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The Role of Emerging Market in Investment Portfolios

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Abstract

This thesis explores the role of emerging markets in investment portfolios. Could an investment portfolio consisting of emerging market securities have outperformed similar portfolios that did not contain emerging markets over recent years? Gathering data from January 1, 2009 to December 31, 2010, mean-variance efficiency and the efficient frontier were used to compare the risk-return tradeoff for six constructed portfolios comprised of emerging markets, developed markets, and the risk-free asset. Brazil, Russia, India, and China were chosen to represent the emerging market allocation of the portfolios, accomplished by working with a BRIC Exchange Traded Fund (ETF). The S&P 500 was used to represent the U.S. equity market, a European ETF was used as an alternative developed market, and U.S. treasuries served as a proxy for the risk-free asset. I found that the diversification benefits of emerging market securities significantly improved the risk-return tradeoff of investment portfolios over the holding period of the study.

I. Introduction

"Emerging markets" is a term used by investment analysts to specify countries that are in a growing economic phase. Emerging markets are transitioning between the concept of initial industrialization and being fully developed. It has been hypothesized that including emerging markets in investment portfolios would optimize their risk-return tradeoff. Past evidence has shown that this is true. Incorporating emerging markets in investment portfolios allows for ideal diversification because of their lack of correlation with developed markets. However, is this theory still valid in the new era of economic contraction of the past two years? Since the economic contraction, research shows that there are definitely still advantages on a risk-return basis for portfolios that include emerging markets.

While emerging markets encompass several Southeast Asian countries, Eastern Europe, and parts of Africa and Latin America, four countries are expected to personify emerging markets over the next several years; Brazil, Russia, India, and China. These BRIC countries, as coined by Goldman Sachs, represent a unique and dynamic set of investment opportunities. A combination of a large and competitive work force, access to natural resources, and a sustainable revitalization of internal demand have considerably increased the role of BRIC economies in the global economy. Today, they collectively account for nearly 30% of global output, and their growth projections in the coming years are substantially above the average growth of world and developed economies (Aloui, Ben Aissa, Ngyuen, 2011). Economists and experts expect that, based on their potential of internal demand expansion and spending power, BRIC could provide a cushion against slower growth in the future (Aloui, Ben Aissa, Ngyuen, 2011). These forecasts have encouraged large investments in the BRIC countries. For example, investors in the $48 billion iShares Emerging Markets Index Fund have nearly half their money weighted in BRIC

3

stocks (Farzad, Roben, Bloomberg, 2010). There is no question that Brazil, Russia, India, and China are leaving an innovative and promising investment footprint all over the globe. It is for these reasons that a BRIC ETF was chosen in this study as a valid proxy for developing emerging markets.

Harry Markowitz's mean-variance efficiency was used as an effective way to measure and compare the risk-return tradeoff among the different portfolios. Specifically this means generating mean-variance efficient portfolios for portfolios of risky assets and then comparing the slopes, i.e., Sharpe ratios, of the capital allocation lines (CAL's) resulting from the inclusion of the risk-free asset as another investment option. Are emerging markets worth including? It was found that emerging markets, though their stand alone risk is very high compared to developed markets, provide diversification benefits due to low correlation of their returns with developed markets that make their inclusion necessary to optimally diversify an investment portfolio.

II. Literature Review

a) *Global financial crisis, extreme interdependences, and contagion effects: The role of economic structure?*

Modern portfolio theory, relying on the work of Markowitz (1952) and the principals of the Capital Asset Pricing Model (CAPM), suggests that investors can improve the performance of their portfolios by allocating their investments into different classes of financial securities and industrial sectors that are not expected to react similarly if new information emerges. Solnik (1974) extends this theory to an international context and suggests that diversifying globally, as opposed to a strictly domestic portfolio, will lead to optimization of the risk-return tradeoff. Therefore, investors should allocate their money into assets exhibiting low return correlation. A

paper written by Riadh Aloui, Mohamed Safouane Ben Aissa, and Duc Khung in 2011 at the Paris School of Management, France, examines the extreme correlations between the BRIC economies and the US, especially over 2007-2009. Empirical evidence indicates that although BRIC markets have many features in common, they do not behave similarly in regard to their financial linkages to the US.

