Active Portfolio Management Adapted For the Emerging Markets

by

Dohyen Nam

B.A. Business Administration
Yonsei University, 2000

SUBMITTED TO THE MIT SLOAN SCHOOL OF MANAGEMENT IN PARTIAL

FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN MANAGEMENT STUDIES

AT THE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

JUNE 2011

Signature of Author: _____

May 6, 2011
MIT Sloan School of Management

Certified by: _____

S.P. Kothari
Gordon Y Billard Professor of Management
Thesis Supervisor

Accepted by: _____

Michael A. Cusumano
SMR Distinguished Professor of Management
Program Director, M.S. in Management Studies Program
MIT Sloan School of Management

This Page is intentionally left blank.

Active Portfolio Management Adapted For the Emerging Markets

by

Dohyen Nam

Submitted to the MIT Sloan School of management

on May 6, 2011 in partial fulfillment of the

requirements for the Degree of Master of Science in Management Studies

ABSTRACT

In the emerging markets with a fast growing economy but a not quite efficient capital market, investors try to find a constant excess return against the benchmark from active portfolio management. In this paper, after defining what an active portfolio is, we tested various alpha generating strategies empirically in the emerging markets and reviewed possible asset allocation models as implementation methods for those alpha generating strategies.

For finding adaptable alpha strategies for the emerging markets, an empirical study was carried out for four possible alpha generating strategies - value and growth strategy, Fama-French multi-factor strategy, residual earning strategy, and momentum strategy – in 14 emerging countries. The results from alpha testing for fundamental strategies showed a positive correlation between the alpha return and the multi-factor used in size and book-to-market ratio in most Asian countries. Also, the results for technical strategy commonly showed mean-reversion effect in the short run in most emerging countries.

Following this empirical test results, we discussed the two possible asset allocation models adapted for active portfolio management to implement alpha generating strategy: Treynor-Black Model and Black-Litterman Model. These two models allow us to input the alpha return and risk obtained by the empirical test results in order to complete active portfolio management.

Finally, we expect the completion for active portfolio management adapted for the emerging markets with the empirical test results and the implementation methods.

Thesis Supervisor: S.P. Kothari
Title: Gordon Y Billard Professor of Management

This Page is intentionally left blank.

TABLE OF CONTENTS

1. Introduction

In the current financial market, the presence of an active portfolio management is a controversial issue for investors. Many famous managers boast of achieving a high residual return for several years of active portfolio management. However, the names of successful managers constantly change over time. Therefore, it may be impossible for the managers to maintain a positive long-term alpha return. Moreover, the average return for passive managers who invest in the market index outperforms those for the average active managers. Despite this fact, investors still pursue active portfolio management to get a higher return constantly than the market return from their own alpha generating strategy. Especially, in the emerging markets which is a fast growing region, investors believe that there are a lot of opportunities for managers to catch the alpha strategies from the experience of developed markets because the emerging market follows the track of the developed markets.

From this intuition, we focus from the start to the end on the active portfolio management adaptable for the emerging markets. To complete the active portfolio management, managers need to go through several steps. First, managers define the active and passive portfolio management and define the alpha. Second, they find the alpha generating factors for the emerging markets. Finally, after finding the possible alpha generating factor, they construct an optimal portfolio through asset allocation model.

The objective of this paper is to verify the alpha generating strategies in the emerging market through the empirical tests and to construct an efficient active portfolio using the alpha strategies. To complete this project, the paper will be categorized into 5 main categories.

First, we define active portfolio management. We deal with basic concepts of portfolio management theory academically. We study CAPM which is related to the risk of an individual security to its expected returns and Harry Markowitz's mean-variance portfolio theory, including the efficient frontier in order to find an optimal portfolio in theory. Additionally, we enlarge the study to Tobin's Separation theorem to set the market portfolio as the optimal risky portfolio. After studying CAPM, we look over Efficient Market Hypothesis. If the market is a strong-form efficient market, there is no excess return because the stock price reflects all information. However, if the status of the emerging market is not strong-form efficient market, we can find various alpha strategies because the market is not perfectly efficient. After looking at the main concepts of portfolio theories, we focus on the emerging markets and find empirical evidence of inapplicability of the CAPM on Emerging markets. Moreover, we find evidence of whether the emerging market is weak- or semi-strong- or strong-form efficient from the empirical results conducted by other researchers targeting the emerging markets. After confirming the probability of the existence of alpha generating strategies from the research and setting the benchmark which represents the market or optimal portfolio, we define the alpha generating strategy using information ratio, information coefficient, and residual return and risk.

