

## **International Equity Returns: Absolute vs. Dollar Adjusted**

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*The purpose of this research is to analyze the performance of selected international equity markets relative to U.S. stock market performance. The major conclusions include 1)Although globalization has increased world interconnectedness, significant differences still exist between equity returns and volatility in foreign countries and U.S. equity returns, 2)When the returns for foreign indexes are adjusted for changes in the value of the foreign currency relative to the U.S. dollar, the results show international investing can play an important role in portfolio diversification and increasing returns, and 3)Foreign currency fluctuation has had an important impact on U.S. investor returns.*

### **INTRODUCTION**

This research analyzes the returns and volatility of international stock markets relative to the United States, both on an absolute basis and adjusted for foreign currency value changes relative to the U.S. dollar. The S&P 500 and eleven major international stock indexes were selected for the analysis. The objectives are to compare foreign stock market performance and volatility relative to the United States, and also analyze, from a U.S. investor's perspective, the returns and volatility of foreign equity investing relative to the U.S. equity market.

The research will also analyze the relationship between returns on the S&P 500 and selected major international indexes on both an absolute basis and adjusted for foreign currency value changes relative to the U.S. dollar. The relationship between the returns on the foreign indexes is also examined.

### **THE LITERATURE**

A wide variety of issues regarding international markets and investing have been researched and analyzed by the literature.

Dorodnyk (2012) shows developed equity markets are moving toward greater integration in terms of increasing correlation, they are interdependent and affected by globalization processes, showing strong and lasting relationships between each other. Kashefi (2012) analyses international growth and value indexes and concludes that the relationship between international markets is positive in almost all markets and often statistically significant. Anson (2011) discusses the progression of institutional investor approaches to portfolio management, including the evolution of international investing mandates as an important part of the equity portfolio. The growth and rationale for global equity mandates is analyzed by

Kang, Nielsen, and Fachinotti (2010). Global mandates allow portfolio managers to pick stocks from a global opportunity set and accommodate investment bets on global sector and style exposures.

Curcuro, Thomas, Warnock, and Wongswan (2011) analyze U.S. investor international equity portfolios and find 1) US investors do not exhibit returns-chasing behavior, but, consistent with partial portfolio rebalancing, tend to sell past winners; and 2) US investors increase portfolio weights on a country's equity market just prior to its strong performance, behavior inconsistent with an informational disadvantage.

Opiela (2007) discusses the growth in international investment by U.S. investors, despite Americans' historical investment preference towards domestic stocks and funds. Advantages of international investing include the world economy is becoming more of an equal playing field and that great companies exist in foreign and domestic markets. Pozen and Fleishman (2005) analyze the merits of structuring international portfolios with growth and value indexes, and analyze why spreads between international growth and value returns vary less than the spreads in their U.S. counterparts.

Beach and Beller (2006) analyze the impact of Federal Reserve policy on U.S. consumption and investment decisions, and its impact on equity returns in developed international financial markets. Tokat and Wicas (2005) discuss various issues related to short-run considerations for the long-term international investor, including how short-term international returns, volatilities and correlations can vary from long-term expectations. The impact and importance of a country's economic performance on global real estate investing is analyzed by Mueller and Ball (2006).

The growth in global investing, trade, and capital markets spawned literature aimed at international tax issues (Sergeant, 2010).

Earlier research on international investing includes Fama and French (1998) finding evidence that value stocks typically outperform growth stocks outside the United States; Chanwit (2004) analyzing and questioning the benefits of investing in emerging market stocks; and Siquefield (1996) providing results that show superior performance through international portfolios can be obtained by focusing on value stocks and small-cap stocks.

## **DATA**

The timeframe of the analysis begins with introduction of the euro in financial markets in January, 1999 and extends through 2012. Monthly data is used to determine holding period returns for twelve major international stock indexes. The data is used to analyze stock market performance, both in absolute returns and returns adjusted for changes in the value of the respective foreign currency relative to the U.S. dollar. The objectives are to compare foreign stock market performance relative to the U.S., and from a U.S. investor's perspective, compare U.S. dollar returns of investing in foreign equity markets relative to the U.S. The selected countries, index, and a brief description of each index are included below.

### **United States – S&P 500**

The S&P 500 is one of the leading indexes measuring U.S. stock market performance, and widely regarded as the main benchmark for large capitalization equities. The index is comprised of 500 leading large cap firms in a variety of industries, and accounts for approximately 80% of available market capitalization.

### **Brazil – Bovespa Index**

The main index of the Sao Paulo exchange, the index is revised quarterly and is comprised of stocks that accounted for 80% of the volume traded in the last 12 months and traded on at least 80% of the trading days.

### **China - Shanghai**

The Shanghai Composite Index is a total stock market index measuring the performance of all shares that trade on the Shanghai Stock Exchange.

**France – CAC 40**

The CAC tracks the 40 largest stocks based on market capitalization on the Paris Bourse (stock exchange).

**Great Britain – FTSE 100**

The FTSE consists of the 100 largest market capitalization stocks trading on the London Stock Exchange and represents approximately 80% of the market capitalization of the entire exchange.

**Germany – DAX**

The DAX is comprised of the 30 largest firms that trade on the Frankfurt Exchange, and comprises approximately 75% of the total market capitalization of the exchange.

**Hong Kong – Hang Seng**

The Hang Seng is a market capitalization weighted index comprised of the 40 largest companies that trade on the Hong Kong Exchange. The index comprises approximately 65% of the total capitalization of the Hong Kong Exchange.

**India – BSE 30**

The Bombay Stock Exchange (BSE) Index is comprised of the 30 largest and most actively-traded stocks on the BSE.