Figure 1 illustrates the variation of returns for five markets used in this study. Data consists of five indices representing Brazil, Russia, India, and China, together with the US market index. All data are the MSCI total return indices expressed in US dollars on a daily basis from March 22, 2004 to March 20, 2009 (Aloui, Ben Aissa, Ngyuen, 2011). Figure 1 illustrates the variation of stock returns of the five markets.

Observably, stock prices were fairly stable throughout the period of March 2004 to the third quarter of 2008. Once the fourth quarter of 2008 begins, BRIC and the US display more instability resulting from the global financial crisis.

Despite the five countries reacting similarly to the world's economic struggles, table 1 reports unconditional correlations that vary considerably between each individual BRIC country and the US. Not surprisingly, there is a positive correlation between the US and BRIC markets. However, there are variations within these associations. The highest correlation is between the US and Brazil (.64), and the lowest is between the US and China (.21), with Russia and India roaming between. Additionally, there are positive correlations between the BRIC markets, although the China-India and Russia-Brazil markets are more highly correlated, showing a relationship of .57 and .54, respectively.

Reflecting upon the correlations between the US and BRIC markets, one must ask about the correlation among developed markets. Table 2 shows that many developed European markets

are significantly more positively correlated with the U.S. economy in comparison to BRIC. However, Italy appears to be on the lower end of the spectrum, with Brazil showing a higher correlation by .048. This could be due to the sluggish growth of the Italian economy since 2002. Aside from the slight decrease in US and Italy's correlation compared to US and Brazil's, developed markets on the whole have a higher correlation with the US economy. Thus, though a portfolio benefits greatly from international diversification accomplished with developed markets, the additional presence of emerging markets should improve the risk-return tradeoff for such portfolios.

During the economic crisis of 2007-2009, Brazil and Russia were much more financially dependent on the US than China and India, Meanwhile, the latter two had established important trade connections around the world (Aloui, Ben Aissa, Ngyuen, 2011). This led to China and India having a rapidly increasing degree of economic openness, with current trade-to-GDP ratios of 71.3% and 44.9% (Aloui, Ben Aissa, Ngyuen, 2011). During this time, Brazil's ratio increased rather steadily to its present 28.5%, and Russia's decreased from 110% to 52.8%.[1] Although Russia currently has a higher trade-to-GDP ratio than India, it reached its peak in the early 1990's and has been on a downward slope ever since.[2] Comparing the BRIC countries' trade-to-GDP ratios is significant because it represents the combined weight of total trade in a country's economy, the country's dependence on their exports, and the degree of reliance on imports. The trade-to-GDP ratio is especially important when evaluating BRIC countries because each attains very similar trade characteristics. For example, a low trade-to-GDP ratio does not necessarily imply high obstacles to foreign trade. There are many factors, including size and geographic remoteness, which play a vital role when comparing the trade-to-GDP ratios between countries.

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[1] data.worldbank.org
[2] data.worldbank.org

BRIC's variations in trade-to-GDP ratio can be attributed to their low correlations in economic activities between themselves and the U.S.

Another important factor leading to a wide variation in correlations among BRIC countries are the differences in each countries' trade profiles. 51.8% of Brazil's and 79.1% of Russia's revenues from exports are due to the trading of commodity products, such as corn, crude oil, gold, and rubber. 93.4% of China's and 64.0% of India's revenue from exports is owing to the trading of manufactured products, such as toys, clothing, shoes, and kitchenware. This reveals that Brazil and Russia are more dependent on the revenues from exports of commodity products, whereas the economic performance of China and India is greatly attributed to exports of manufactured products (Aloui, Ben Aissa, Ngyuen, 2011). Countries with higher sensitivity to commodity-price changes tend to have economies that move closely with the US in both bull and bear markets (Aloui, Ben Aissa, Ngyuen, 2011). Therefore, Brazil and Russia would behave similarly to the US when new information emerges. However, stock markets in both China and India are less dependent on US shocks and would keep a portfolio including the US and BRIC markets rather stable (Aloui, Ben Aissa, Ngyuen, 2011).

