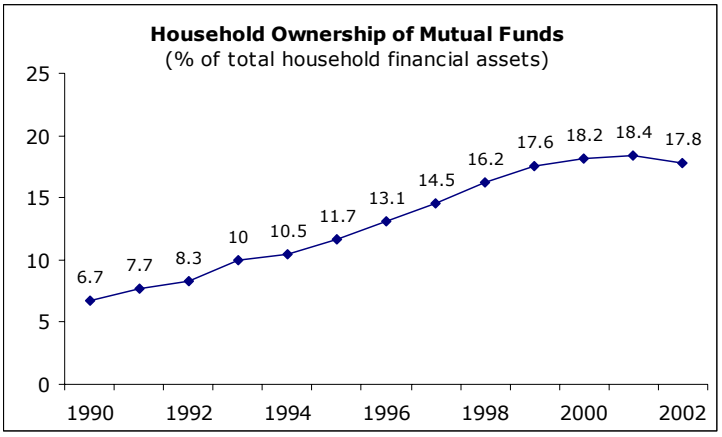


Source: Investment Company Institute

With fund assets reaching close to 20% of all U.S. household financial wealth, this topic has become increasingly important and has correspondingly been under the research spotlight. The paper will address the relative diversification costs and benefits of holding foreign assets, in the form of international equity mutual funds.

The measures being analyzed include correlation, optimal portfolio allocation, and the effect of optimization on the Sharpe ratio. Given the relative newness of international mutual funds within the youthful fund industry, data collected on the last 15 years is optimal in gaining a broad sense of this sector. The time horizon gives us a good grasp of long-term trends, while keeping the sample set from becoming too sparse.

Before addressing the methodology and the results of analyses, a brief introduction of the mutual fund industry from a historical context is important, as well as an explanation of the mechanics and structure of a basic mutual fund. Moreover, a discussion of international funds within the industry as a whole will serve to bridge the gap between the questions posed and answers given. Hypotheses to be tested: 1. Average correlation of international mutual funds to the U.S. index should be significantly lower than the average U.S. mutual fund, 2. Correlation will tend to increase when looking at a breakdown of 5 year periods, as markets globalize, 3. Optimal portfolios should be heavily weighted in favor of international holdings in the last 5 years, while optimal portfolios will be primarily, if not 100% U.S. holdings in the 1990's (since the market run produced abnormal returns relative to the world indices), and 4. International diversification should make sense in the long run. Finally, the paper summarizes the results found and discusses areas for research.



Source: Investment Company Institute

International Mutual Funds

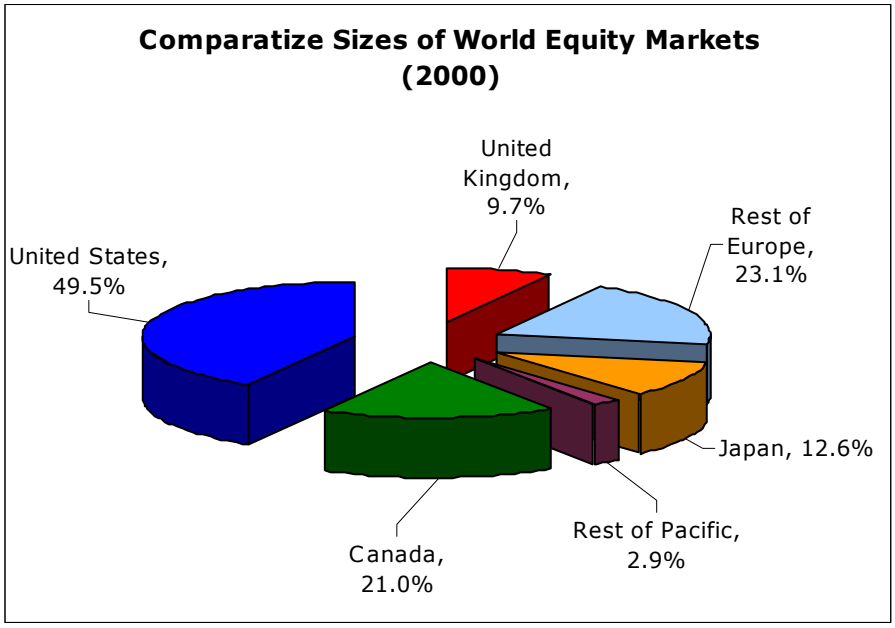
The gains made from diversification of investment portfolios across national markets are now a well-established fact. Many studies in the 1960's and early 1970's showed that holding a global set of assets rather than following the normal home-bias allocation gave investors a higher return per unit risk. This has become increasingly apparent as fixed barriers to international investment, such as political controls on cross-border capital flows and information gathering, continue to decline. However, taking a look at the share of international investment in the United States and Canada, there is an obvious disconnect between the allocation, suggested by the theoretical and quantitative studies, and reality. As of 1991, foreign equity investments of any kind were less than 5% of the total portfolios for the United States and Canada (Tesar and Werner). This is a glaring contrast to the actual size of the world equity markets (shown below). The last few years have caused a change in this trend, with net new cash flows moving into international equity funds while moving out of most other equity funds, signifying increased interest in the markets outside of the U.S.

	2000	2001	2002
Total Net New Cash Flow	$228,874.0	$129,152.1	$121,326.5
Aggressive Growth	$129,318.5	$19,015.3	($1,079.5)
Growth	119,078.4	6,081.2	(25,066.4)
Sector	62,310.5	(7,917.0)	(10,599.0)
World Equity- Emerging Markets	108.5	(1,249.9)	566.0
World Equity- Global	22,688.8	(10,342.0)	(7,849.9)
World Equity- International	31,461.5	(6,056.6)	5,535.4
World Equity- Regional	(4,465.4)	(4,153.5)	(1,187.6)
Growth and Income	(32,079.8)	31,986.0	8,450.2
Income Equity	(19,056.3)	4,564.7	3,561.4
Total Equity Funds	309,364.7	31,928.2	(27,669.4)

Source: Investment Company Institute

Despite the fact that in the last decade the percentage weight of international holdings has risen substantially, the question remains of whether this increase in foreign investment has any direct correlation to the gains from diversification, or if it is really a major change in the paradigm of investor psychology. The next few years

should give the answer, with the domestic markets rallying back to a moderate pre-bubble level and economic indicators pointing towards a steady but firm growth rate.



While the equity markets are obviously dominated by the United States, taking a look at the number of funds available in the world, the U.S. only represents 16% of the total number. This indicates a large potential for growth in the markets outside of the country. This potential for diversification and return benefits were clearly noted in the past decade, with an increase of global/international mutual assets from $46.2 billion to $501.4 billion within 10 years (1990-1999). Appendix A through E breaks out an exact analysis of return and performance statistics for international funds. The first table denotes fund assets growth and the second (on the next page) denotes the number of funds in existence.