Secondly, we study and pre-design several alpha generating strategies. We divide strategy into two categories: fundamental valuation strategy and technical strategy. Fundamental valuation strategy is related to the firm specific information. Many researchers set their portfolio strategy using various internal factors such as book to price, P/E ratio, EPS, Market Capitalization, and etc. to find constant alpha. Depending on the market development,

investors use different factors to generate alpha return. We try to find suitable variable sets according to efficiency levels of emerging markets and make the alpha strategy using the signal from those variables. Traditionally, value and growth approach based on the firm's accounting information is a well known fundamental strategy and we categorize the value and growth stocks through the book-to-market ratio in the emerging market and investigate which conditions are needed for making alpha return through this approach. Additionally, we look over the Fama and French three factors Model. This factor model is very famous in the academic field. Through this model, we may find excess return which can't be explained by CAPM. We investigate whether the combination of size and book value factor captures residual return and we make the active portfolio from those factors. Moreover, currently, many investors focus on earnings quality and try to analyze the firm's financial statements in a more sophisticated way in order to capture a firm's sustainability of earnings. Residual earnings model may capture alpha return by investing in good firms with sustainable earning potential. Therefore, we may make another active portfolio from residual earning model in the emerging markets. In technical strategy, we look over the momentum strategy and moving average trading rule. Momentum strategy focuses on a stock's historical performance. We study the momentum strategy created by Jegadeesh and Titman and classify the winner and loser stocks from the historical stock price in the emerging market. Then we set the active portfolio with momentum scheme. Moving average trading rule is another technical approach. Moving average rule relies on a comparison of a short-run moving average with a long-run moving average in order to catch the signals. Honestly speaking, although this is not a portfolio strategy but a trading rule, we expect that the trading policy followed by moving average rule may capture the alpha return especially in the emerging market which is not perfectly efficient.

The third step is to run the empirical tests in the emerging market. After we select the possible alpha generating strategies from the research, we run the empirical tests to verify whether those alpha generating strategies are well adapted for the emerging markets. Among the countries included in the emerging market index, we choose the main countries where the financial data is available and where it is credible to do the empirical tests. Empirical tests will be focused on the evidence of the alpha generating for each strategy. We can verify whether the strategy makes the constant alpha from empirical results of the information ratio (IR), information coefficient (IC), and residual return and risk in the emerging market.

The final step of the paper is to research the efficient implementation methods in order to adapt our alpha strategies confirmed from the empirical tests into the active portfolio management. Alpha strategies focus on finding alpha generating factors in the emerging markets. However, to make an efficient portfolio from the strategies, we need the implementation tools which are represented by the asset allocation methods. As we have indicated in the first chapter, the basis of the asset allocation methods is Markowitz's mean-variance portfolio theory. However, due to several restrictions, Markowitz's portfolio optimization is not the proper method for active portfolio management in practice. Therefore, we need to research the advanced asset allocation model in order to efficiently implement the alpha strategies. We introduce the Treynor-Black Model and Black-Litterman Model which are widely used in investment banks in the emerging markets. Then we show how to work our finding of residual alpha and risk from the empirical tests into the Treynor-Black and Black-Litterman Models. Through the research, we will make a suitable methodology to get the desirable input sources adapted in the emerging markets.

Following these processes, we find proper alpha generating factors from the empirical test results. The results from alpha testing for fundamental strategies showed a positive correlation between the alpha return and the multi-factor used in size and book-to-market ratio in most Asian countries. The portfolio consisting of small firms with high book-to-market ratio, constantly generates alpha return against the benchmark in Asian countries. Also, the results for technical strategy commonly showed mean-reversion effect in the short run in most emerging countries. Return on the portfolio consisting of firms with high historical performance in the short period of time tends to reverse the return to mean.

From these findings, we catch the size factor and value factor from fundamental analysis and mean-reversion factor from technical analysis. Alpha generating factor is the main ingredient for progress for the next step of active portfolio management because expected residual return and risk can be derived from the alpha generating factor. Then, we discussed two asset allocation models which are Treynor-Black and Black-Litterman model as portfolio construction methods adapted for active portfolio management. As a result, we completed active portfolio management adapted for the emerging markets with the alpha generating factor from the empirical test results and the portfolio construction methods from the active asset allocation models.

2. Active Portfolio Management

In this chapter, we need to define the active portfolio management. Before studying the active portfolio management directly, we deal with basic concepts of portfolio management theory academically.

First, we look over the main concepts of portfolio management. We study Harry Markowitz's mean-variance portfolio theory including the efficient frontier in order to define the portfolio risk and return, establish the relationship between risk and return, and finally find the optimal portfolio in theory and we look into Tobin's Separation theorem dealt with risk-free asset and risky asset which is necessary for understanding the concept of capital market line. Then, we study the CAPM formula which is related to the risk of an individual security to its expected returns

After studying CAPM, we enlarge the research for the Efficient Market Hypothesis. Efficient Market Hypothesis is important for the study of the active portfolio management in emerging markets because, according to the status of emerging market based on EMH, we can decide which factors are more reasonable sources for generating alpha in the emerging markets. For example, if the emerging market denies weak-form efficiency, we can generate alpha strategy from historical price information. In other words, if the emerging market is weak-form efficient but is not semistrong-form efficient, we need to use the firm's reported financial information to find proper alpha strategy.

After looking at the main concepts of portfolio theories and EMH, we investigate the

empirical research about the evidence whether CAPM theory is applicable for the emerging market or not. Moreover, we research whether the emerging market is weak- or semistrong- or strong-form efficiency based on EMH. If we can deny the emerging markets are not strong-form efficient or we cannot explain the security return by the CAPM formula, we can confirm the existence of alpha generating portfolio strategies. Afterwards, we define the active portfolio management from the definition of alpha and introduce information ratio to measure the quality of alpha.