BRIC markets have experienced momentous growth as measured by ratios of stock market capitalization to GDP over recent years. They are less correlated with developed markets and display higher idiosyncratic risk due to the low level of their market sensitivities to global factors (Aloui, Ben Aissa, Ngyuen, 2011). Idiosyncratic risk is risk that affects a very small number of assets, and can be almost eliminated with diversification. Thus, a diversified investment portfolio that includes BRIC should present unique investment opportunities.

b) *Portfolio Selection*

Markowitz's (1952) *Portfolio Selection* describes the process of choosing a portfolio as being divided into two stages: The first stage starts with observation and experience and ends with beliefs about the future performances of available securities. The second stage starts with the relevant beliefs about future performances and ends with the choice of portfolio. During the second stage, an investor should consider expected return as desirable and variance of return as undesirable. Markowitz utilizes the "expected returns-variance of returns" rule to show that diversification of an investment portfolio is sensible.

This rule implies that the investor should both diversify and that he should maximize expected returns (Markowitz, 1952). In order to adhere to this rule, an investor should diversify his funds among securities which give maximum expected returns and minimize risk, i.e., standard deviation. The law of large numbers assumes that there is a portfolio which gives both maximum expected return and minimum risk as measured by return variance.

Using expected return and variance, Markowitz computed an efficient frontier. An efficient frontier is a line created from an isovariance line and an isomean curve that defines the optimal portfolios, that is, the portfolios that have the highest expected return possible for the given amount of risk. We define an isomean curve to be the set of all points (portfolios) with a given expected return (Markowitz, 1952). Similarly, an isovariance line is defined to be the set of all points (portfolios) with a given variance of return (Markowitz, 1952). Typically, the isomean curve is a system of parallel straight lines; the isovariance curve is a system of concentric ellipses. The center of the concentric ellipses is the point which minimizes variance. Variance increases as you move away from this center point. More precisely, if one isovariane curve lies closer to the isomean center point than another, it has a smaller variance. The point of the

isomean line at which the variance takes on its least value is the point at which the isomean line is tangent to an isovariance curve. Now, being informed of what (E,V) groupings are attainable, an investor can state what level of risk is desired coupled with its expected return.

Using the two equations below to compute expected return and variance respectively,

$$E = \sum_{i=1}^{N} X_i u_i \qquad\qquad V = \sum_{i=1}^{N}\sum_{i=1}^{N} \sigma_{ij} X_i X$$

Markowitz created an efficient frontier. N signifies the number of securities being used for the expected portfolio return and variance. X_i represents the percentage of the investor's assets which are allocated to the ith security, otherwise known as the security's weight within the investment portfolio, u_i is the expected value of return on the ith security and σ_{ij} represents the covariance of two securities. Since the X_i are percentages we have $\sum X_i = 1$.[3] Together these equations allowed Markowitz to create an efficient frontier using an isomean curve and isovariance line for portfolios of risky assets.

The expected return-variance of return rule implies diversification for a wide range of expected returns and portfolio covariances. Due to this large umbrella of coverage, the E-V rule can sometimes imply the superiority of an undiversified portfolio (Markowitz, 1952). Since one security might have an extremely higher yield and lower variance than all other securities, some undiversified portfolios may have higher returns for less risk. But, for a large, presumably representative range of expected returns and covariance's, the E-V rule leads to efficient portfolios almost all of which are diversified (Markowitz, 1952).

The E-V hypothesis goes further than to simply suggest diversification. It implies the "right kind" of diversification for the "right reason" (Markowitz, 1952). The adequacy of diversification is not solely dependent on the number of different securities held. A portfolio

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[3] In the analysis negative values of X_i were used, therefore short sales of the securities were possible.

with sixty different railway securities, for example, would not be as well diversified as the same size portfolio with some railroad, some public utility, mining, various sorts of manufacturing, etc. The reason is that it is generally more likely for firms within the same industry to do poorly at the same time than for firms in dissimilar industries (Markowitz, 1952). In other words, diversifying across different markets is necessary to avoid investing in securities with high covariances among themselves.

As shown in the literature review of *Global Financial Crisis, Extreme Interdependences, and Contagion Effects: The Role of Economic Structure?*, emerging markets have low market correlation with the United States due to their different economic characteristics. Therefore, the covariance between BRIC and the U.S. is small. A portfolio that is comprised of developed and emerging markets follows Markowitz's theory of a well diversified portfolio; the low covariance among the developed and emerging countries optimizes the diversification risk-return rule. However, what happens when the risk-free asset is included?