	1997	1998	1999	2000	2001	2002
Canada	197,985	213,451	269,825	279,511	267,863	248,979
France	495,774	626,154	656,132	721,973	713,378	845,147
Germany	146,888	190,520	237,312	238,029	213,662	209,168
Italy	209,410	439,701	475,661	424,014	359,879	378,259
Japan	311,335	376,533	502,752	431,996	343,907	303,191
Luxembourg	390,623	508,441	551,084	747,117	758,720	803,869
Spain	177,192	238,917	207,603	172,438	159,899	179,133
United Kingdom	235,683	277,511	375,199	361,008	316,702	288,887
Others	657,906	946,835	1,269,233	1,530,466	1,542,349	1,571,953
Total Non-USA	2,822,796	3,818,063	4,544,801	4,906,552	4,676,359	4,828,586
USA	4,468,201	5,525,209	6,846,340	6,964,667	6,974,976	6,391,571
USA % of World	*61%*	*59%*	*60%*	*59%*	*60%*	*57%*
Total World	**7,290,997**	**9,343,272**	**11,391,141**	**11,871,219**	**11,651,335**	**11,220,157**

Source: Investment Company Institute Factbook, 2003

	1997	1998	1999	2000	2001	2002
Brazil	1,502	1,601	1,760	2,097	2,452	2,755
Canada	1,023	1,130	1,328	1,627	1,831	1,956
France	5,797	6,274	6,511	7,144	7,603	7,773
Japan	5,203	4,534	3,444	2,793	2,867	2,718
Korea	5,436	13,442	13,606	8,242	7,117	5,873
Luxembourg	4,064	4,524	5,023	6,084	6,619	6,874
Spain	1,456	1,866	2,150	2,422	2,524	2,456
United Kingdom	1,455	1,576	1,618	1,766	1,982	1,787
Others	7,114	8,673	9,536	11,353	11,807	12,678
Total Non-USA	33,050	43,620	44,976	43,528	44,802	44,870
USA	6,684	7,314	7,791	8,155	8,307	8,256
USA % of World	*17%*	*14%*	*15%*	*16%*	*16%*	*16%*
Total World	39,734	50,934	52,767	51,683	53,109	53,126

Source: Investment Company Institute Factbook, 2003

Obviously there are still risks to investing abroad, which might limit the amount of exposure one would assume in an optimal portfolio of assets. Factors such as currency risk, settlement risk/trading costs, legal and regulatory risks, and political/country risks all play a part in determining the net effect of an international investment. These factors can vary substantially based upon the investment region of the world. By looking at internationally diversified mutual funds, this problem is mitigated so that a more direct comparison with the S&P benchmark can be made.

International equity funds are distinct from other world funds. Global and World funds invest primarily in equity securities traded worldwide, including those of U.S. companies. Emerging market funds invest primarily in companies based in developing countries, and regional funds invest in companies based in a certain sector of the world. International equity funds will invest in all areas of the world *except* for companies located within the United States. This allows for a better separation between the returns of domestic stock versus all other stock and should define a better picture of the relative gains made from diversification against the costs of the associated risks that were mentioned earlier.

Research has already been made on the correlations of foreign securities to domestic securities. Using the Morgan Stanley Capital International indices a comparison of correlations between domestic and international stocks can be conducted. In

Gruber's research, the average correlation coefficient between a pair of U.S. common stock was about 0.40 and the correlation between U.S. indexes was much higher (i.e. S&P 500 and stocks on the NYSE is 0.97. This is a stark contrast to the average correlation between two different international stock indexes of differing countries, which is at the same level as the correlation found between two U.S. stocks. Returns from international portfolios also warrant some attention. While it is obvious that most countries' returns would be inferior to the U.S. equity index in the 1990's, studies of other periods show otherwise. From 1971-1985, Solnik studied equity indexes for 17 countries and for all but two countries the return on the foreign index expressed in dollars was greater than the return on the S&P index. Coupled with the relatively low correlation coefficients between countries, an internationally diversified portfolio would have done much to minimize any idiosyncratic risks while maximizing holding returns. However, the caveat holds that these correlations will tend to rise as globalization continues to occur, as well as economic integration of countries through political ties (such as all the member nations of the European Union). At the same time, these changes will not likely make a significant impact in the near future as the intracountry correlations of foreign countries are still substantially lower than highly integrated economies such as Canada and the United States.

Mutual Fund Structure and Mechanics

While the prevalence of mutual funds, especially in the United States, allows for a basic understanding of the fund environment and its functions, a more thorough and methodical debriefing is needed. A mutual fund is strictly defined as a type of investment company that gathers assets from investors and collectively invests those assets in stocks, bonds, or money market instruments. Through the collective investments of the mutual fund, each investor shares in the returns from the fund's portfolio while benefiting from professional investment management, diversification, liquidity, and other benefits and services[1].

The structure of a mutual fund can be organized as either as a corporation or a business trust. Both individuals and institutions invest in a mutual fund by purchasing shares issued by the fund. Through these sales of shares, a mutual fund raises the cash it needs to invest in their portfolio of stocks, bonds, and related securities. Funds are managed in a different way than most operating companies in that third parties and independent contractors are in charge of its activities. The fund relies on these external sources for all activities, including buying and selling securities.

At the core of the structure are the shareholders. Mutual fund shareholders are similar to those in any firm. They have voting rights including the right to elect directors at meetings, the right to vote on material changes in the terms of a fund's contract with its investment advisor, and the right to vote when a fund seeks to change investment objectives or fundamental policies. The fund always provides a prospectus describing the fund's goals, fees and expenses, investment strategies and risks, as well as information on how to buy and sell shares. Periodic shareholder

[1] Investment Company Institute 2003 Factbook

reports discuss the fund's recent performance and include other relevant news, such as the fund's financial statements.

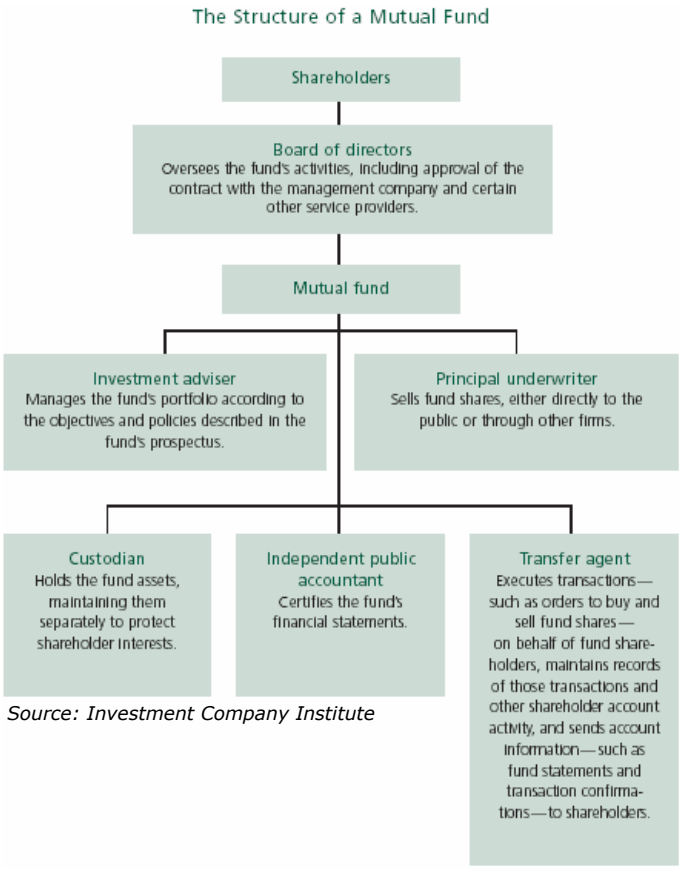
As with any other business entity, there is a governing body overseeing the management of the fund's affairs. The board of directors is elected by the funds shareholders. With the establishment of the Sarbanes Oxley act, the board has become even more important and is increasingly scrutinized. The board is expected to have sound business judgment and periodically review the performance of the investment advisor and any other professional that service the fund. Thus, in order to serve in this capacity and fulfill the fiduciary duties, each director must stay up to date about any material information that comes before the board and to be able to defend any decisions made based on the good-faith requirement. Consistent with Sarbanes Oxley, mutual funds are required by law to include independent directors in hopes of eliminating the governance scandals that have hit headlines in recent years. An SEC rule in January 2002 changed requirements, and now in most instances a majority of most funds' boards of directors must be independent. Independent directors better serve as watchdogs for the shareholders' interests and oversee a fund's investment advisor and others closely affiliated with the fund when there is no relationship between the fund's underwriters and its directors. Although in theory this system should work to stem any misconduct, recent news has shown otherwise (notably with Canary Partners, Putnam and other major fund families).