2.1. Main Concepts of portfolio management

2.1.1. The Capital Asset Pricing Model

2.1.1.1. Mean-Variance Portfolio Analysis

Markowitz's mean-variance portfolio selection model is the most important inception in modern finance theory, especially in the investment field (Markowitz, 1952). According to his theory, the rational investors want to maximize the discounted value of future returns. However, those expected returns include an allowance of risk. Therefore, the rational investors should focus on not only expected return but also risk. Markowitz measured the expected return by the discount value of uncertain future returns and the risk by the standard deviation of its expected value. The more important concept is that the returns from securities are not independent but inter-correlated. Therefore, if the investors invest in a large number of securities, there is a diversification effect. We can show this analytically. Assume there are N securities, expected return of security i denoted by r_i and its standard deviation denoted

by σ_i, portfolio weight of security i denoted by w_i, and covariance of security i and j denoted by σ_{ij}. Then Markowitz showed that the expected return and variance of the expected return on portfolio is

$$r_p = \sum_{i}^{N} w_i r_i$$

$$\sigma_p^2 = \sum_{i}^{N} \sum_{j}^{N} w_i w_j \sigma_{ij}$$

Where,

$$\sum_{i}^{N} w_i = 1, \qquad \sigma_{ij} = \rho_{ij}\sigma_i\sigma_j(-1 \leq \rho_{ij} \leq 1)$$

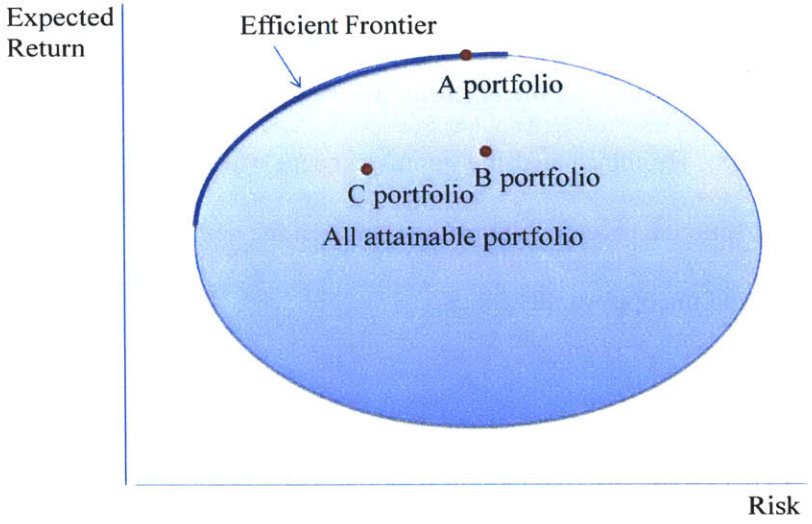
Also, Markowitz demonstrated that a quadratic program with an objective function of maximizing an optimal portfolio.

$$\text{Max } (r_p - \lambda\sigma_p^2)$$

Where: $\lambda = \text{risk aversion}$

In this formula, because the correlation coefficient of two securities is between -1 and 1, the standard deviation on portfolio is always less than the simple weighted average standard deviation of the securities. We call it the diversification effect. Therefore, through r_p and σ_p we can plot risk and return on each portfolio in the mean-variance plane. The set of all obtainable portfolios is as in Figure 1.

Figure 1



As shown in Figure 1, an investor can invest in any portfolio which plots inside the circle such as A, B, and C portfolio in the mean-variance plane. However, the rational investor chooses the portfolio A rather than B because A portfolio shows higher return and is less risky than B portfolio. In other words, B portfolio is dominated by A portfolio. Another key concept of the Markowitz's mean-variance portfolio selection model is the efficient frontier. The highlighted upper boundary shown in Figure 1 is called the efficient frontier that means the portfolio set on the efficient frontier shows the highest expected return for a given level of risk and the lowest risk for a given level of expected return.

The mean variance portfolio selection model and efficient frontier are the basic concepts of portfolio management. Keeping in mind this concept, we expand the two main academic theories related to the active management: the William Sharpe's capital market line and James Tobin's separation theorem.

2.1.1.2. Separation theorem and Capital Market Line

J. Tobin advanced the area of the portfolio theory using Keynesian model of liquidity preference (Tobin, 1958). He introduced the genius concept which is an essential ingredient of the Capital Market Line: an inverse relationship between the demand for risk free asset and interest bearing asset and the opportunity locus.

Prior to looking over an inverse relationship and opportunity locus, we need to know about the indifferent curve. The investor's preference for portfolio selection is represented by his or her own indifferent curve which maximizes the expected value of his or her utility. Under the assumptions that an investor prefers higher expected return to lower expected return and exhibits risk aversion, the shape of the investor's indifference curves between mean and standard deviation will be settled by his utility-of-return function and show a concave upward-sloping. Surely, we need another assumption that the probability distribution between mean and standard deviation is approximated by normal distribution in order to draw a conclusion. Figure 2 shows the indifferent curve on the mean-variance plane.