Mean-variance efficiency allows an investor to see which portfolio has the highest expected return at a given level of risk. It allows the investor to separate the "product decision", which is how to construct a mean-variance efficient risky portfolio, from the "consumption decision", which describes the investor's allocation of funds between the efficient risky portfolio and the safe asset. An infinite number of rays can be constructed that define a portfolio consisting of a single risky portfolio from the efficient frontier and the risk-free security. The "tangency" portfolio is defined as that ray having the maximum slope and, therefore, must be tangent to the upper half of the efficient frontier. The "tangency" portfolio and the risk-free asset define the capital allocation line (CAL) that dominates all portfolios consisting of only risky assets. The construction of the optimal portfolio is purely a technical problem. There is a single

optimal risky portfolio appropriate for all investors (Bodie, Kane, Marcus, 1998). Investors differ only in how they apportion investments between that risky portfolio and the safe asset.

Mean-variance theory also speaks to portfolio performance by offering a criterion to judge an investor's choice of various risky securities comprising different risky portfolios that may generate different efficient frontiers. Such a criterion is the Sharpe ratio. The Sharpe ratio measure divides average portfolio excess return by the standard deviation of portfolio returns over the sample period. The numerator is the incremental return the portfolio earned in comparison with an alternative investment in the risk-free asset, and the denominator is the increment in portfolio volatility compared with the risk-free alternative (Bodie, Kane, Marcus, 1998). Therefore, the ratio as the slope of the capital allocation line provides the constant risk-return tradeoff of a given portfolio at various weightings between the risk-free security and the risky tangency portfolio. Though constant for a given portfolio, the Sharpe ratio can serve as the basis for judging return performance among a number of different contemporaneous portfolios comprised of different risky securities and the risk-free asset.

III. Discussion

a) Data

In order to create an efficient frontier and determine whether a portfolio including BRIC is a better investment opportunity on a mean-variance efficiency basis, four investment securities were chosen to obtain data over the 2009-2010 period of the study. After careful research, iShares MSCI BRIC Index fund (ETF), ticker symbol BKF, was chosen to represent BRIC market allocation in the portfolios. Vanguard European ETF, ticker symbol VGK, represents the

fully developed economy of Europe, and the S&P 500 index embodies the United States market. Finally, a 10-year treasury yield was chosen as the risk-free asset in the portfolios.

BRIC Index fund, BKF, is a free floating adjusted market capitalization index that is designed to measure the combined equity market performance in Brazil, Russia, India and China ("BRIC"). The Underlying Index consists of stocks traded primarily on the BM&FBOVESPA (the Brazilian exchange), Russian Trading System Stock Exchange, National Stock Exchange of India, Shanghai Stock Exchange, Shenzen Stock Exchange and the Stock Exchange of Hong Kong. As of September 30, 2010, the BKF's three largest sectors by component weighing were financials, energy, and materials. BKF's top country holdings are as follows: China 36.48%, Brazil 34.01%, Russia 15.55%, India 13.58%, Hong Kong .09%, Cayman Islands .05%, and the United States .01%.

VGK seeks to track the performance of the MSCI Europe Index, an unmanaged benchmark of stocks in developed European markets. This index is made up of approximately 467 common stocks of companies located in 16 European countries- mostly companies in the United Kingdom, France, Germany, and Switzerland. VGK's top country holdings are as follows: United Kingdom 31.7%, France 16.3%, Germany 11.7%, Switzerland 12.2%, Spain 6.1%, Sweden 4.2%, Italy 5.0%, Netherlands 5.0%, Denmark 1.4%, Finland 1.8%, Belgium 1.5%, Norway 1.1%, Austria 0.5%, Greece 0.7%, Ireland 0.4%, Ireland 0.4%, and Portugal 0.4%.

The S&P 500 Index is a well-known value-weighted stock market index that includes common stocks of 500 companies from several industrial sectors representing 70% of market value of all stocks publically traded in the United States.[4] Each stock in the index contributes to the index in the same proportion as the value of its shares, and most of these stocks are listed on

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[4] www.world-stock-exchanges.net

the New York Stock Exchange. The S&P 500's three largest sectors are energy, financials and industrials. Its top ten company holdings are as follows: Exxon Mobil Corp. 3.81%, General Electric 3.15%, AT&T Inc. 1.92%, Microsoft Corp. 1.76%, Citigroup 1.72%, Bank of America Corp. 1.66%, Proctor & Gamble 1.63%, Cisco Systems 1.50%, Chevron Corp. 1.48%, and Johnson & Johnson 1.41%.