**Japan – Nikkei 225**

The Nikkei is a price weighted, diversified index comprised of the top 225 blue-chip companies on the Tokyo Stock Exchange.

**Mexico - IPC**

The IPC is the main benchmark index for the Mexican Stock Exchange. The index is a diversified index designed to be representative of all the shares listed on the exchange and is weighted by market capitalization.

**South Korea – KOSPI Composite Index**

The KOSPI is an index measuring the performance of the entire South Korean stock market.

**Taiwan - TSEC**

The TSEC weighted index is a market capitalization weighted average, and is comprised of all stocks on the Taiwan Stock Exchange. The TSEC is a measure of total stock market performance.

For each index, monthly data over the period from 1999 through 2012 is used to determine the following:

- the mean one year holding period return and standard deviation of returns (unadjusted for currency value changes)
- the mean three year annualized holding period return and standard deviation of returns (unadjusted for currency value changes)
- the mean five year annualized holding period return and standard deviation of returns (unadjusted for currency value changes)
- the mean one year holding period return adjusted for changes in the value of the foreign currency relative to the U.S. dollar and standard deviation of returns
- the mean three year annualized holding period return adjusted for changes in the value of the foreign currency relative to the U.S. dollar and standard deviation of returns

- the mean five year annualized holding period return adjusted for changes in the value of the foreign currency relative to the U.S. dollar and standard deviation of returns
- the correlation between monthly returns of the S&P 500 and the monthly returns of each foreign index
- the correlation of monthly returns between foreign indexes

## HYPOTHESES

Three statistical tests are performed to determine the significance of a difference in holding period returns for a given foreign index (measured in the foreign currency) versus the S&P 500. Each test is performed for each of the 11 foreign indexes relative to the S&P 500. The mean one, three, and five-year holding period returns are determined for the period January 1, 1999 through December 31, 2012. The objective of each test is to analyze foreign stock market performance relative to the United States.

### Test 1

$H_0$ : mean 1-year holding period return of foreign index = mean 1-year holding period return of S&P 500

$H_a$ : mean 1-year holding period return of foreign index  $\neq$  mean 1-year holding period return of S&P 500

### Test 2

$H_0$ : mean 3-year holding period return of foreign index = mean 3-year holding period return of S&P 500

$H_a$ : mean 3-year holding period return of foreign index  $\neq$  mean 3-year holding period return of S&P 500

### Test 3

$H_0$ : mean 5-year holding period return of foreign index = mean 5-year holding period return of S&P 500

$H_a$ : mean 5-year holding period return of foreign index  $\neq$  mean 5-year holding period return of S&P 500

In each case, the null hypothesis states that the holding period return of the foreign index, unadjusted for any change in the value of the foreign currency relative to the U.S. dollar, is equal to the holding period return of the S&P 500. The alternative hypothesis states that the holding period return of the foreign index, unadjusted for any change in the value of the foreign currency relative to the U.S. dollar, is not equal to the holding period return of the S&P 500.

For each foreign index, tests 1 through 3 are performed to determine any statistically significant difference in the holding period returns of the foreign index, *unadjusted* for changes in the value of its foreign currency relative to the U.S. dollar, compared to holding period returns of the S&P 500.

Three statistical tests (tests 4 through 6) are performed to determine the significance of a difference in holding period returns for a given foreign index, adjusted for changes in the value of the foreign currency relative to the U.S. dollar, versus the S&P 500. Each test is performed for each of the 11 foreign indexes relative to the S&P 500. The mean one, three, and five-year holding period returns are determined for the period January 1, 1999 through December 31, 2012. The objective of each test is to analyze, from a U.S. investor perspective, the holding period returns of foreign stock market investing (measured in U.S. dollars) relative to the United States.

### Test 4

$H_0$ : mean 1-year holding period return of foreign index adjusted for changes in value of currency relative to U.S. dollar = mean 1-year holding period return of S&P 500

$H_a$  : mean 1-year holding period return of foreign index adjusted for changes in value of currency relative to U.S. dollar  $\neq$  mean 1-year holding period return of S&P 500

#### Test 5

$H_0$  : mean 3-year holding period return of foreign index adjusted for changes in value of currency relative to U.S. dollar = mean 3-year holding period return of S&P 500

$H_a$  : mean 3-year holding period return of foreign index adjusted for changes in value of currency relative to U.S. dollar  $\neq$  mean 3-year holding period return of S&P 500

#### Test 6

$H_0$  : mean 5-year holding period return of foreign index adjusted for changes in value of currency relative to U.S. dollar = mean 5-year holding period return of S&P 500

$H_a$  : mean 5-year holding period return of foreign index adjusted for changes in value of currency relative to U.S. dollar  $\neq$  mean 5-year holding period return of S&P 500

In each case, the null hypothesis states that the holding period return of the foreign index, adjusted for changes in the value of the foreign currency relative to the U.S. dollar, is equal to the holding period return of the S&P 500. The alternative hypothesis states that the holding period return of the foreign index, adjusted for changes in the value of the foreign currency relative to the U.S. dollar, is not equal to the holding period return of the S&P 500.

For each foreign index, tests 4 through 6 are performed to determine any statistically significant difference in the holding period returns of the foreign index, *adjusted* for changes in the value of its foreign currency relative to the U.S. dollar, compared to holding period returns of the S&P 500.

Tests 1 through 6 will determine the statistical significance of the difference in annualized holding period returns of the foreign index relative to the S&P 500 over one, three, and five-year holding periods. A t-test is performed to determine the statistical significance of the difference in holding period returns. The results of the t-tests will show the probability that the two groups have the same mean.