The actual professionals running the operations are the investment advisors. They manage the money accumulated in a mutual fund and invest on behalf of shareholders in accordance with a fund's objectives as described in a fund's prospectus. One of the main reasons for investing in a fund is the diversification benefits. Pooling together money allows the fund to have enough in assets to spread

it across differing securities. A diversified portfolio will reduce risk by offsetting losses from some securities with gains in others. Mutual funds provide an economical way for the average investor to obtain professional money management and diversification of investments much like large institutions and wealthy investors receive. The goal of the advisor is to add value to the individual investors' returns, especially in changing economic conditions. This is accomplished by adjusting asset and specific allocations while staying true to the fund's investment objective. Investment advisors who oversee "actively managed" fund portfolios base their investment decisions on personal knowledge and research of market conditions, as well as the financial performance of individual companies and specific securities in the quest to meet or beat average market returns. While there is overwhelming evidence that after expenses, mutual fund managers on average underperform a combination of passive portfolios of similar risk, finding the right manager can still result in a fund that outperforms the index by a sufficient amount. Using risk-adjusted returns to analyze funds, Elton, Gruber and Blake found that past performance is predictive of future risk-adjusted performance in both the short run and longer run. On the other end of the spectrum are investment managers who oversee "passively managed" funds. They try to track a market index such as the S&P 500 and buy and hold a representative sample of the securities in the index.

The final four categories of stakeholders support the board, advisors, and investors. These are the administrative services, principal underwriters, custodians, and transfer agents. Administrative services may be provided to a fund by an affiliate of the fund, such as the investment advisor, or by another third party. Administrative services include overseeing the performance of other companies that provide services to the fund and ensuring that the fund's operations are in legal compliance. Principal underwriters are regulated as broker-dealers and are subject to NASD rules

governing mutual fund sales practices. They act as the portal for mutual funds to continuously offer new shares to the public at a price based on the current value of fund net assets plus any sales charges. Custodians are in charge of mutual fund portfolio securities. Nearly all mutual funds use qualified bank custodians. The SEC requires mutual fund custodians to segregate mutual fund portfolio securities from other bank assets. Finally, a transfer agent is employed by a mutual fund to maintain records of shareholder accounts, calculate and disburse dividends, and prepare and mail shareholder account statements, federal income tax information, and other shareholder notices[2].



Source: Investment Company Institute

Now that there has been a comprehensive discussion of the mutual fund industry and of the mutual fund itself, a brief historical discourse will complete the overall picture of the industry.

[2] Investment Company Institute 2003 Factbook

Historic Overview

To better understand the framework in which the paper is constructed around, a historical context is necessary. This is helpful to realize the importance of the research topic at hand, and the reasons for the development of this particularly popular investment vehicle.

The first mutual funds in the form of closed-end investment trusts appeared during the last quarter of the nineteenth century. The first open-end mutual fund was created in Boston in 1924. Mutual funds of both type experienced tremendous growth in the 1920's along with the rest of the market, but they suffered a major setback from mismanagement and fraud (reminiscent of events in the last few years) as well as from the stock market crash of 1929. Over the following forty years, the fund industry as a whole grew relatively slowly, although there was a marked increase of interest in equity funds during the stock market rally from early to mid 1960's. Growth stagnated soon after the 1970's following the first oil crisis and the poor performance of equity markets. The collapse of International Overseas Services, a fraudulent fund management group, in the late 1960's contributed to the loss of investor confidence in mutual funds.

A major product innovation occurred in the 1970's with the launching of money market mutual funds. These funds specialized in investing in money market instruments and competed with banks by offering market-related returns and a lower spread than traditional bank deposits, while ensuring liquidity and ease of access. Money market mutual funds were launched in the United States in the 1970's in response to the regulatory restrictions that prohibited U.S. banks from paying market rates of interest on their retail deposits when inflation was pushing market rates to high levels compared to the ceilings imposed on banks. They also achieved

high levels of development in other countries with rigid restrictions on bank deposit rates, such as France, Greece and Japan. Even without regulatory distortions, money market mutual funds tended to grow to meet the demand from sophisticated investors who needed a convenient place for parking their liquid investment balances.

Growth of equity and bond funds resumed in the early 1980's as macroeconomic performance and equity markets started to improve. However, it was not until the 1990's that mutual funds and especially equity funds came into favor and asset allocations tilted in their direction. A possibility of this jumpstart could have been a result of the widening of bank spreads as U.S. commercial banks attempted to rebuild their capital following the market downturn in the late 1980's. As the gap between returns on bank deposits and returns on equity funds widened considerably, investors continued to pile assets into equity funds.

Several other factors contributed to investors' increased preference for mutual funds. General market conditions, with a brisk economy, low inflation, and an environment suited for investment increased demand for mutual funds as part of a broader pickup in demand for financial assets. In addition, retirement savings plans became more prevalent as employers rewarded employees with 401k plans and individuals invested in individual retirement accounts.

In Europe and other regions, the growth of equity funds lagged somewhat behind, both because equity markets were less well established outside of the U.S. and because the operating costs of mutual funds continued to be relatively high. Market integrity and governance were not developed to the extent of the U.S. market, and thus the bond market was the driver in the 1990's for international regions.

Moreover, non-U.S. countries favored developing the long-term bond market and more stable investments before shifting their efforts to the equity markets. This natural progression from the cultivation of bond markets to equity markets continues to play itself out as Europe and other more developed countries focus on the equity capital markets and developing countries focus efforts on the debt side[3].

Key Developments in Mutual Fund History

The first mutual funds are established in Boston.	**1924**	
	1933	The Securities Act of 1933 regulates the registration and offering of new securities, including mutual fund shares, to the public.
The Revenue Act of 1936 establishes the tax treatment of mutual funds and their shareholders.	**1936**	
	1951	The total number of mutual funds surpasses 100, and the number of shareholders exceeds 1 million for the first time.
The first US-based international mutual fund is introduced.	**1955**	
	1971	Money market mutual funds are introduced.
The Tax Reform Act of 1986 reduces IRA deductibility	**1986**	
	1990	Mutual fund assets top $1 trillion.
The SEC approves the most significant disclosure reforms in the history of US mutual funds, encompassing "plain English," fund profiles, and improved risk disclosure.	**1998**	
	2001	The enactment of the Economic Growth and Tax Relief Reconciliation Act of 2001 expands retirement savings opportunities for millions of working Americans.

Source: Investment Company Institute

[3] Fernando, Deepthi, Leora Klapper, et al. The Global Growth of Mutual Funds

Methodology - Overview

In order to come up with the data for analysis, a methodical approach had to be taken. First of all, a long time horizon of 15 years is necessary to evaluate trends and results several periods of time, and to provide a comparison between the 1990's and 2000's (obviously very different conditions for the United States). There were three approaches to analyzing correlations. The first was to use data from the original 15 year funds. Also, randomly selected funds with inception dates under 15 years and under 10 years were used for comparison to the 15 year data (in the same time period). Finally, the 1990's was an "era" that is commonly used for data analysis and by setting this time frame, a benchmark for the integrity of results could be made.