A 10-year treasury security was chosen as the risk free asset represented in the six portfolios. The risk-free rate was obtained by visiting the U.S. Treasury website and determining the 10-year end of day yield on December 31, 2008. It was given as 2.25%. BKF, VGK, S&P 500, and the 10-year treasury security were used to create six different portfolios:

1. Risk Free Asset + BRIC + VGK

2. Risk Free Asset + BRIC

3. Risk Free Asset + VGK

4. Risk Free Asset + S&P 500

5. Risk Free Asset + BRIC + S&P 500

6. Risk Free Asset + VGK + S&P 500

 Portfolios 3, 4 and 6 include the risk-free asset and developed markets, portfolios 1 and 5 contained a combination of the risk-free asset, a developed market and emerging markets, and portfolio 2 was comprised of the risk-free asset and emerging markets.

b) *Methodology*

The purpose of the methodology was to determine which of the six portfolios provide the best risk-return tradeoff, i.e. the highest Sharpe ratio, over the period of the study. The first step was generating discrete weekly returns from the index levels. Discrete returns were used instead

of continuous-time returns in order to minimize the effect of negative skewness present for all indices' return data.[5] Means and standard deviations determined from weekly returns were then annualized.

The efficient frontier is used as a means of determining the optimal risk-return tradeoff for a portfolio of risky securities each having a mean and standard deviation and a portfolio covariance matrix specifying the degree of correlation among the securities' returns comprising the portfolio. For vectors of weights as the chosen proportion of investor wealth allocated to each risky security, an efficient frontier can be generated for the risky portfolio that provides the maximum return and the minimum risk, i.e., standard deviation, for a specific set of weights assigned to each risky security. For our risky portfolios consisting of only two risky assets, each hypothetical portfolio is determined as

$$\mu_{pj} = x_{j1}\mu_1 + x_{j2}\mu_2 \tag{1}$$

and

$$\sigma_{pj} = [\, x_{j1}^2 \sigma_1^2 + x_{j2}^2\sigma_2^2 + 2\rho_{1,2}\, \sigma_1\, \sigma_2\, x_{j1}\, x_{j2}]^{1/2} \tag{2}$$

where x_{j1} and x_{j1}^2 are wealth allocations that must sum to 1. μ_1 and μ_2 are mean returns determined from a time series of weekly returns and $2\rho_{1,2}$ is the correlation coefficient from the two return time series. The efficient frontier shown as an example in figure 2 can be generated from equations (1) and (2). As can be seen, only risky portfolios on the upper half of the efficient frontier will be of interest.

The introduction of the risk-free asset as a single point on the y-axis in μ/σ space gives another investment option. Now the slope of the CAL, i.e., the Sharpe ratio, measuring the

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[5] Sfiridis, James M., Revisiting the Market Risk Premium (June 12, 2010). Available at SSRN: http://ssrn.com/abstract=1031131

additional portfolio return beyond the risk-free return per unit of risk incurred, can serve as the means to determine which portfolios given in section III.a on page 13 provide the best risk/return tradeoff. The greater the Sharpe ratio, or the steeper the slope, the better the portfolio.

c) *Empirical Results*

Table 3 and figure 4 show empirical results for the six portfolios used in our study. For portfolios comprised of only the risk-free asset and a single risky asset, i.e., portfolios 2, 3 or 4, the one using the BRIC index (portfolio 2) is clearly superior as can be seen by a comparison of the Sharpe ratios in table 3. The addition of the developed markets, i.e., portfolios 1 and 5, provides further diversification benefits as seen in table 3. The addition of the S&P 500 index raises the Sharpe ratio from 1.088 to 1.18. The addition of the European index (VGK) is even better, raising the Sharpe ratio from 1.088 to 1.268. Also noteworthy is the fact that portfolio 3 comprising the risk-free asset and the BRIC index as the only risky asset is superior to portfolio 6 having both developed market indices as the portfolio's risky portion.