The volatility of holding period returns is also analyzed. Three statistical tests (tests 7 through 9) are performed to determine the significance of a difference in volatility for a given foreign index (measured in the foreign currency) versus the S&P 500. Each test is performed for each of the 11 foreign indexes relative to the S&P 500. The standard deviations for one, three, and five-year holding period returns are determined for the period January 1, 1999 through December 31, 2012. The objective of each test is to analyze foreign stock market volatility relative to United States stock market volatility.

#### Test 7

$H_0$  :  $\sigma$  of mean 1-year holding period return of foreign index =  $\sigma$  of 1-year mean holding period return of S&P 500

$H_a$  :  $\sigma$  of mean 1-year holding period return of foreign index  $\neq$   $\sigma$  of 1-year mean holding period return of S&P 500

#### Test 8

$H_0$  :  $\sigma$  of mean 3-year holding period return of foreign index =  $\sigma$  of 3-year mean holding period return of S&P 500

$H_a$  :  $\sigma$  of mean 3-year holding period return of foreign index  $\neq$   $\sigma$  of 3-year mean holding period return of S&P 500

#### Test 9

$H_0$  :  $\sigma$  of mean 5-year holding period return of foreign portfolio =  $\sigma$  of 5-year mean holding period return of S&P 500

$H_a$ :  $\sigma$  of mean 5-year holding period return of foreign portfolio  $\neq$   $\sigma$  of 5-year mean holding period return of S&P 500

In each case, the null hypothesis states that the standard deviation of holding period returns of the foreign index, unadjusted for changes in the value of the foreign currency relative to the U.S. dollar, is equal to the standard deviation of holding period returns of the S&P 500. The alternative hypothesis states that the standard deviation of holding period returns of the foreign index, unadjusted for changes in the value of the foreign currency relative to the U.S. dollar, is not equal to the standard deviation of holding period returns of the S&P 500.

For each foreign index, tests 7 through 9 are performed to determine any statistically significant difference in the standard deviation of holding period returns of the foreign index, *unadjusted* for changes in the value of its foreign currency relative to the U.S. dollar, compared to the standard deviation of holding period returns of the S&P 500.

Three statistical tests (tests 10 through 12) are performed to determine the significance of a difference in volatility for a given foreign index, adjusted for changes in the value of the foreign currency relative to the U.S. dollar, versus the S&P 500. Each test is performed for each of the 11 foreign indexes relative to the S&P 500. The standard deviations for one, three, and five-year holding period returns are determined for the period January 1, 1999 through December 31, 2012. The objective of each test is to analyze the volatility of foreign stock market returns, adjusted for changes in the value of the foreign currency relative to the U.S. dollar, compared to United States stock market volatility.

For each foreign index, tests 10 through 12 are performed to determine any statistically significant difference in the standard deviation of holding period returns of the foreign index, *adjusted* for changes in the value of its foreign currency relative to the U.S. dollar, compared to the standard deviation of holding period returns of the S&P 500.

#### **Test 10**

$H_0$ :  $\sigma$  of mean 1-year holding period return of foreign index (adjusted for changes in the value of the foreign currency relative to the U.S. dollar) =  $\sigma$  of 1-year mean holding period return of S&P 500

$H_a$ :  $\sigma$  of mean 1-year holding period return of foreign index (adjusted for changes in the value of the foreign currency relative to the U.S. dollar)  $\neq$   $\sigma$  of 1-year mean holding period return of S&P 500

#### **Test 11**

$H_0$ :  $\sigma$  of mean 3-year holding period return of foreign index (adjusted for changes in the value of the foreign currency relative to the U.S. dollar) =  $\sigma$  of 3-year mean holding period return of S&P 500

$H_a$ :  $\sigma$  of mean 3-year holding period return of foreign index (adjusted for changes in the value of the foreign currency relative to the U.S. dollar)  $\neq$   $\sigma$  of 3-year mean holding period return of S&P 500

#### **Test 12**

$H_0$ :  $\sigma$  of mean 5-year holding period return of foreign index (adjusted for changes in the value of the foreign currency relative to the U.S. dollar) =  $\sigma$  of 5-year mean holding period return of S&P 500

$H_a$ :  $\sigma$  of mean 5-year holding period return of foreign index (adjusted for changes in the value of the foreign currency relative to the U.S. dollar)  $\neq$   $\sigma$  of 5-year mean holding period return of S&P 500

In each case, the null hypothesis states that the standard deviation of holding period returns of the foreign index, adjusted for changes in the value of the foreign currency relative to the U.S. dollar, is equal to the standard deviation of holding period returns of the S&P 500. The alternative hypothesis states that the standard deviation of holding period returns of the foreign index, adjusted for changes in the value of the foreign currency relative to the U.S. dollar, is not equal to the standard deviation of holding period returns of the S&P 500.

Test 7 through 12 will determine the statistical significance of the difference in the standard deviation of holding period returns of the foreign index relative to the S&P 500 over one, three, and five-year holding periods. F-tests will show the probability that the two groups have the same standard deviation.

Three statistical tests (tests 13 through 15) are performed to determine the significance of a difference in holding period returns for a given foreign index, measured in the currency of the index, versus the holding period returns of the foreign index when returns are measured in U.S. dollars. Each test is performed for each of the eleven foreign indexes across one, three, and five-year holding period returns. The objective is to analyze and compare foreign stock market returns on an absolute basis compared to the returns from the perspective of a U.S. investor, in U.S. dollars.