Data Set

In the process of figuring out the exact nature of the study, the data sets used became one of the most important issues. The most widely used mutual fund databases in recent studies are those provided by the Center for Research in Security Prices (CRSP) and Morningstar. Morningstar is well known among a large segment of individual investors as the de facto standard for mutual fund information. Another advantage of the Morningstar database is that it includes much more data on composition and performance. CRSP has not been around for a long time, and one of the major driving forces behind the birth of this database is the availability of technology to create computer-readable databases on the characteristics and returns of all funds in the market. CRSP has a major advantage in that its database includes some data on funds that merge and liquidate. Recently, CRSP has been gaining prominence and research support focusing on securities, especially in mutual fund data. Because CRSP is a newer database, the integrity, consistency, and quality of the information has not been tested as extensively. Blake, Elton and Gruber (2001)

tested the CRSP database for errors in order to verify the database's information condition. They found several problems with the CSRP database, especially with bias problems. The first bias problem arises not from survivorship bias in the traditional sense; rather, it is a problem of omission bias. Some funds under $25 million in total net assets have monthly data in the CRSP database, and because the omitted funds have much greater merger and liquidation rates, the study shows that the returns of small funds that have monthly data overstate the population returns and alphas. This is not a problem for the purposes of the study, which focuses on large international funds that have survived over a decade. There is also a problem with the data CRSP provides on mergers. As a rule of thumb, the differences are most severe for the smallest funds. For all funds, the differences are larger as analyses reach further back in time. The main problems centered on small funds, alphas, and data from early years, which did not make for materially adverse effects for this paper's dataset. Thus, CRSP is still a viable candidate, when coupled with Morningstar. This dual use of databases will be discussed further in the actual process section.

Within CRSP, the data for this analysis comes primarily from the *Center for Research in Security Prices - Survivor-Bias Free US Mutual Fund Database* (CRSPMF). This database contains information on both active funds and funds that have delisted over the covered period. The CRSPMF dataset began in December 1962 and is updated quarterly with a one-quarter lag. Data for this analysis includes information from 1963 through 2002. The CRSPMF dataset includes information on each mutual fund name and organizational history, annual mutual fund attributes, monthly returns, monthly total net assets, and monthly net asset values. The entire CRSPMF data set includes data from 10 individual data files. Data from the Monthly Total Returns Data file and the Funds List file were used to develop the dataset.

Sample Selection

The sample selection was based on several screening factors. First of all, CRSP does not have a complex search engine for its mutual funds when screening along type of fund. Thus, the Morningstar database was used to find international funds. There is a distinction between global funds and international funds. Namely, global funds are allowed to have a blend of holdings within the United States in addition to those outside of the country. These funds were eliminated from the sample since the study tries to understand the correlation between purely international indices and the U.S. proxy, which is the Standard & Poor's 500 index. The range that was considered contained the years 1989 until 2003. The data ends at 3Q 2003 (September 2003) since the data is updated with a one quarter lag. This allows for a five, ten, and fifteen year analysis. This longer term analysis will help to highlight any temporal shifts in correlation and the possible global integration of markets around the world. It also roughly divides up the boom and bust of the economy.

The actual screening process followed three steps. First, the entire universe of funds was screened under the international fund group. Second, the fund inception date was set for 1989 and earlier. This limits the universe to a very small group, since mutual funds surviving for 15 years in addition to being international stock are somewhat rare. Keep in mind the first international mutual fund was not created until 1955. The initial list that was returned consisted of ninety four fund names. Of these, seventeen were eliminated from the sample because they were precious metal funds, rather than straight equity funds. This list was further whittled down through the CRSP database. Each fund name returned in the Morningstar database was entered in the CRSP search using ICDI codes. These codes were found by searching for the fund names individually. The same process was done for the randomly selected comparison funds for the 10 year and 5 year period. Fund inception date

parameters were between 1990 and 1994 for 10 year fund history, and between 1995 and 1999 for 5 year funds.

Sample

The sample set that was left consisted of three groups; one group had inception dates of fifteen years or earlier, one group had ten years of data, and one group had five years. Within each group, there were three types of funds; they were classified as International, Global, and Regional. The table below shows the breakdown of funds in the sample. International funds were the target of the research. Global funds are allowed to have United States holdings, but do not necessarily include domestic stock. Finally, Regionals were funds that were focused on specific areas in the world, including European funds, Pacific basin/Asian funds, and Emerging Market funds. Analyses on all three types are beneficial to understanding the exact relationships between the domestic and foreign markets. However, for the purpose of this study, looking solely at international mutual funds would give answers that the other two kinds of funds would not for the reasons stated earlier.

Another research decision involved the funds within each group. Analyses could be made of just the funds that had been around for over 15 years, with a subdivision of data for each five, ten, and fifteen year period. They could also be done by using data from funds that matched up for each category. For example, only funds incepted between 1995 and 1999 would be used for the 5 year analysis, those created between 1990 and 1994 for the 10 year analysis, and so on. For the purposes of this paper, the samples for the five and ten year were randomly selected sets of eighteen funds, allowing for minimal idiosyncratic error. This also matches up with what the initial screen came up with, eighteen purely international funds. These funds are not counted in the table below, which only indicates the breakdown of the

initial screen. Unique screens for funds of the respective inceptions dates were completed at a later time and thus includes data until the end of 2003 (the data was updated close to the end of this paper). This comprehensive analysis would illustrate any differences in the composition of holdings or geographies for international funds created at each respective time period. Theoretically, the correlations would point this possible phenomenon out. Thus, both approaches were studied and compared in the results.

Original Sample Set				
Funds Length	International	Global	Regional	Total
15 years	18 funds	14 funds	8 funds	40 funds
10 years	5 funds	4 funds	3 funds	12 funds
5 years	11 funds	4 funds	1 fund	16 funds
No match - CRSP				9 funds
Total				77 funds*

**77 funds are less the 17 precious metal funds out of the original 94 funds found.*

Analyses of the Sample Set

Once the data was compiled, the numbers were run through Excel, as well as through modern portfolio analysis software by Elton and Gruber. The software had both a performance and portfolio model. Most of the answers found and correlations were checked against formulas built in Excel. Data on the results of the regressions and computations are listed in Appendix F through Q.

For the 15 year funds, data show that indeed mutual funds holding international stock have a much lower correlation with the S&P index than any domestic mutual fund, with an average of 0.68. This verifies the first hypothesis and shows that correlation is much lower for an average international fund relative to the S&P with a domestic fund. Also, for the past 10 years, the correlation with the U.S. market moves up to 0.752. For the most recent 5 years, correlation again increases to 0.77. This trend supports the second hypothesis, although it does not necessarily isolate reasons for this trend. Other reasons for this increase includes the possibility of manager decisions to allocate assets to countries that are more dependent on the U.S. than the average nation (be it a developed nation with strong trade ties with the U.S. or a developing country that pegs its currency and economic-political welfare to the U.S.). Another possibility is the existence of globally impacting macroeconomic effects that have caused markets to move somewhat in tandem (i.e. the stock market run in the 1990's and 9/11 to some extent). Regardless of the reason, the correlation rise can be at least be partly attributed to the increasingly interdependent economies in the world market.