To draw the opportunity locus, we set the portfolio A consisting of a proportion w of risk-free asset and (1-w) risky asset. The expected return on a portfolio A is

$$E(R_a) = wr_f + (1 - w)r_p$$

Where, r_f = return of risk – free asset

r_p = return of risky asset

And the standard deviation on a portfolio A is

$$\sigma_a = \sqrt{w^2\sigma_f^2 + (1-w)^2\sigma_p^2 + 2w(1-w)\sigma_{fp}}$$

Where, σ_f = standard deviation of risk-free asset

σ_p = standard deviation of risky asset

σ_{fp} = covariance between risk-free asset and risky asset

Since σ_f and σ_{fp} are equal to 0, we simplify the standard deviation on a portfolio A

$$\sigma_a = (1-w)\sigma_p$$

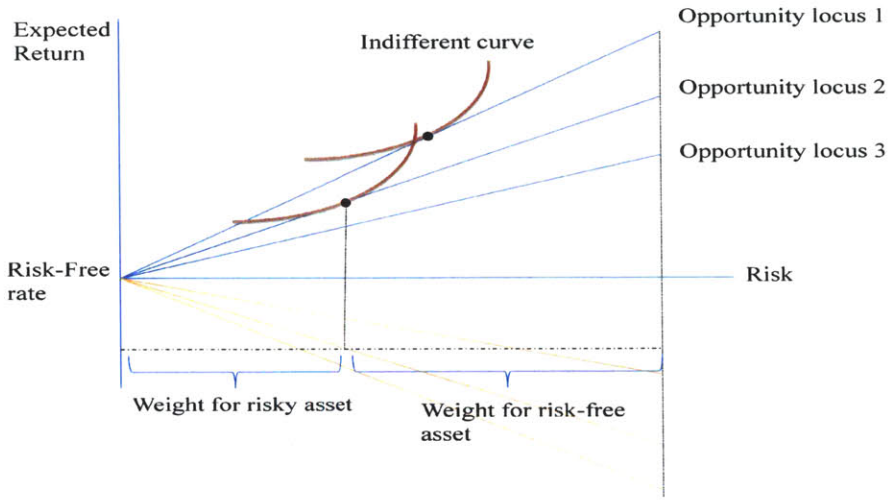
When we look over the relationship between $E(R_a)$ and σ_a, we can derive

$$E(R_a) = wr_f + \frac{r_p}{\sigma_p}\sigma_a$$

Therefore, we can draw the linear line on the mean-variance plane. Tobin defined this linear line as the opportunity locus. Eventually, Tobin asserts that the tangent point between the indifferent curve and the opportunity locus is optimal portfolio with risk-free asset and risky asset.

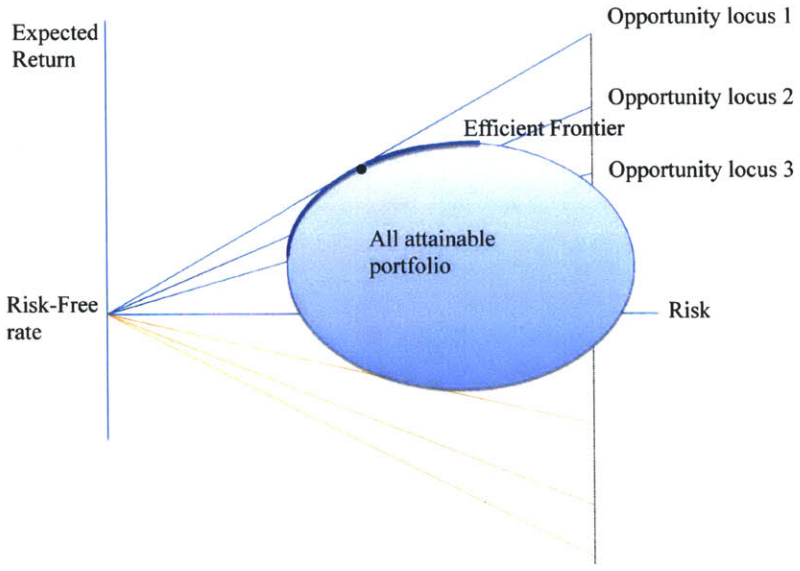
In figure 2, we can identify the relationship more clearly.

Figure 2



Then if we combine Figure 1 with Figure 2,

Figure 3



As we see from the above figure, there is no opportunity locus above the efficient frontier. Even though we can draw the opportunity locus 2 or 3, those risky portfolios are dominated by the portfolio on the opportunity locus 1. There are no investors who want to invest in the risky portfolio below the opportunity locus 1 because the portfolio has a lower expected return given by certain risk level or higher risk with the same expected return. Therefore, we can ignore other opportunity lines except for opportunity locus 1 which meets the efficient frontier. W. Sharpe defined this opportunity locus 1 as the capital market line and tangent point between CML and efficient Frontier as optimal portfolio which ensures that the aggregate of all investors' holdings will itself be efficient. In the equilibrium world in which all investors behave rationally and the market is perfectly efficient, there is no reason for investors to hold a different risky portfolio. The most important point in this concept denies the existence of active portfolio management.