#### **Test 13**

$H_0$ : mean 1-year holding period return of foreign index, measured in currency of index = mean 1-year holding period return of foreign index, measured in U.S. dollars

$H_a$ : mean 1-year holding period return of foreign index, measured in currency of index  $\neq$  mean 1-year holding period return of foreign index, measured in U.S. dollars

#### **Test 14**

$H_0$ : mean 3-year holding period return of foreign index, measured in currency of index = mean 3-year holding period return of foreign index, measured in U.S. dollars

$H_a$ : mean 3-year holding period return of foreign index, measured in currency of index  $\neq$  mean 3-year holding period return of foreign index, measured in U.S. dollars

#### **Test 15**

$H_0$ : mean 5-year holding period return of foreign index, measured in currency of index = mean 5-year holding period return of foreign index, measured in U.S. dollars

$H_a$ : mean 5-year holding period return of foreign index, measured in currency of index  $\neq$  mean 5-year holding period return of foreign index, measured in U.S. dollars

In each case, the null hypothesis states that the holding period return of a given foreign index, measured in the currency of the index, is equal to the holding period return of the index when the return is measured in U.S. dollars. The alternative hypothesis states that the holding period return of a given foreign index, measured in the currency of the index, is not equal to the holding period return of the index when the return is measured in U.S. dollars.

For each foreign index, tests 13 through 15 are performed to determine any statistically significant difference in the holding period returns of the foreign index, when the returns as measured in the currency of the index are compared to the returns as measured in U.S. dollars. The results of t-tests will show the probability that the two groups have the same mean.

Three statistical tests (tests 16 through 18) are performed to determine the significance of a difference in volatility for a given foreign index, measured in the currency of the index, compared to the volatility of the index when returns are measured in U.S. dollars. Each test is performed for each of the eleven foreign indexes across one, three, and five-year holding periods. The objective of each test is to analyze and compare foreign stock market volatility when returns are measured in the currency of the index relative to the volatility when returns are measured in U.S. dollars.

### Test 16

$H_0$ :  $\sigma$  of mean 1-year holding period return of foreign index, measured in currency of index =  $\sigma$  of 1-year mean holding period return of foreign index, measured in U.S. dollars

$H_a$ :  $\sigma$  of mean 1-year holding period return of foreign index, measured in currency of index  $\neq$   $\sigma$  of 1-year mean holding period return of foreign index, measured in U.S. dollars

### Test 17

$H_0$ :  $\sigma$  of mean 3-year holding period return of foreign index, measured in currency of index =  $\sigma$  of 3-year mean holding period return of foreign index, measured in U.S. dollars

$H_a$ :  $\sigma$  of mean 3-year holding period return of foreign index, measured in currency of index  $\neq$   $\sigma$  of 3-year mean holding period return of foreign index, measured in U.S. dollars

### Test 18

$H_0$ :  $\sigma$  of mean 5-year holding period return of foreign index, measured in currency of index =  $\sigma$  of 5-year mean holding period return of foreign index, measured in U.S. dollars

$H_a$ :  $\sigma$  of mean 5-year holding period return of foreign index, measured in currency of index  $\neq$   $\sigma$  of 5-year mean holding period return of foreign index, measured in U.S. dollars

In each case, the null hypothesis states that the standard deviation of holding period returns of the foreign index, measured in the currency of the index, is equal to the standard deviation of holding period returns when returns are measured in U.S. dollars. The alternative hypothesis states that the standard deviation of holding period returns of the foreign index, measured in the currency of the index, is not equal to the standard deviation of holding period returns when returns are measured in U.S. dollars. F-tests will show the probability that the two groups have the same standard deviation.

Given comparisons are made for each of the eleven foreign indexes for each of the 18 tests, there are a total of 198 statistical tests. For each test, statistical significance will be determined at the 1% significance level.

## RESULTS

Table 1 shows the mean one, three and five-year holding period returns for the S&P 500 and eleven foreign stock indexes over the period 1999 through 2012. The returns in Table 1 are the absolute returns in the currency of the respective stock index. Table 1 also shows the standard deviation of returns for one, three, and five-year holding periods for each of the stock indexes.

The objectives of Table 1 are to compare foreign stock market performance relative to the U.S., in terms of both returns and volatility across one, three, and five-year holding periods over the period 1999 through 2012. Table 1 shows the results of hypotheses tests 1, 2 and 3 for each foreign stock index regarding absolute returns relative to the S&P 500. In addition, Table 1 shows the results of hypotheses tests 7, 8, and 9 for each foreign stock index regarding its volatility of returns relative to the volatility of returns for the S&P 500.