Summary of Correlations		
	15 year funds	Random Funds
1989-2003	0.682	-
1994-2003	0.752	**0.6835**
1999-2003	0.769	**0.7226**
	Randomly Selected	
1989-1993	0.572	
1994-1998	0.737	
1999-2003	0.769	

Once the 15 year mutual fund data is partitioned, the results found for the second hypothesis stands out even more. From 1989-1993, correlation between the average fund and the S&P was only 0.57, whereas from 1999-2003 the correlation is close to 0.77. This obviously points towards a greater interdependence of major world economies with integrated trade policies. The final method of extracting meaning from the information was to benchmark to commonly used eras, in this case 1990-1999. Looking at Appendix L, Elton and Gruber's results are strikingly similar to the next Appendix, M, which was composed of funds that were in the new sample set. The major differences were the average standard deviations, which can be attributed to Gruber's use of emerging market and regional funds. This explains the larger variance since these were less diversified and riskier than well spread-out international funds. Thus, the findings were very similar and the integrity of data was confirmed.

Another interesting point of information comes from the comparison of randomly selected funds for the periods 1994 to 2003 and 1999 to 2003. Relative to the same periods for the 15 year fund data, the correlations are substantially lower. There are several conclusions that can be drawn from these findings. First, managerial style and management of "newly" created funds might be different than those funds that existed for longer periods of time. Related, this could also imply an explicit effort on behalf of the investment advisors to allocate funds so that they have lower correlations with respect to the U.S. market, and increase diversification benefits that older funds do not capture. There is always the possibility of random sample error, in that the sample chosen coincidentally had an average below the normal bounds. It would be of interest to conduct more random sampling of 5 and 10 year funds to further support or disprove this finding. Regardless of that assertion, the increasing correlation again points towards a convergence of capital markets. If the

finding is indeed partly based on managerial decisions, then it is also seen that despite efforts, correlation continues to rise between intracountry holdings.

The importance of finding these correlations can only be fully conveyed with a practical application of their influence on optimal portfolios. The relevant way to utilize this data to examine the "reasonableness of international diversification is to examine the proportions to invest in the U.S. and an international portfolio at various levels of assumed differences between returns in the U.S. and returns in other countries"[4]. In order to find optimal portfolios, a simple measure had to be tested. First, the portfolio of two risky assets (S&P and International Index) generated a portfolio return as defined by:

$$Weight_1*Return_1+(1-Weight_1)*Return_2$$

Also, the portfolio variance is defined by:

$$Weight_1^2*Variance_1+(1-Weight_1)^2*Variance_2+2*Variance_1*Variance_2*Weight_1*(1-Weight_2)*Correlation$$

Using these two formulae and the riskless asset return, the Sharpe ratio could be found, which is defined as:

$$(Return_{RiskyPortfolio} - Return_{Riskless}) / Standard\ Deviation_{RiskyPortfolio}^2$$

The purpose of using the Sharpe ratio was to find the highest risk-adjusted return. Maximization of the ratio would result in an optimal portfolio based on the portfolio of risky assets with a risk-free rate of borrowing or lending.

[4] Elton and Gruber Modern Portfolio Theory textbook

There were two methods in analyzing optimization of a portfolio, a theoretical and an actual approach. For the theoretical approach, in calculating the proportions, the risk-free return was assumed to be 6% and the total return on the S&P index was assumed to be 12%. These are generally accepted historical rates. A relative scale was then applied to international returns, with standard deviations and correlations based on results found in the earlier analysis for each specific time period studied. Using the theoretical approach, as shown in Appendix N, Elton and Gruber conducted an analysis of 10 and 15 year data from 1985 to 1999. At a par level between international and domestic holdings for 15 year proportions, it is seen that an optimal portfolio contains 20% of international holdings and 80% of domestic holdings. This portfolio weighs heavier on the U.S. index since the data does not include the recent weakness in the U.S. market (from 2000-2003). Thus, when more recent data is inputted, portfolio weightings become far more skewed toward international indexes, as is relayed in Appendix O. Whether new or old data is used, results point in the direction that international diversification over a long period pays off as a net gain, which was the fourth hypothesis to be tested.

The theoretical approach is a good way to test diversification benefits, but more importantly to the average investor, looking at actual returns allow for a better gauge of the benefits and costs of holding such an investment in the last 15 years. As show in the table on the next page, the results are in line with expectations of optimal portfolio weightings, with heavily weighted U.S. portfolios in the periods that contain the bubble of the late 1990's against those years which exclude that bubble. From 1999-2003, international funds performed far superior to the U.S. proxy, with 87% optimal international weighting for the 15 year funds and 100% international weighting for the randomly selected funds. There is a see-saw effect based on real data given the last 15 years can be separated into very distinct periods for the U.S.

Thus, it is seen that the 1990's severely skews the data, as does the years from 2000-2003, in the other direction, favoring the international portfolio. For optimal portfolios, the Sharpe Ratio was the value to be maximized or minimized. For instance, using 1989 to 1993 data, a portfolio of U.S. holdings would generate a ratio of approximately 2.48, whereas the optimal portfolio of 12% weighting in international stocks (as seen in the table above) would generate a Sharpe Ratio of 4.50.

With Original 15 year Funds				
	Proportions		Actual Returns	
	International	United States	International	United States
1999-2003	87%	13%	(0.14)	(1.22)
1994-2003	0%	100%	4.69	11.29
1989-2003	0%	100%	7.02	12.39
1989-1993	12%	88%	11.55	14.53
1994-1998	0%	100%	9.28	23.16
With Randomly Selected Funds				
1999-2003	100%	0%	1.30	(1.22)
1994-2003	0%	100%	5.26	11.29

Conclusions

Based on the research, data continues to prove the importance of international diversification through mutual fund returns. Theoretical optimal portfolios show that even with lower returns, it is possible and advantageous to hold international investments. It is important to keep in mind that the US in the 1990's made a disproportionate run in the stock market possibly skewing long-term results and trends. Further studies with longer-term focus would uncover true benefits of diversification over time. Also, isolating the factors in the trends in correlation is necessary to ensure international diversification continues to be a net gain. Analyses done for earlier years, such as the 1980's would be of benefit, as the Pacific region which did poorly in the 1990's (Japan especially), fared much better in that time period. Japan's Nikkei was at the beginning of the 1990's comparable to the U.S. market, yet by the end of the decade was barely a tenth of the size. Finally, a more comprehensive screen of the funds chosen would allow for a better comparison to the S&P index. The screens for funds were determined by fund type, but not by fund holdings. It would be more exact to use funds that invested in large-cap stocks only when comparing to the S&P 500, or if they were not, to use the Wilshire 2000 or other index that would better capture the same type of investments as the funds.

The four hypotheses were proven to be correct: 1. Average correlation of international mutual funds to the U.S. index is significantly lower than the average U.S. mutual fund, 2. Correlation increased when looking at a breakdown of 5 year periods, as markets globalize, 3. Optimal portfolios were heavily weighted in favor of international holdings in the last 5 years, while optimal portfolios were 100% U.S. holdings in the 1990's (since the market run produced abnormal returns relative to the world indices), and 4. International diversification makes sense in the long run.