2.1.1.3. Capital Asset Pricing Model (CAPM)

CAPM is widely used practically by estimating the cost of capital for the firm and evaluating the performance of portfolio management. W. Sharpe focused on the question "How are the capital asset prices determined in the individual security level?"(Sharpe, 1964) He constructed a market equilibrium theory of asset prices under condition of risk. It is called Capital Asset Pricing Model. CAPM states that an individual asset's rate of return divided into two parts: the perfectly correlated return on the market portfolio and uncorrelated return with the market return. We can define β_p as the correlation between the individual security and the market portfolio.

$$\beta_p = \frac{\mathrm{Cov}(r_p, r_m)}{\mathrm{Var}(r_m)}$$

Therefore, we can obtain the regression of the rate of return on the individual security p.

$$R_p = R_f + (R_m - R_f)\beta_p + \alpha_p + \epsilon_p$$

When we calculate the expected value, expected residual return on the security p should be zero. Therefore, finally we can get CAPM formula

$$E(R_p) = R_f + (E(R_m) - R_f)\beta_p$$

This formula tells us that the expected return on individual security is determined by risk-free rate, market risk premium, and beta. The fact that there is no residual excess return explains that investors should hold the market portfolio under the assumption that all investors have the same expectations and the market is perfectly efficient. As a result, in this paper, we can use the expected return on the individual stock from the CAPM as a benchmark return and the market portfolio as a benchmark portfolio in order to measure the residual return and risk.

2.1.2. Efficient Market Hypothesis

As mentioned above, the CAPM works only under the assumptions of all investors' rational behavior and perfect market efficiency. Even though there is a lot of research about behavioral finance and empirical evidence of this topic, we decide the behavioral finance as out of our scope and focus only on the market efficiency.

In this chapter, we will look over the efficient market hypothesis and intuition of 3

forms of market efficiency. The Efficient Market Hypothesis is that the markets are extremely efficient so the price of individual security reflects all available information. In other words, the individual security reflects new information as soon as it is published. Therefore, we cannot predict tomorrow's security price because we cannot know tomorrow's information. The Efficient Market Hypothesis is closely related to random walk theory. If it is true, the market does not allow investors to earn constant alpha which is above-average market return without bearing higher risk than the market. Thus, the efficient market hypothesis supports the CAPM formula.

Since the theory was published, many scholars including Fama (Fama, 1964) have run empirical tests about the Efficient Market Hypothesis. The scholars mainly dealt with the informational efficiency and security price behavior in various manners in the developed markets. After the empirical tests, the EMH was classified by 3 forms depending on the information levels: weak-form, semistrong-form, and strong-form EMH.

The weak-form of the EMH express that the current security price reflects all information implied by the historical prices. Therefore, technical analysis only using the historical trends of price does not create added value under the weak-form efficiency. The second form is the semistrong-form of the EMH. This form states that the security price reflects all generally available public information. Therefore, investors cannot earn the excess return with the fundamental analysis through the published financial statement of the firm. As well, the information needed for the public announcement such as stock splits and dividend change is immediately reflected on the security price. Final version of the EMH is the strong-form of the EMH. The strong-form of the EMH states that the security price already reflects

not only public information but also internal, unpublished information. As a result, the investors cannot earn extra profit from any of the valuable information. Empirically, every nation has a different form of the EMH. Especially, as the capital market develops, information efficiency level increases. Therefore, the market moves from weak-form to strong-form according to the pace of capital market development. If the market has fully developed and become strong-form of the EMH, active portfolio management would have disappeared. However, very little support has ever existed for the extreme interpretation of the strong-form EMH even in the developed market. Moreover, nowadays, research showed that the emerging capital market located some points between weak-form and semistrong-form of the EMH (Alexakis et al., 2010; Alexakis, Patra, & Poshakwale, 2010; Aquino, 2006; Balaban & Kunter, 1997; K. Cheung & Coutts, 2001; Grieb & Reyes, 1999; Kawakatsu & Morey, 1999; Ozdemir, 2008; Siourounis, 2002). In the next chapter, we search the empirical evidence about the application of CAPM and the status of EMH in the emerging markets in order to confirm the possibility of the alpha strategy in active portfolio management.

2.2. Study of portfolio management on Emerging markets

2.2.1. Empirical Evidence of inapplicability of the CAPM on Emerging Markets

Practically, the CAPM has been criticized by many researchers in that the expected return for the portfolio is accounted only for the systematic risk which is measured by beta if the portfolio is completely diversified.

Since the late 1970s, empirical tests for the CAPM have been done mainly in the

developed market. Richard J. Dowen (Dowen, 1988), who focused on the research whether sufficiently large portfolio could eliminate all non-systematic risks, concluded that even sufficiently large portfolio constructed only by beta would have the level of non-systematic risk and therefore those portfolios are substantially riskier than that estimated by the CAPM. However, even though Fama and French (Fama & French, 1992; Fama & French, 1996) concluded that there is virtually no relationship between the beta and the expected return in a short period, the research for the re-examination of the cross-section of expected stock returns conducted by S.P. Kothari et al (Kothari, Shanken, & Sloan, 1995) showed that there is a significant relationship between the beta risk and expected return on the annual basis. After 70s, in the developed market, many researchers insisted that the beta could use a useful tool of portfolio construction but not as an only tool.