**TABLE 1**  
**INDEX RETURNS 1999 - 2012**

	<i>United</i>		<i>Great</i>		<i>Hong</i>						<i>South</i>	
	<i>States</i>	<i>Japan</i>	<i>Britain</i>	<i>Germany</i>	<i>Kong</i>	<i>Brazil</i>	<i>Mexico</i>	<i>China</i>	<i>France</i>	<i>India</i>	<i>Korea</i>	<i>Taiwan</i>
<b>1-Year Holding Period</b>												
Average Return (%)	2.13	-1.75	0.65	5.74	7.29	18.58	19.80	13.19	0.54	16.76	10.77	3.75
Standard Deviation (%)	17.91	22.66	15.92	26.44	26.17	34.87	25.73	52.91	23.41	32.83	27.07	26.51
Statistical Significance of Difference in Return Relative to U.S.		<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	0.13	<b>0.00</b>	<b>0.00</b>	0.26
Statistical Significance of Difference in Volatility of Returns Relative to U.S.		<b>0.00</b>	0.14	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>3-Year Annualized Holding Period</b>												
Average Return (%)	0.23	-3.05	-0.16	2.11	4.77	15.96	18.82	5.20	-2.65	15.98	10.41	2.29
Standard Deviation (%)	9.69	13.78	9.64	15.11	11.54	16.79	14.97	19.76	12.57	18.39	12.04	10.05
Statistical Significance of Difference in Return Relative to U.S.		<b>0.00</b>	0.18	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
Statistical Significance of Difference in Volatility of Returns Relative to U.S.		<b>0.00</b>	0.95	<b>0.00</b>	0.05	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>	0.67
<b>5-Year Annualized Holding Period</b>												
Average Return (%)	0.26	-2.28	0.25	2.92	6.07	18.35	20.00	6.02	-1.93	17.84	10.77	2.61
Standard Deviation (%)	4.47	8.11	4.55	8.01	7.81	11.47	9.60	12.89	6.64	12.43	7.65	6.51
Statistical Significance of Difference in Return Relative to U.S.		<b>0.00</b>	0.96	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
Statistical Significance of Difference in Volatility of Returns Relative to U.S.		<b>0.00</b>	0.86	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>

Generally, the difference in mean holding period returns between the foreign stock indexes and the S&P 500 was statistically significant. For the mean one-year holding period, nine out of the eleven foreign stock indexes had returns where the difference was statistically significant from the returns of the S&P 500; the difference in returns was not statistically different for France and Taiwan. Only Great Britain had returns where the difference was not statistically different from the S&P 500 for three and five-year holding period returns. Eight out of the eleven foreign indexes had one, three and five-year holding period returns greater than the S&P 500. Only Japan, Great Britain, and France underperformed relative to the S&P 500.

Generally, the difference between volatility of foreign stock returns and the volatility of returns for the S&P 500 was statistically significant, with greater volatility of returns for the foreign stock indexes. For the mean one-year holding period, the volatility of returns was greater and statistically significant for ten out of the eleven foreign stock indexes; only Great Britain had volatility where the difference was not statistically significant from the S&P 500. Only Great Britain, Hong Kong, and Taiwan had volatility where the difference was not statistically significant from S&P 500 volatility for three-year holding period returns; the volatility was greater for every index except Great Britain. For five-year holding period returns, only Great Britain had volatility where the difference was not statistically significant from the S&P 500. The volatility of every foreign index was greater than the S&P 500.

Table 2 shows the mean one, three and five-year holding period returns for the S&P 500 and eleven foreign stock indexes over the period 1999 through 2012, where the returns for foreign indexes are adjusted for changes in the value of the foreign currency relative to the U.S. dollar. Table 2 also shows the standard deviation of returns for one, three, and five-year holding periods for each of the stock indexes

when the returns have been adjusted for changes in the value of the index currency relative to the U.S. dollar.

The objectives of Table 2 are to compare foreign stock market performance relative to the U.S., in terms of both returns and volatility across one, three, and five-year holding periods over the period 1999 through 2012, when all returns are presented in U.S. dollars. Table 2 shows the results of hypotheses tests 4, 5, and 6 regarding foreign returns measured in U.S. dollars compared to the returns of the S&P 500. In addition, Table 2 shows the results of hypotheses tests 10, 11, and 12 for each foreign stock index regarding its volatility of returns, measured in U.S. dollars, relative to the volatility of returns for the S&P 500.

**TABLE 2**  
**INDEX RETURNS ADJUSTED FOR CHANGES IN VALUE OF CURRENCY RELATIVE TO USD 1999 - 2012**

	<i>United States</i>	<i>Japan</i>	<i>Great Britain</i>	<i>Germany</i>	<i>Hong Kong</i>	<i>Brazil</i>	<i>Mexico</i>	<i>China</i>	<i>France</i>	<i>India</i>	<i>South Korea</i>	<i>Taiwan</i>
<b>1-Year Holding Period</b>												
Average Return (%)	2.13	0.90	1.57	4.98	7.28	24.09	18.41	15.73	-0.12	16.90	13.67	5.26
Standard Deviation (%)	17.91	23.28	20.82	29.00	26.10	52.40	30.32	55.54	27.08	38.53	34.18	29.27
Statistical Significance of Difference in Return Relative to U.S.		0.28	0.36	0.08	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.05
Statistical Significance of Difference in Volatility of Returns Relative to U.S.		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>3-Year Annualized Holding Period</b>												
Average Return (%)	0.23	-0.23	0.44	-0.66	4.79	19.05	16.00	7.75	-5.37	15.67	11.73	3.16
Standard Deviation (%)	9.69	13.26	12.24	15.84	11.55	28.01	17.10	21.60	13.04	21.21	17.29	11.47
Statistical Significance of Difference in Return Relative to U.S.		0.41	0.59	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Statistical Significance of Difference in Volatility of Returns Relative to U.S.		0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.05
<b>5-Year Annualized Holding Period</b>												
Average Return (%)	0.26	0.69	0.94	-0.73	6.10	22.24	16.77	8.72	-5.47	17.70	11.64	3.47
Standard Deviation (%)	4.47	7.13	7.05	7.28	7.80	18.44	10.28	13.95	4.98	14.90	10.90	7.10
Statistical Significance of Difference in Return Relative to U.S.		0.24	0.05	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Statistical Significance of Difference in Volatility of Returns Relative to U.S.		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00

When returns are measured in U.S. dollars, only six out of eleven foreign indexes had a one-year mean return where the difference was statistically significant from the one-year mean return of the S&P 500. The difference in mean returns for three and five-year holding periods was statistically significant for eight foreign indexes, an increase of two relative to the one-year holding period. Eight out of the eleven foreign indexes had mean one and three-year holding period returns greater than the S&P 500; nine indexes had a mean five-year holding period return greater than the S&P 500.