The superior performance of an investment portfolio containing a BRIC asset can be seen on an efficient frontier graph that includes a capital allocation line. Once the mean and standard deviation of the risky assets are plotted to create the efficient frontier, as shown in figure 2, the capital allocation line can be added with the inclusion of a risk-free asset. Using the risk-free return as the y-intercept and the tangency portfolio, the capital allocation line is formed tangent to the efficient frontier. This is shown graphically in figure 3.

Such calculations and graphs were made for the six investment portfolios shown in section III.a on page 13. When each portfolio's capital allocation line was plotted on the same graph, the dominance of the investment portfolios including BKF was obvious. Figure 4 clearly illustrates graphically what is shown in table 3. A portfolio that holds the BRIC asset outperforms

15

alternative portfolios that only include a riskless asset combined with developed market securities.

IV. Summary and Conclusions

Using Markowitz's (1952) *Portfolio Selection* and the idea behind Modern Portfolio Theory, six investment portfolios were constructed to measure the risk-return tradeoff advantages of including emerging markets in investment portfolios. Due to the unique and dynamic set of investment opportunities that Brazil, Russia, India, and China have to offer, the BRIC Index Fund ETF was chosen to represent emerging market allocation. The S&P 500 and Vanguard European ETF were used to represent the fully developed economies of the United States and Europe. Finally, a risk-free treasury bill was used as the riskless asset. Measuring each portfolio's mean-variance efficiency and Sharpe ratio allowed for the construction of an efficient frontier and capital allocation line which visually proved that my hypothesis was correct: The diversification benefits of emerging market securities significantly improves the risk-return tradeoff of investment portfolios over the period of the study.

As noted in table 3 and figure 4, investment portfolios containing BKF obtained the highest Sharpe ratio of their capital allocation lines. This means that investments in these emerging markets during 2009 and 2010 offered investors higher returns on a risk-return basis compared to portfolios that did not contain a BRIC asset. While this is true of the past, can it be expected in the future? The answer is unclear. However, it is apparent that inclusion of an emerging market asset optimized the risk-return tradeoff over the 2-year period of the study.

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    <http://www.world-stock-exchanges.net/indices.html>.

Table 1: Market Correlation between Brazil, Russia, India, China and the United States

	Brazil	Russia	India	China	US
Brazil	1.000	0.537	0.363	0.424	0.639
Russia		1.000	0.391	0.449	0.306
India			1.000	0.570	0.254
China				1.000	0.206
US					1.000

(Aloui, Ben Aissa, Ngyuen, 2011)

Table 2: Market Correlation between Italy, France, Germany, the UK and the United *States*

	Italy	France	Germany	UK	US
Italy	1.000	0.767	0.685	0.679	0.591
France		1.000	0.758	0.742	0.664
Germany			1.000	0.695	0.642
UK				1.000	0.676
US					1.000

(Savva, 2009)

Table 3: Portfolio Return, Standard Deviation, and Sharpe ratios

Portfolio	Return	Sigma	Sharp Ratio
T-Note, BKF, S&P 500	.901	.739	1.188
T-Note, BKF, VGK	.697	.531	1.268
T-Note, S&P 500, VGK	.173	.216	.696
T-Note, BKF	.370	.319	1.088
T-Note, S&P 500	.173	.216	0.696
T-Note, VGK	.195	.280	0.617