Appendix A

Categories of International Open-End Mutual Funds and Total Net Assets

	Number of Funds in 1990s	Number of Funds as of 12/99	Total Net Assets as of 12/99 ($US Millions)
Well-Diversified Funds			
Global/World	432	359	128,466.28
International	724	619	174,124.58
International Income	57	39	69,997.05
International Growth	42	32	6,410.35
International Miscellaneous	21	16	33,499.05
EAFE	8	5	30,641.50
Emerging Markets	202	171	18,055.69
Regional Funds			
Africa	6	6	5.60
Asia/Pacific Rim	148	120	9,387.57
Australia/Asia	2	0	0.00
Europe	134	112	20,989.34
Latin America	48	44	1,762.32
Nordic	2	1	125.24
North America	2	0	0.00
Developed Country Funds			
Belgium	1	0	0.00
Canada	6	1	47.88
France	1	1	10.27
Germany	5	4	24.44
Holland	1	1	9.17
Italy	2	0	0.00
Japan	45	38	6,580.10
New Zealand	1	1	4.56
Spain	2	0	0.00
Switzerland	1	0	0.00
United Kingdom	4	2	6.43
Emerging Market Country Funds			
China	31	29	895.60
India	5	5	43.53
Israel	4	0	0.00
Korea	4	2	234.97
Mexico	2	1	8.33
Poland	2	1	2.44
Russia	2	2	40.71

Source: Center for Research in Securities Prices

Appendix B

Average Monthly Returns for International Open-End Mutual Funds, 1990-1999

	Number of Funds	Average Monthly Return (Percent)	Significantly Different
Well-Diversified Funds			
Global/World	432	1.636	Emerging Markets, Asia/Pacific Rim
International	724	1.512	Emerging Markets
International Income	57	0.99	
International Growth	42	1.238	
International Miscellaneous	21	1.033	
EAFE	8	0.92	
Emerging Markets	202	0.973	
Regional Funds			
Africa	6	-0.032	
Asia/Pacific Rim	148	0.901	Europe, Global/World
Australia/Asia	2	-0.02	
Europe	134	1.904	Asia/Pacific Rim, Latin America, Canada
Latin America	48	0.85	Europe
Nordic	2	1.778	
North America	2	0.296	
Developed Country Funds			
Belgium	1	1.388	
Canada	6	-0.779	Europe, Russia
France	1	2.128	
Germany	5	1.16	
Holland	1	0.921	
Italy	2	0.992	
Japan	45	1.625	
New Zealand	1	0.325	
Spain	2	0.273	
Switzerland	1	0.921	
United Kingdom	4	0.993	
Emerging Market Country Funds			
China	31	1.077	
India	5	0.774	
Israel	4	0.165	
Korea	4	1.421	
Mexico	2	-0.064	
Poland	2	-1.238	
Russia	2	4.728	Canada
U.S. Equity: S&P 500		1.48	

Source: Center for Research in Securities Prices

Appendix C

Standard Deviation of Monthly returns for International Open-End Mutual Funds, 1990-1999

	Number of Funds	Mean Monthly Stand. Deviation	Significantly Different
Well-Diversified Funds			
Global/World	432	0.048	Intl. Income, Intl. Misc,. Emerging Markets
International	724	0.048	Intl. Income, Intl. Misc,. Emerging Markets
International Income	57	0.033	International, Emerging Markets, Global/World, Intl. Growth
International Growth	42	0.048	Intl. Income, Intl. Misc., Emerging Markets
International Miscellaneous	21	0.032	All other well-diversified except EAFE
EAFE	8	0.041	Emerging Markets
Emerging Markets	202	0.084	All other well-diversified
Regional Funds			
Africa	6	-0.032	Latin America
Asia/Pacific Rim	148	0.901	Latin America, Europe
Australia/Asia	2	-0.02	Latin America
Europe	134	1.904	Latin America, Asia/Pacific Rim
Latin America	48	0.85	All other regional funds
Nordic	2	1.778	Latin America
North America	2	0.296	Latin America
Developed Country Funds			
Belgium	1	1.388	
Canada	6	-0.779	
France	1	2.128	
Germany	5	1.16	
Holland	1	0.921	
Italy	2	0.992	
Japan	45	1.625	
New Zealand	1	0.325	
Spain	2	0.273	
Switzerland	1	0.921	
United Kingdom	4	0.993	
Emerging Market Country Funds			
China	31	1.077	
India	5	0.774	
Israel	4	0.165	
Korea	4	1.421	*
Mexico	2	-0.064	*
Poland	2	-1.238	*
Russia	2	4.728	*
U.S. Equity: S&P 500		1.48	

* Significantly different from all other fund categories
Source: Center for Research in Securities Prices

Appendix D

The Sharpe Ratio for International Open-End Mutual Funds, 1990-1999

	Number of Funds	Mean Sharpe Ratio	Significantly Different
Well-Diversified Funds			
Global/World	432	0.236	Emerging Markets, Latin America, Asia
International	724	0.221	Emerging Markets, Latin America, Asia
International Income	57	0.174	
International Growth	42	0.175	
International Miscellaneous	21	0.197	
EAFE	8	0.129	
Emerging Markets	202	0.066	Global/World, International, Europe
Regional Funds			
Africa	6	-0.081	
Asia/Pacific Rim	148	0.094	
Australia/Asia	2	-0.121	
Europe	134	0.257	
Latin America	48	0.047	
Nordic	2	0.242	
North America	2	-0.006	
Developed Country Funds			
Belgium	1	0.274	
Canada	6	-0.126	
France	1	0.343	
Germany	5	0.141	
Holland	1	0.133	
Italy	2	0.106	
Japan	45	0.190	
New Zealand	1	-0.009	
Spain	2	-0.010	
Switzerland	1	0.152	
United Kingdom	4	0.174	
Emerging Market Country Funds			
China	31	0.066	
India	5	0.044	
Israel	4	0.008	
Korea	4	0.020	
Mexico	2	-0.041	
Poland	2	-0.142	
Russia	2	0.220	
U.S. Equity: S&P 500		0.279	

Source: Center for Research in Securities Prices

Appendix E

Jensen's Alpha for International Open-End Mutual Funds, 1990-1999

	Number of Funds	Mean Alpha	Total Net Assets as of 12/99 ($US Millions)	Mean R^2
Well-Diversified Funds				
Global/World	432	0.00359	8.33	0.56
International	724	0.00458	13.95	0.65
International Income	57	0.00543	63.16	0.21
International Growth	42	0.00321	26.19	0.49
International Miscellaneous	21	0.00581	47.62	0.26
EAFE	8	0.00241	25.00	0.68
Emerging Markets	202	0.00407	8.91	0.83
Regional Funds				
Asia/Pacific Rim	148	0.00229	4.73	0.46
Australia/Asia	2	-0.00442	0.00	0.02
Europe	134	0.00600	4.48	0.65
Latin America	48	0.00119	0.00	0.81
Nordic	2	-0.00142	0.00	0.56
North America	2	-0.00261	0.00	0.45
Developed Country Funds				
Belgium	1	0.00206	0.00	0.60
Canada	6	-0.01069	0.00	0.57
France	1	0.00428	0.00	0.70
Germany	5	-0.00070	0.00	0.75
Holland	1	-0.00107	0.00	0.63
Italy	2	-0.00193	0.00	0.82
Japan	45	0.00880	40.00	0.62
New Zealand	1	-0.00187	0.00	0.53
Spain	2	-0.00290	0.00	0.84
Switzerland	1	-0.00324	0.00	0.72
United Kingdom	4	0.00001	0.00	0.57
Emerging Market Country Funds				
China	31	0.00491	0.00	0.21
India	5	0.00311	0.00	0.48
Israel	4	-0.00395	0.00	0.79
Korea	4	-0.00337	0.00	0.79
Mexico	2	-0.00160	0.00	0.07
Poland	2	-0.01835	0.00	0.80
Russia	2	-0.00373	0.00	0.62