For the one-year holding period, only Japan, Great Britain, and France underperformed relative to the S&P 500. These results are identical to the results in Table 1 where foreign index returns were not adjusted for changes in the value of the currency relative to the U.S. dollar. For the three-year holding period, only Japan, Germany, and France underperformed relative to the S&P 500; for the five-year holding period, only Germany and France underperformed.

Generally, the difference between volatility of foreign stock returns and S&P 500 returns, even when the returns were in U.S dollars, was statistically significant and greater for the foreign stock indexes. For the mean one-year holding period, the volatility of returns was greater and statistically significant for all eleven foreign stock indexes. Only Hong Kong and Taiwan had volatility where the difference not statistically significant from S&P 500 volatility for three-year holding period returns; however, the volatility was greater for every foreign index. For five-year holding period returns, only France had volatility where the difference was not statistically significant from the S&P 500. The volatility of every foreign index was greater than the S&P 500.

Table 3 provides a comparison of the holding period returns for each index on an absolute basis (in the currency of the index) relative to returns in U.S. dollars (after adjustment for changes in the value of the foreign currency relative to the U.S. dollar). The comparison allows a determination of the significance that currency fluctuation has played in U.S. investor returns.

**TABLE 3  
COMPARISON OF INDEX RETURNS**

	<i>United States</i>	<i>Japan</i>	<i>Great Britain</i>	<i>Germany</i>	<i>Hong Kong</i>	<i>Brazil</i>	<i>Mexico</i>	<i>China</i>	<i>France</i>	<i>India</i>	<i>South Korea</i>	<i>Taiwan</i>
<b>1-Year Holding Period</b>												
Average Return (%)	2.13	-1.75	0.65	5.74	7.29	18.58	19.80	13.19	0.54	16.76	10.77	3.75
Average Return Adjusted for Changes in Value of Currency Relative to USD (%)	2.13	0.90	1.57	4.98	7.28	24.09	18.41	15.73	-0.12	16.90	13.67	5.26
Significance of Difference in Return		<b>0.00</b>	0.18	0.38	0.61	<b>0.00</b>	0.05	<b>0.00</b>	0.45	0.84	<b>0.00</b>	<b>0.00</b>
<b>3-Year Annualized Holding Period</b>												
Average Return (%)	0.23	-3.05	-0.16	2.11	4.77	15.96	18.82	5.20	-2.65	15.98	10.41	2.29
Average Return Adjusted for Changes in Value of Currency Relative to USD (%)	0.23	-0.23	0.44	-0.66	4.79	19.05	16.00	7.75	-5.37	15.67	11.73	3.16
Significance of Difference in Return		<b>0.00</b>	0.18	<b>0.00</b>	0.06	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	0.30	<b>0.00</b>	<b>0.00</b>
<b>5-Year Annualized Holding Period</b>												
Average Return (%)	0.26	-2.28	0.25	2.92	6.07	18.35	20.00	6.02	-1.93	17.84	10.77	2.61
Average Return Adjusted for Changes in Value of Currency Relative to USD (%)	0.26	0.69	0.94	-0.73	6.10	23.24	16.77	8.72	-5.47	17.70	11.64	3.47
Significance of Difference in Return		<b>0.00</b>	0.08	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	0.64	0.04	<b>0.00</b>

For the mean one-year holding period return, eight out of eleven foreign indexes had superior returns to the S&P 500. For the same eight indexes, one-year period returns, on both an absolute basis and in U.S. dollars, exceeded the S&P 500. Japan, Great Britain, and Taiwan underperformed the S&P 500 on both an absolute basis and when returns were stated in U.S. dollars. The difference between the return of a given index when measured in the currency of the index relative to the return when measured in U.S. dollars, was statistically significant for only five countries: Japan, Brazil, China, South Korea, and Taiwan.

For the mean three-year holding period return, eight out of eleven foreign indexes had superior returns to the S&P 500. However, Germany outperformed on an absolute basis and underperformed when returns were stated in U.S. dollars; Great Britain underperformed on an absolute basis and outperformed when returns were stated in U.S. dollars. When returns were measured on an absolute basis, Germany, Hong Kong, Brazil, Mexico, China, India, South Korea, and Taiwan had superior returns relative to the S&P 500. When returns are measured in U.S. dollars, Great Britain, Hong Kong, Brazil, Mexico, China, India, South Korea, and Taiwan had superior performance relative to the S&P 500. The difference

between the return of a given index when measured in the currency of the index relative to the return when measured in U.S. dollars, was statistically significant for eight countries; only Germany, Hong Kong, and India had differences that were not statistically significant.

For the mean five-year holding period return, eight out of eleven foreign indexes had superior returns to the S&P 500 when returns were measured on an absolute basis; nine foreign indexes had superior returns when returns were measured in U.S. dollars. When returns were measured on an absolute basis, Japan, Great Britain, and France underperformed the S&P 500. When returns were measured in U.S. dollars, Germany and France underperformed the S&P 500. The difference between the return of a given index when measured in the currency of the index relative to the return when measured in U.S. dollars, was statistically significant for eight countries; only Great Britain, South Korea, and India had differences that were not statistically significant.

Table 4 shows provides a comparison of the volatility of holding period returns for each index on an absolute basis (in the currency of the index) relative to the volatility of returns when stated in U.S. dollars (after adjustment for changes in the value of the foreign currency relative to the U.S. dollar). The comparison allows a determination of the significance of differences in return volatility caused by currency fluctuations relative to the U.S. dollar.