Figure 1: Variation of Stock Returns from Quarter 2, 2004 to Quarter 2, 2009 in Brazil, Russia, India, China, and the United States
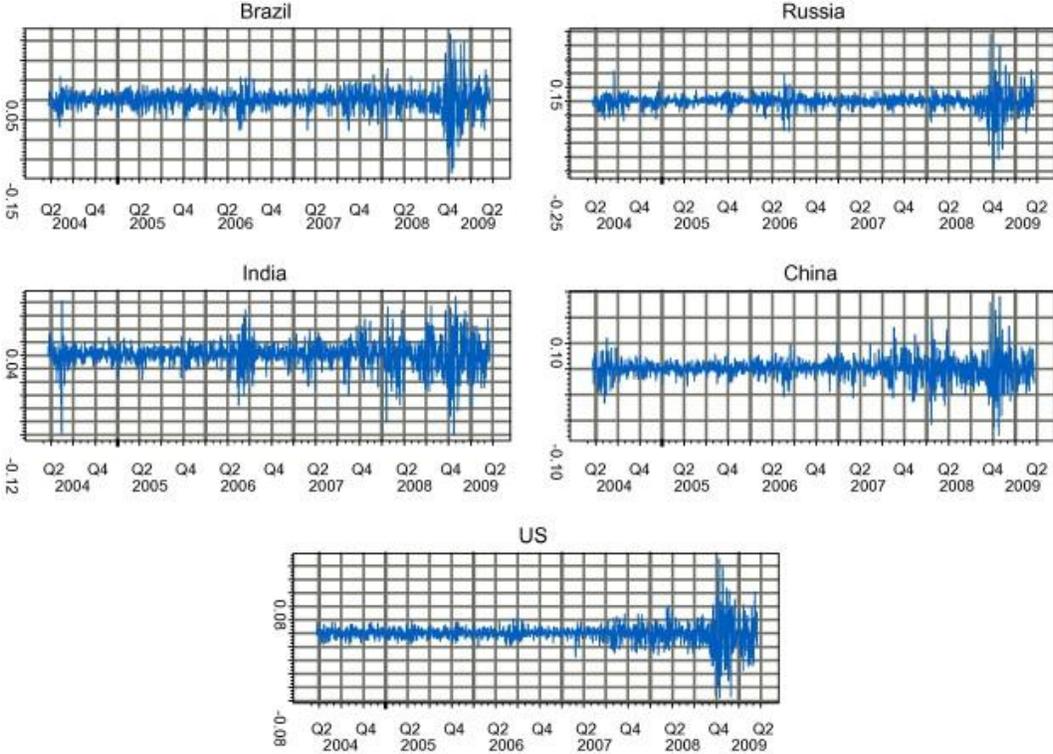
(Aloui, Ben Aissa, Ngyuen, 2011)