[1] Africa is not listed because no benchmark portfolio is available.
Source: Center for Research in Securities Prices; Morgan Stanley Capital International

Appendix F

Years 1989 to 2003				
15 years	**Return**	**Variance**	**Correlation**	**Beta**
Glenmede International Portfolio	0.725	3.068	0.686	0.663
Fidelity International Growth & Income	0.685	3.217	0.674	0.674
Ivy Fund:International/A	0.565	3.188	0.738	0.799
Bailard Biehl & Kaiser Intl Equity Fund	0.283	3.441	0.666	0.706
Boston Company International Core Equity	0.506	3.190	0.659	0.642
Scudder International Fund/S	0.601	3.308	0.682	0.707
Templeton Growth Fund/A	0.958	3.313	0.814	0.744
AXP International Fund/A	0.336	3.451	0.696	0.768
Excelsior International Fund	0.378	3.620	0.668	0.747
Babson-Stewart Ivory International Fund	0.440	3.890	0.617	0.699
RSI Retirement Trust:International Equity Fd	0.358	3.298	0.677	0.697
Schroder Capital International Fund/Inv	0.432	3.489	0.653	0.691
Harbor Funds International Fund/Instl	0.988	3.214	0.715	0.755
Fidelity Overseas	0.543	3.407	0.695	0.756
Elfun International Equity Fund	0.742	2.990	0.764	0.814
Vanguard International Value	0.528	3.344	0.669	0.691
GAM International Fund/A	0.653	4.239	0.495	0.554
Templeton Foreign Fund/A	0.808	2.862	0.704	0.651
Average	0.585	3.363	**0.682**	0.709
S&P 500	1.032	4.336	1.000	1.000

Appendix G

Years 1994 to 2003				
10 years	**Return**	**Variance**	**Correlation**	**Beta**
Glenmede International Portfolio	0.576	2.720	0.750	0.662
Fidelity International Growth & Income	0.580	3.031	0.747	0.732
Ivy Fund:International/A	0.232	2.731	0.816	0.831
Bailard Biehl & Kaiser Intl Equity Fund	0.250	2.764	0.782	0.746
Boston Company International Core Equity	0.371	2.931	0.709	0.633
Scudder International Fund/S	0.396	3.098	0.742	0.737
Templeton Growth Fund/A	0.808	2.463	0.800	0.705
AXP International Fund/A	0.086	3.245	0.758	0.813
Excelsior International Fund	0.193	3.417	0.731	0.788
Babson-Stewart Ivory International Fund	0.106	2.881	0.761	0.727
RSI Retirement Trust:International Equity Fd	0.296	2.848	0.772	0.744
Schroder Capital International Fund/Inv	0.212	2.987	0.750	0.729
Harbor Funds International Fund/Instl	0.773	2.927	0.775	0.772
Fidelity Overseas	0.435	2.856	0.802	0.827
Elfun International Equity Fund	0.554	2.778	0.825	0.873
Vanguard International Value	0.432	3.078	0.738	0.724
GAM International Fund/A	0.167	4.110	0.539	0.563
Templeton Foreign Fund/A	0.573	2.894	0.732	0.669
Average	0.391	2.987	**0.752**	0.738
S&P 500	0.940	4.612	1.000	1.000

Appendix H

Years 1999 to 2003				
5 years	**Return**	**Variance**	**Correlation**	**Beta**
Glenmede International Portfolio	0.117	2.949	0.761	0.684
Fidelity International Growth & Income	0.462	3.512	0.745	0.776
Ivy Fund:International/A	-0.512	2.730	0.847	0.859
Bailard Biehl & Kaiser Intl Equity Fund	-0.072	2.943	0.793	0.759
Boston Company International Core Equity	0.300	2.782	0.749	0.623
Scudder International Fund/S	-0.087	3.653	0.734	0.778
Templeton Growth Fund/A	0.704	2.769	0.793	0.713
AXP International Fund/A	-0.508	3.320	0.796	0.863
Excelsior International Fund	-0.190	3.936	0.745	0.869
Babson-Stewart Ivory International Fund	-0.554	3.169	0.789	0.805
RSI Retirement Trust:International Equity Fd	-0.236	2.619	0.830	0.768
Schroder Capital International Fund/Inv	-0.138	3.297	0.782	0.817
Harbor Funds International Fund/Instl	0.382	3.011	0.795	0.781
Fidelity Overseas	0.017	3.137	0.818	0.882
Elfun International Equity Fund	0.100	3.079	0.830	0.906
Vanguard International Value	0.149	3.053	0.801	0.806
GAM International Fund/A	-0.736	4.763	0.494	0.537
Templeton Foreign Fund/A	0.595	3.230	0.741	0.704
Average	-0.012	3.220	**0.769**	0.774
S&P 500	-0.102	4.974	1.000	1.000

Appendix I

Randomly Selected Funds (1994-2003)				
10 years	**Return**	**Variance**	**Correlation**	**Beta**
Morgan Stanley Instl:Emerging Markets/A	0.242	5.518	0.680	1.110
Federated International Equity Fund/C	0.310	4.655	0.633	0.818
Smith Barney International All Cap Growth/Y	0.356	10.573	0.336	0.813
Harbor Funds International Growth Fund/Instl	0.085	4.041	0.719	0.899
Ivy Fund:International/B	0.157	2.731	0.817	0.832
Vanguard Emerging Markets Stock Index	1.309	15.622	0.310	1.106
Phoenix-Aberdeen:International Fund/B	0.130	3.231	0.743	0.771
GAM Europe Fund/A	0.584	3.494	0.682	0.698
AIM International Growth Fund/A	0.377	3.425	0.722	0.769
American AAdvantage Fds Intl Eqty/Instl	0.630	2.649	0.781	0.711
Fidelity Diversified International	0.874	2.880	0.743	0.687
GMO Tr International Intrinsic Value/III	0.554	2.856	0.676	0.563
Schwab International Index Fd/Inv	0.346	2.627	0.799	0.752
AXP International Fund/A	0.086	3.245	0.758	0.813
Columbia International Stock Fund	0.431	3.270	0.702	0.692
Oakmark International Fund	0.728	3.957	0.687	0.806
Merrill Lynch International Equity Fund/D	0.068	2.839	0.768	0.733
Delaware Pooled Trust:International Equity	0.629	2.689	0.749	0.653
Average	0.439	4.461	**0.684**	0.790
S&P 500	0.940	0.000	1.000	1.000

Appendix J

Randomly Selected Funds (1999-2003)				
5 years	**Return**	**Variance**	**Correlation**	**Beta**
Enterprise Grp Internatl Growth Fund/B	-0.491	3.790	0.775	0.918
GMO Tr International Intrinsic Value/III	0.422	3.123	0.651	0.530
Ivy Fund:International Growth Fund/Y	0.138	6.446	0.511	0.755
Vanguard Total Internatl Stock Index	-0.088	2.685	0.837	0.811
Morgan Stanley Instl:Intl Magnum/A	-0.123	2.571	0.794	0.664
Excelsior International Equity/Institutional	-0.381	4.291	0.703	0.840
Principal International Emerging Markets/A	0.817	4.728	0.756	1.084
Evergreen International Equity/A	0.057	3.086	0.686	0.575
Janus Adviser:International Growth Fund/I	0.339	5.329	0.671	0.949
Frank Russell International Securities/C	-0.166	2.850	0.804	0.763
BlackRock International Equity Fund/Inv B	-0.530	3.002	0.777	0.732
Fidelity Advisor Overseas Fund/Instl	0.025	3.148	0.817	0.883
Artisan International Fund	0.591	5.226	0.642	0.861
AIM International Growth Fund/C	-0.168	4.136	0.700	0.802
Templeton Foreign Fund/C	0.532	3.232	0.740	0.703
American Century 20th Cent:Intl Disc/Inv	0.916	6.197	0.547	0.800
GE Instl:International Equity/Inv	-0.045	3.129	0.818	0.880
MFS International Growth Fund/A	0.107	3.011	0.777	0.735
Average	0.108	3.888	**0.723**	0.794
S&P 500	-0.102	0.000	1.000	1.000