**TABLE 4  
COMPARISON OF INDEX VOLATILITY**

	<i>United</i>		<i>Great</i>		<i>Hong</i>					<i>South</i>		
	<i>States</i>	<i>Japan</i>	<i>Britain</i>	<i>Germany</i>	<i>Kong</i>	<i>Brazil</i>	<i>Mexico</i>	<i>China</i>	<i>France</i>	<i>India</i>	<i>Korea</i>	<i>Taiwan</i>
<b>1-Year Holding Period</b>												
Standard Deviation of Index Returns (%)	17.91	22.66	15.92	26.44	26.17	34.87	25.73	52.91	23.41	32.83	27.07	26.51
Std. Dev. of Index Returns (%) Adjusted for Changes in Value of Currency Relative to USD	17.91	23.28	20.82	29.00	26.10	52.40	30.52	55.54	27.08	38.53	34.18	29.27
Significance of Difference in Std. Dev.		0.74	<b>0.00</b>	0.25	0.97	<b>0.00</b>	0.04	0.55	0.07	0.05	<b>0.00</b>	0.22
<b>3-Year Annualized Holding Period</b>												
Standard Deviation of Index Returns (%)	9.69	13.78	9.64	15.11	11.54	16.79	14.97	19.76	12.57	18.39	12.04	10.05
Std. Dev. of Index Returns (%) Adjusted for Changes in Value of Currency Relative to USD	9.69	13.26	12.24	15.84	11.55	28.01	17.10	21.60	13.04	21.21	17.29	11.47
Significance of Difference in Std. Dev.		0.66	<b>0.00</b>	0.59	0.98	<b>0.00</b>	0.13	0.31	0.68	0.10	<b>0.00</b>	0.13
<b>5-Year Annualized Holding Period</b>												
Standard Deviation of Index Returns (%)	4.47	8.11	4.55	8.01	7.81	11.47	9.60	12.89	6.64	12.43	7.65	6.51
Std. Dev. of Index Returns (%) Adjusted for Changes in Value of Currency Relative to USD	4.47	7.13	7.05	7.28	7.80	18.44	10.28	13.95	4.98	14.90	10.90	7.10
Significance of Difference in Std. Dev.		0.18	<b>0.00</b>	0.32	0.99	<b>0.00</b>	0.48	0.42	<b>0.00</b>	0.06	<b>0.00</b>	0.36

When returns were measured in the currency of the index, ten out of eleven foreign indexes had greater volatility than the S&P 500 for the one and three-year holding periods. Only Great Britain had less volatility. All eleven foreign indexes had greater volatility for the five-year holding period. When returns were measured in U.S. dollars, every foreign index had greater volatility across each of the holding periods. The difference in volatility between returns measured on an absolute basis and returns measured in U.S. dollars was statistically significant for Great Britain, Brazil, and South Korea for all holding periods. In addition, the difference was statistically significant for France for the five-year holding period.

Table 5 shows the correlation between monthly returns of all the indexes, where the returns are measured in the currency of the index. The correlation between monthly returns of the S&P 500 and the monthly returns of foreign indexes ranged from a low of .26945 with China to a high of .86342 with Great Britain. Two countries, India and Taiwan, had monthly returns that had a correlation between .50 and .60 with the S&P 500. Four countries had monthly returns that had a correlation between .60 and .70 with the S&P 500: Japan, Brazil, Mexico, and South Korea. Only Hong Kong had monthly returns that were correlated with the S&P 500 between .70 and .80. Three countries had monthly returns that had a correlation greater than .80 with the S&P 500: Great Britain, Germany, and France. Correlations between foreign indexes ranged from a low of .17736 between Great Britain and China, to a high of .92186 between Germany and France.

**TABLE 5**  
**CORRELATION MATRIX-CORRELATION BETWEEN MAJOR STOCK INDEXES**

	<i>Japan</i>	<i>Great Britain</i>	<i>Germany</i>	<i>Hong Kong</i>	<i>Brazil</i>	<i>Mexico</i>	<i>China</i>	<i>France</i>	<i>India</i>	<i>South Korea</i>	<i>Taiwan</i>
<i>US</i>	0.62096	0.86342	0.81752	0.70754	0.68324	0.69428	0.26945	0.84189	0.50837	0.63026	0.54171
<i>Japan</i>		0.59283	0.55208	0.59942	0.51699	0.54841	0.28223	0.58876	0.55173	0.58426	0.49433
<i>Great Britain</i>			0.80909	0.69217	0.66426	0.64204	0.17736	0.86457	0.48377	0.57305	0.47833
<i>Germany</i>				0.66293	0.64423	0.64175	0.22728	0.92186	0.47236	0.59095	0.53606
<i>Hong Kong</i>					0.71627	0.64462	0.39737	0.66127	0.57327	0.65698	0.58858
<i>Brazil</i>						0.70757	0.28933	0.66503	0.57262	0.58939	0.53617
<i>Mexico</i>							0.21010	0.63498	0.49268	0.62409	0.52526
<i>China</i>								0.22757	0.32994	0.26230	0.31568
<i>France</i>									0.49234	0.57223	0.53604
<i>India</i>										0.5594	0.49856
<i>South Korea</i>											0.61604

**TABLE 6**  
**CORRELATION MATRIX-CORRELATION BETWEEN MAJOR STOCK INDEXES ADJUSTED FOR CHANGES IN CURRENCY EXCHANGE RATE WITH USD**