Figure 2: Efficient Frontier for Portfolio Containing BRIC and the S&P 500
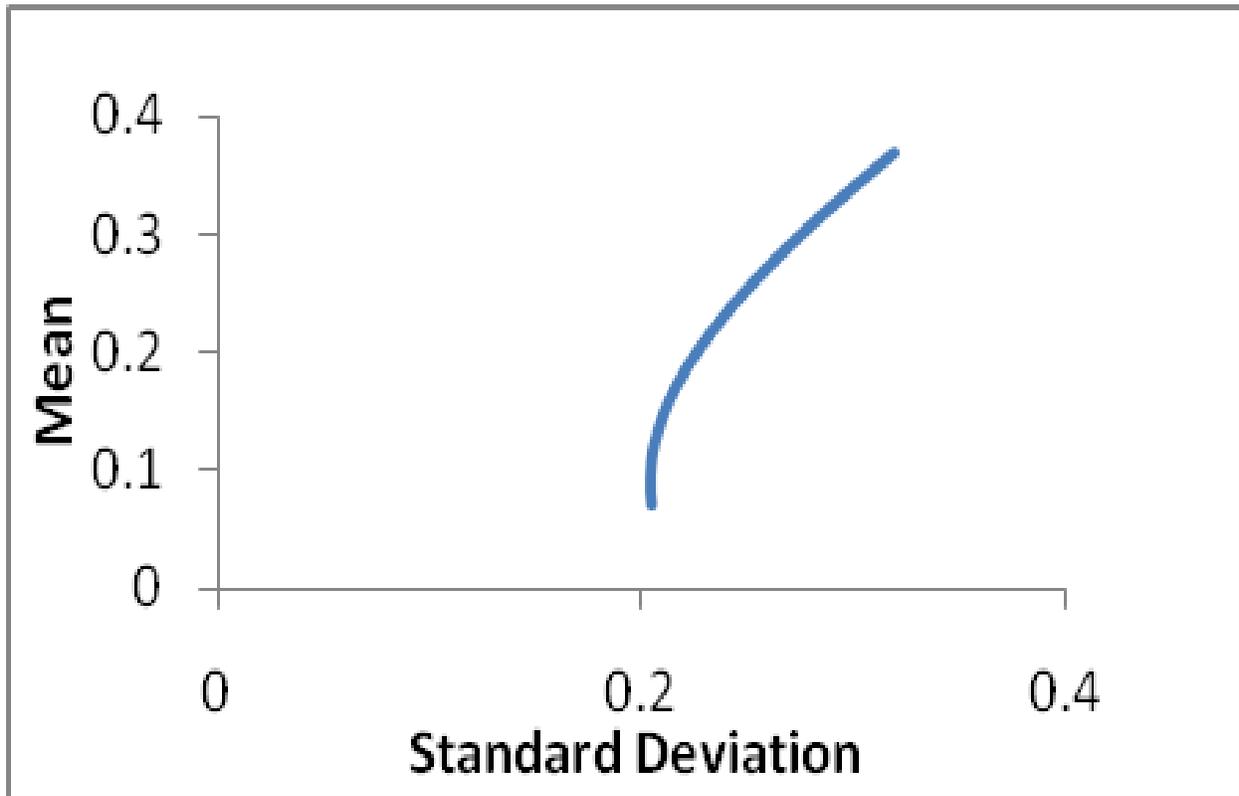
Figure 3: Efficient Frontier and Capital Allocation Line for Portfolio Containing BRIC and the S&P 500
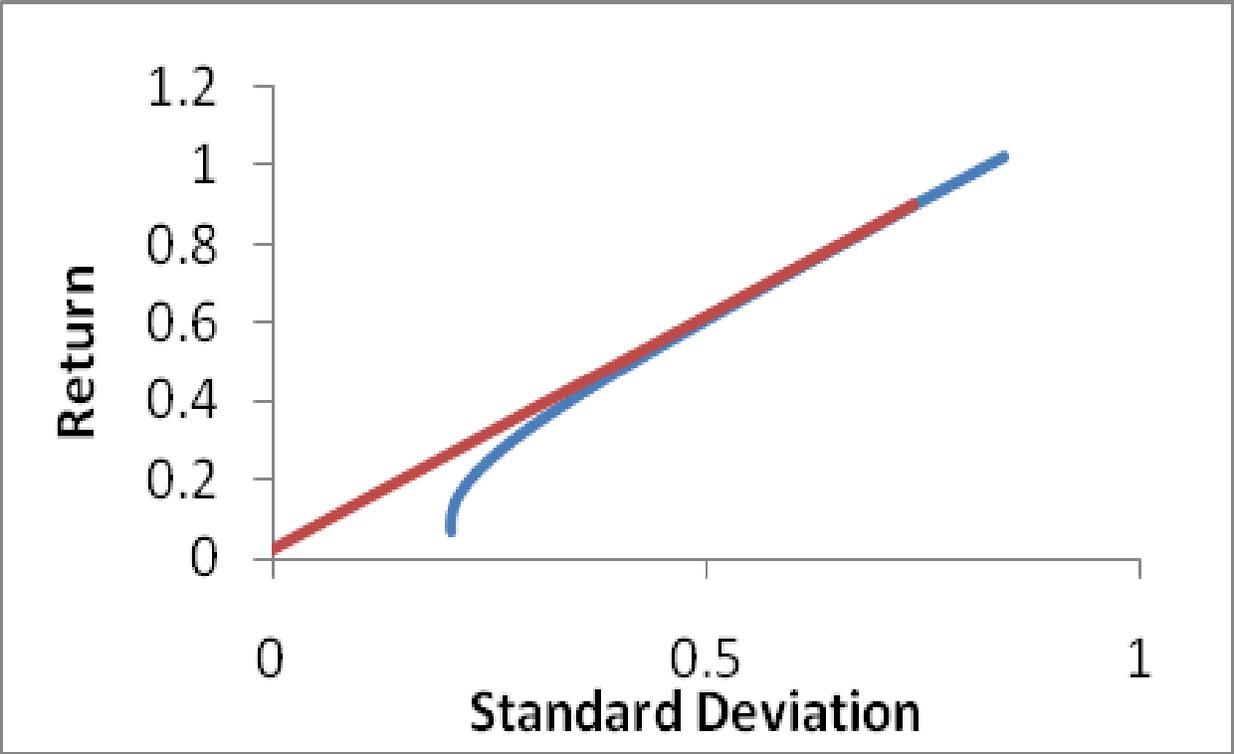
Figure 4: Combined Graph of the Six Investment Portfolios Capital Allocation Line