Appendix K

Years 1990 to 1999				
10 years	**Return**	**Variance**	**Correlation**	**Beta**
Glenmede International Portfolio	1.042	3.102	0.610	0.610
Fidelity International Growth & Income	1.012	4.050	0.580	0.641
Ivy Fund:International/A	1.026	4.400	0.670	0.740
Bailard Biehl & Kaiser Intl Equity Fund	0.578	3.607	0.610	0.709
Boston Company International Core Equity	0.595	3.308	0.624	0.674
Scudder International Fund/S	1.126	4.300	0.616	0.684
Templeton Growth Fund/A	1.136	2.324	0.799	0.787
AXP International Fund/A	0.908	3.593	0.625	0.734
Excelsior International Fund	0.859	3.660	0.604	0.708
Babson-Stewart Ivory International Fund	0.939	4.172	0.496	0.610
RSI Retirement Trust:International Equity Fd	0.734	3.549	0.605	0.689
Schroder Capital International Fund/Inv	0.758	3.508	0.565	0.614
Harbor Funds International Fund/Instl	1.188	3.268	0.661	0.735
Fidelity Overseas	0.961	4.360	0.625	0.698
Elfun International Equity Fund	1.141	2.949	0.724	0.789
Vanguard International Value	0.677	3.413	0.574	0.612
GAM International Fund/A	1.210	4.126	0.466	0.556
Templeton Foreign Fund/A	0.971	3.880	0.600	0.652
Average	0.937	3.643	**0.614**	0.680
S&P 500	1.506	3.580	1.000	1.000

Appendix L

Performance Data on Stock Funds	1990 - 1999			
	Mean Monthly Return	Standard Deviation	Correlation with Market	Beta
Canada General Fund	1.05	4.27	0.93	0.92
Keystone International Fund	0.76	3.96	0.63	0.58
Japan Fund	0.76	7.08	0.25	0.41
Scudder International Fund	1.12	4.30	0.62	0.62
GT Pacific Fund	0.23	6.52	0.53	0.81
Alliance International Fund/A	0.65	4.55	0.62	0.66
Templeton Foreign Fund	0.98	3.88	0.66	0.60
T. Rowe Price International Stock Fund	1.00	4.30	0.64	0.63
Fidelity Overseas Fund	0.97	4.36	0.63	0.64
Vanguard World - International Growth	0.89	4.40	0.60	0.61
Managers Funds: International	1.06	3.68	0.66	0.56
Morgan Stanley Instl. Fund - International E	1.12	3.93	0.58	0.53
Warburg Pincus International Equity	1.09	4.72	0.59	0.64
GT Global Growth - Europe Growth	0.78	4.90	0.62	0.71
T. Rowe Price International Discovery	1.17	5.41	0.43	0.54
Schroder Capital Funds: International	0.84	4.24	0.57	0.56
Smith Barney World Funds International	1.19	4.86	0.64	0.72
Thompson McKinnon Invest Trust Global	0.84	4.67	0.71	0.76
Fidelity International Growth and Income	1.01	4.05	0.62	0.58
Ivy Fund International	1.03	4.40	0.66	0.67
Average	0.93	4.62	**0.61**	0.64
S&P	1.48	3.58	1.00	1.00

Source: Elton and Gruber, Modern Portfolio Theory textbook

Appendix M

Performance Data on Stock Funds	1990 - 1999			
	Mean Monthly Return	Standard Deviation	Correlation with Market	Beta
Glenmede International Portfolio	1.04	3.10	0.61	0.61
Fidelity International Growth & Income	1.01	4.05	0.58	0.58
Ivy Fund:International/A	1.03	4.40	0.67	0.67
Bailard Biehl & Kaiser Intl Equity Fund	0.58	3.61	0.61	0.71
Boston Company International Core Equity	0.60	3.31	0.62	0.67
Scudder International Fund/S	1.13	4.30	0.62	0.62
Templeton Growth Fund/A	1.14	2.32	0.80	0.79
AXP International Fund/A	0.91	3.59	0.63	0.73
Excelsior International Fund	0.86	3.66	0.60	0.71
Babson-Stewart Ivory International Fund	0.94	4.17	0.50	0.61
RSI Retirement Trust:International Equity Fc	0.73	3.55	0.60	0.69
Schroder Capital International Fund/Inv	0.76	3.51	0.57	0.61
Harbor Funds International Fund/Instl	1.19	3.27	0.66	0.74
Fidelity Overseas	0.96	4.36	0.62	0.64
Elfun International Equity Fund	1.14	2.95	0.72	0.79
Vanguard International Value	0.68	3.41	0.57	0.61
GAM International Fund/A	1.21	4.13	0.47	0.56
Templeton Foreign Fund/A	0.97	3.88	0.60	0.65
Average	0.94	3.64	**0.61**	0.67
S&P	1.48	3.58	1.00	1.00

Appendix N

Optimal Investment Proportions		
1990-1999	10 year data	
Return on International Portfolio Relative to US Portfolio	International	United States
+3	73%	27%
+2	60%	40%
+1	47%	53%
0	32%	68%
-1	15%	85%
-2	1%	99%
-3	0%	100%
1985-1999	15 year data	
Return on International Portfolio Relative to US Portfolio	International	United States
+3	60%	40%
+2	47%	53%
+1	34%	66%
0	20%	80%
-1	4%	96%
-2	0%	100%
-3	0%	100%

Source: Elton and Gruber, Modern Portfolio Theory textbook

Appendix O

Optimal Investment Proportions (15yr fund data)		
1999-2003	5 year data	
Return on International Portfolio Relative to US Portfolio	International	United States
+3	100%	0%
+2	100%	0%
+1	100%	0%
0	100%	0%
-1	99%	1%
-2	66%	34%
-3	1%	99%
1994-2003	10 year data	
Return on International Portfolio Relative to US Portfolio	International	United States
+3	100%	0%
+2	100%	0%
+1	100%	0%
0	100%	0%
-1	96%	4%
-2	65%	35%
-3	7%	93%
1989-2003	15 year data	
Return on International Portfolio Relative to US Portfolio	International	United States
+3	100%	0%
+2	100%	0%
+1	100%	0%
0	87%	13%
-1	65%	35%
-2	36%	64%
-3	0%	100%

Appendix Q

Optimal Investment Proportions		
1990-1999	10 year data	
Return on International Portfolio Relative to US Portfolio	International	United States
+3	73%	27%
+2	60%	40%
+1	47%	53%
0	32%	68%
-1	15%	85%
-2	1%	99%
-3	0%	100%
1990-1999	10 year data	
Return on International Portfolio Relative to US Portfolio	International	United States
+3	90%	10%
+2	78%	22%
+1	64%	36%
0	48%	52%
-1	29%	71%
-2	6%	94%
-3	0%	100%

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