	<i>Japan</i>	<i>Great Britain</i>	<i>Germany</i>	<i>Hong Kong</i>	<i>Brazil</i>	<i>Mexico</i>	<i>China</i>	<i>France</i>	<i>India</i>	<i>South Korea</i>	<i>Taiwan</i>
<i>US</i>	0.58348	0.85100	0.69772	0.70652	0.68960	0.73936	0.26848	0.68782	0.51998	0.66582	0.53824
<i>Japan</i>		0.56966	0.37898	0.58942	0.51219	0.53431	0.26219	0.38498	0.54896	0.60846	0.45544
<i>Great Britain</i>			0.56821	0.71272	0.65951	0.67951	0.24855	0.57335	0.54503	0.59854	0.51615
<i>Germany</i>				0.54624	0.55111	0.59922	0.13605	0.92679	0.36504	0.50422	0.41864
<i>Hong Kong</i>					0.72752	0.68199	0.39641	0.51329	0.59354	0.70034	0.58774
<i>Brazil</i>						0.72776	0.28942	0.51589	0.59717	0.65881	0.55442
<i>Mexico</i>							0.22229	0.56694	0.52502	0.67923	0.53638
<i>China</i>								0.12250	0.35267	0.30482	0.31587
<i>France</i>									0.35115	0.46108	0.38029
<i>India</i>										0.61320	0.50977
<i>South Korea</i>											0.64212

Table 6 shows the correlation between monthly returns of all the indexes, where the returns are measured in U.S. dollars. When returns are measured in dollars, the correlation between monthly returns of the S&P 500 and the monthly returns of foreign indexes ranged from a low of .26848 with China to a high of .85100 with Great Britain. Three countries had monthly returns that had a correlation between .50 and .60 with the S&P 500: Japan, India, and Taiwan. Four countries had monthly returns that had a correlation between .60 and .70 with the S&P 500: Germany, Brazil, France, and South Korea. Hong

Kong and Mexico had monthly returns that were correlated with the S&P 500 between .70 and .80. Only Great Britain had monthly returns that had a correlation greater than .80 with the S&P 500. Correlations between foreign indexes ranged from a low of .12250 between France and China, to a high of .92679 between Germany and France.

## SUMMARY

This research provides insight on several important international relationships regarding equity investing. The important points are highlighted in italics below.

*Although globalization has increased the interconnectedness between the United States and various economies throughout the world, significant differences still exist between equity returns and volatility in foreign countries and U.S. equity returns.* When analyzing returns in the currency of the index, generally the difference in mean holding period returns between the foreign stock indexes and the S&P 500 was statistically significant. For the mean one-year holding period, nine out of the eleven foreign stock indexes had returns where the difference was statistically significant from the returns of the S&P 500; for the three and five-year holding periods, ten out of the eleven foreign indexes had returns where the difference was statistically different from the S&P 500. Eight out of the eleven foreign indexes had one, three and five-year holding period returns greater than the S&P 500. Volatility of foreign indexes was also generally greater than that of the S&P 500. For the mean one-year holding period, the volatility of returns was greater and statistically significant for ten out of the eleven foreign stock indexes. Only three indexes had volatility where the difference was not statistically significant from S&P 500 volatility for three-year holding period returns; the volatility was greater for every index except Great Britain. For five-year holding period returns, only Great Britain had volatility where the difference was not statistically significant from the S&P 500. The volatility of every foreign index was greater than the S&P 500.

The differences in returns and volatility are reflected by the correlation between the monthly returns of the S&P 500 and the foreign indexes. When returns are measured in the currency of the index, the correlation between monthly returns of the S&P 500 and the monthly returns of foreign indexes ranged from a low of .26945 with China to a high of .86342 with Great Britain. The distribution includes two foreign indexes having a correlation with the S&P 500 of between .50 and .60, four foreign indexes having a correlation with the S&P 500 between .60 and .70, one foreign index having a correlation with the S&P 500 between .70 and .80, and three foreign indexes having a correlation with the S&P 500 greater than .80.

*When the returns for foreign indexes are adjusted for changes in the value of the foreign currency relative to the U.S. dollar, the results show international investing can play an important role in portfolio diversification and offer the potential of increasing returns for a U.S. investor.* When returns are measured in dollars, the correlation between monthly returns of the S&P 500 and the monthly returns of foreign indexes ranged from a low of .26848 with China to a high of .85100 with Great Britain. The distribution includes three foreign indexes having a correlation with the S&P 500 between .50 and .60, four foreign indexes having a correlation with the S&P 500 between .60 and .70, two foreign indexes having a correlation with the S&P 500 between .70 and .80, and only one foreign index having a correlation with the S&P 500 greater than .80. Although only six out of eleven foreign indexes had a one-year mean return where the difference was statistically significant from the one-year mean return of the S&P 500, the difference in mean returns for three and five-year holding periods was statistically significant for eight foreign indexes. Eight out of the eleven foreign indexes had mean one and three-year holding period returns greater than the S&P 500; nine indexes had a mean five-year holding period return greater than the S&P 500.

*Foreign currency fluctuation has had an important impact on U.S. investor returns.* Differences in the holding period returns for each index on an absolute basis (in the currency of the index) relative to returns in U.S. dollars (after adjustment for changes in the value of the foreign currency relative to the U.S. dollar) were generally statistically significant across longer holding periods (three and five years). For the mean five-year holding period return, the difference between the return of a given index when

measured in the currency of the index relative to the return when measured in U.S. dollars, was statistically significant for eight countries; only Great Britain, South Korea, and India had differences that were not statistically significant.

International equity markets will continue to play an important role for investors and corporate finance. Continued research will be important to monitor new developments, changes, and trends.

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