Compared with the developed market which is a more efficient market, the emerging market is far less appropriate for the CAPM theory. The asset price cannot be explained only by the market risk. In fact, there are many other factors to affect the asset price such as P/E ratio effect, size effect, seasonality, and book to market effect. Inapplicable of the CAPM in the emerging market means there is enough room for catching the sustainable excess return.

Empirically, many researchers have tested the empirical evidence to verify the CAPM in the emerging market especially in Asian stock markets for the last two decades. K.A. Wong et al (Wong & Tan, 1991) tested the empirical relationship between portfolio returns and the various measures of risks which are systematic, unsystematic, and total risk in the Singapore market using the weekly data, the same as Fama and MacBeth (Fama & MacBeth, 1973) research. They concluded that the application of the CAPM in Singapore

market is improper because there are no significant relationships between stock returns and any types of risks. The research conducted by K. Bark (Bark, 1991) implied almost the same conclusion even in the Korean Stock market. She used the same methodology of Fama and MacBeth and concluded that there is no significant evidence of a positive trade-off between market risk and return and residual risk plays an important role in the stock return. She analyzed that the emerging market is not efficient yet and the investors hold highly undiversified portfolios. Above this, various empirical researchers carried out in the emerging markets including Hong Kong, Taiwan, and Singapore during the 1990s (Chan, 1997; Y. Cheung & Wong, 1992; Y. Cheung, Wong, & Ho, 1993; Wong & Tan, 1991). Almost all researches got similar results that the systematic risk could not account for the expected returns either on the weekly or the monthly basis.

According to those empirical tests of the application for the CAPM, especially in the emerging markets, there are other factors except on the beta on the effect of stock's expected return. In other words, the active portfolio management works well in the emerging market and investors have more opportunity to earn the constant residual excess returns on their portfolio using proper alpha strategy in the emerging market than in the developed market. In the next section, we will find another reason for active portfolio management well adapted for the emerging market through the market efficiency level.

2.2.2. The status of the EMH on Emerging Markets

Since 1970, various empirical tests have been tested to verify the Efficient Market Hypothesis usually in the developed market. While the emerging capital market started to

open to the foreign investors and eased the regulations, empirical tests of the EMH has been tested for the emerging market since the last decade.

Most of the research was focused to confirm the weak-form of the EMH. In this section, we mention about various empirical tests and methodologies and estimate the current market efficiency in the emerging market.

A. Antoniou et al (Antoniou, Ergul, Holmes, & Priestley, 1997; Cooray & Wickremasinghe, 2008) researched the phenomena that investors use technical analysis to make an alpha although investors believe that the emerging capital markets are weak-form efficient. They analyzed the market efficiency with the level of trading volume of the company in the emerging market and concluded that prices on stocks with high volume cannot predict future returns with the past sequence of prices but future prices of stocks with low volume can be predictable using moving average model in the Istanbul stock market. More recently, Arusha V. Cooray et al (Cooray & Wickremasinghe, 2008) examined the efficiency in the South Asian stock markets including India, Sri Lanka, Pakistan, and Bangladesh. Using classical root tests, they concluded that all those 4 countries' stock markets support weak-form efficiency hypothesis. Additionally, they examined semistrong-form efficiency through Cointegration and Granger causality tests and as a result refute the validity of the semistrong-form efficient market hypothesis for the emerging markets. Several researchers have studied the empirical tests about the EMH specially to verify that the emerging market is weak-form efficient with various methods such as the augmented Dickey-Fuller test and Variance-ratio test. As a result, almost all results supported a weak-form EMH of the emerging market. Very recently, C. Alexakia et al (Alexakis et al., 2010) examined the

predictability of stock prices in the Athens Stock Exchange by using the published information such as accounting information. In other words, their objective is to confirm whether the emerging market becomes a semistrong-form efficient market. Research showed that the portfolio selected by financial ratios produces a higher return than the benchmark. Therefore, the stock prices do not fully reflect on those published accounting information and hence it is not supported by the semistrong-form EMH.

According to those various researches, in contrast with the developed market, the emerging market is not quite efficient. Nowadays, even though the emerging market is rapidly developing, the efficiency level in the emerging market is still low. As a result, investors can make alpha profits from the portfolio using the fundamental analysis. Even though the past sequence of prices is not quite useful for the estimation of future prices in a short period, technical analysis adjusted by other factors such as trading volume will be meaningful to make sustainable alpha profits.

2.3. Definition of active portfolio

2.3.1. Alpha and Information Ratio

Through the previous chapters, we look over the portfolio theories and, under the perfect capital market, the active portfolio management does not survive and all investors invest their money in a combination of risk-free asset and the market portfolio which has the highest expected return given the level of risk depending on an investor's indifferent curve. However, according to the empirical evidence in the emerging markets, the researches

implied that there are various alpha generating strategies to capture consistent alpha, record high information ratio and value added in the emerging market. In this section, we define the active portfolio with residual return (alpha) and risk, information ratio, and information coefficient.

Basically, the objective for active portfolio management beats the market on a regular basis. Therefore, before we define the active portfolio management, we need to define the benchmark. As mentioned above, the CAPM states that expected return on the security is decided by the beta which is the market risk factor and hence defined that the expected residual return equals to zero. Therefore, in the individual stock level, the expected return from the CAPM formula is a good candidate as a benchmark return of the security. In the portfolio level, W. Sharpe defined the aggregate sum of all securities in the market as the market portfolio and the market portfolio as an optimal combination of the risky asset. Therefore, benchmark of the portfolio is the nation's index. This is reasonable for the emerging market because the nation index of the emerging countries is usually calculated to use the market capitalization method. Using the benchmark defined by the CAPM, we can define the active portfolio as the portfolio with expected residual excess returns.

Then we can define the alpha. Ex ante Alpha is the expected residual returns and ex post alpha is the average of the realized residual return compared to the benchmark. When we study the CAPM, we defined the return of portfolio p through below formula.

$$R_p = R_f + (R_m - R_f)\beta_p + \alpha_p + \epsilon_p$$

In this regression, we find the residual returns of the portfolio p

$$\theta_p = \alpha_p + \epsilon_p$$

Where, α_p= the average residual return

ϵ_p= the stochastic component of error term

The CAPM assumed expected residual return E (θ_p) is equal to 0. However, if there is constantly positive θ_p, we can confirm the portfolio has an alpha.

The residual risk is the risk exposure after excluding the known or systematic risk. This value is calculated by the below formula

$$\sqrt{\text{Var}(r_p) - \beta^2 \times \text{Var}(r_m)}$$

Where, r_p: the return of the portfolio

r_m: the return of the market or the benchmark

If the portfolio has high alpha, is this a good active portfolio? We cannot answer directly. If the portfolio requires higher residual risk in order to make alpha, investors easily know that the portfolio is not managed efficiently. Therefore, when active managers construct the active portfolio, they need to consider information ratio denoted by IR which is a ratio of annual residual return to annual residual risk. The information ratio for portfolio P is

$$IR_p = \frac{\alpha_p}{\omega_p}$$

Where, ω_p = portfolio residual risk.

IR is related to the t-statistic for the portfolio's alpha which is simply a ratio of the

annualized estimated alpha to the annualized standard error of the estimate. Therefore, IR is a good parameter to measure whether the alpha differs from zero.

According to Active portfolio management written by Grinold et al. (Grinold & Kahn, 2000), IR could be calculated by the general formula called the fundamental law of active portfolio which explains IR in terms of breadth and skill.

$$IR = IC \times \sqrt{BR}$$

Breadth denoted by BR is the number of independent forecasts of residual return per year and Information coefficient denoted by IC is the correlation coefficient between expected residual return and actual residual return. If we define the actual market direction as variable x and the forecast as variable y, then IC is

$$IC = Cov(x_t, y_t) = \frac{1}{N}\sum_{t=1}^{N} x_t y_t$$

Where $x_t, y_t \sim \mathcal{N}(0,1)$ and N = N bets on market direction.

According to the empirical observations conducted by Kahn and Rudd (Kahn & Rudd, 1995) in the US stock market, top-quartile active portfolio strategies got over 0.5 of IR on the after-fee basis.

After this chapter, we will investigate various possible alpha strategies adapted in the emerging markets. With the alpha formula above mentioned and the empirical tests, we can verify whether the active strategies create excess value on the portfolio. If so, we can find out how valuable those strategies are from the IR and IC analysis.

3. Alpha Generation strategy

After we define the alpha, we investigate several alpha generating strategies in this chapter. As we look at the alpha in the previous chapter, if investors select stocks which have constantly higher returns compared to the expected returns calculated by the CAPM, we can conclude that those strategies will generate alpha return. Many active portfolio managers seek to select those stocks using the firm-specific information or using the firm's past performance. We call the strategy using the firm-specific information the fundamental valuation strategy and the strategy using the firm's past performance the technical trading strategy.

In this chapter, we study three fundamental valuation strategies and two technical trading strategies academically. We investigate the basic concepts of those strategies, search the method of how investors selected the stocks using those strategies, look into the empirical evidence conducted by many researchers in the developed market, and finally check what those concepts mean in the emerging markets.

3.1. Fundamental Valuation Strategy

Traditionally, the fundamental approach is one of the well-known strategies to generate alpha return in the field of active portfolio management. Basically, many investors run various valuation models using the firm's accounting data in order to find the firm's proper value. Since the early 1900s, many scholars developed the valuation methods using various accounting numbers as an input data. Many empirical and academic researches determine that book value, earnings, and cash flows are the most valuable variables to

evaluate the firm's proper value and to decide whether the current price is overpriced or underpriced among various useful accounting numbers. In this chapter, we consider three well-known valuation approaches: value vs. growth which uses the book-to-market ratio, Fama-French three-factor model which uses book-to-market ratio and market capitalization, and Residual Income valuation model which uses book value to the equity, earnings, and cost of equity. We study the basic concepts of those three fundamental valuation strategies and the results of the empirical evidence in the developed markets.

3.1.1. Traditional approach: Value stock vs. Growth stock

If returns on stocks which share unique characteristics always outperform or underperform to the market return and investors capture those characteristics, we can make an active portfolio with a sustainable alpha.

Since Benjamin Graham (Graham & Dodd, 1934), who is recognized by many active investors as the father of the fundamental valuation analysis, introduced the concept of value portfolio strategy, many scholars have studied about the feature on value stocks and growth stocks from the firm's accounting data and tested whether the return on value stock portfolio or growth stock portfolio can show constant excess return not explained by CAPM and whether this excess return can be predictable.

To define the value and growth stocks, many scholars have tested empirically the relationship between the individual stock returns and various variables such as earning per share, cash flow per share, book value per share, and dividends per share. After various

researches, typically, value stocks are defined as the stocks with low P/E ratio and high book-to-market ratio. In comparison, stocks with relatively high P/E ratio and low book-to-market ratio are classified as growth stocks. Through the historical performance analysis conducted by many researchers in developed markets, the returns on value portfolio usually outperform the returns on growth portfolio.

Fama and French (Fama & French, 2007; Fama & French, 2007) explained this anomaly driven by standard economic forces. Typically, the return on a stock is broken into a dividend return and a capital gain return:

$$1 + R_{t+1} = \frac{D_{t+1}}{P_t} + \frac{P_{t+1}}{P_t}$$

Where, R_{t+1}: return at time t+1

$\frac{D_{t+1}}{P_t}$: a dividend yield at time t+1

$\frac{P_{t+1}}{P_t}$: a capital gain return at time t+1

They divide the capital gain return into the growth in book to equity from earning retentions and mean reversion in profitability and expected returns. In other words, the capital gain return is divided by two components: growth in book value and the growth in P/B ratio.

$$\frac{P_{t+1}}{P_t} = \left(\frac{P_{t+1}/B_{t+1}}{P_t/B_t} \right) \left(\frac{B_{t+1}}{B_t} \right) = \left(\frac{PB_{t+1}}{PB_t} \right) \left(\frac{B_{t+1}}{B_t} \right)$$

Where, PB_{t+1}: Price to Book ratio at time t+1

According to above equation, the return on stocks depends on expected dividend

return, expected growth of book value, and expected growth of P/B ratio. We already define the value stocks as stocks with high book to market ratio which are low P/B ratio and the growth stocks as stocks with high P/B ratio. Intuitively, growth stocks represent the fast-growing and profitable firm. Price of growth stocks already reflect the firm's good features. However, the fast growth rate and high profit margin cannot be maintained for a long time because those firms encounter intense competition. In contrast, possibly unprofitable firms which are classified as the value stocks strive to reduce costs and increase the margin in order to survive. As a result, the stocks classified as the growth stocks will decrease the sustainable growth potential and reflect their future prices until the stocks are reclassified as the value stocks. On the other hand, stocks classified as the values stocks will track in the exact opposite way. Due to the mean reversion phenomena, the return on value stocks has shown a constantly better performance than that on growth stocks.

In the sense of CAPM formula, value strategies which consist of stocks with low P/B ratio are fundamentally riskier, so value stocks need higher expected return than growth stocks in order to compensate for bearing risk. Therefore, there is an additional expected value not explained by the market risk.

Through various empirical tests conducted in many developed countries, the fact that the value strategies can create benchmark excess returns called alpha is widely accepted (Barber & Lyon, 1997; Capaul, Rowley, & Sharpe, 1993; Fama & French, 1992; Graham & Dodd, 1934; Lakonishok, Shleifer, & Vishny, 1994). However, we need to find the robust empirical evidence to verify that the value strategies also create the alpha in the emerging market due to the different capital market structures. Among the emerging markets, most

Asian countries have rapidly grown during the past decade. In contrast to the well diversified industry in the developed market, a few big companies monopolized the specific industry and grew rapidly through the business diversification policy. For example, in Korea, aggregate market capitalization of only 10 big companies comprises over 50% of the total market capitalization in the Korean Stock Exchange and Market capitalization of Samsung group which is the biggest company group, comprised nearly a quarter of the total market in 2010. More important, those few big companies have grown fast in the past few years and still maintain a higher growth rate than the market average. We can easily observe these phenomena in the emerging nations with the fast economic growth rate. For these phenomena, we can infer that the fast-growing stocks classified with the growth stocks may maintain their competitiveness and constantly outperform the value stocks if the nation's GDP growth rate is still relatively high. However, the important thing is that if either the value stocks or growth stocks constantly outperform the benchmark, we can find the sustainable alpha from value or growth strategies.

In the later chapter, we will conduct empirical tests about the value and growth strategies with the firm's financial statement data in order to verify whether there is an adaptable alpha strategy using value-growth classification method in the emerging countries.

3.1. 2. Fama and French three factors Model

Before considering Fama and French three factors Model, we look over the Arbitrage Pricing Theory. The Arbitrage Pricing Theory (APT) formulated by Ross (Stephen A. Ross, 1976) is an effective alternative to the CAPM. Though the APT shares the basic CAPM

formula, the theory makes up for the practical weakness of CAPM which asserts that the only single factor called beta is required to measure risk. The APT estimates the expected stock return from the linear relationship between the return and the several risk factors, not only one factor. The APT asserts that the expected excess return on the stock is determined by the relationship with the firm-specific risk factors. The APT postulates a multi-factor model. Therefore, we define the expected return on the stock expressed as

$$E(r_i) = R_f + \beta_1 Factor_1 + \beta_2 Factor_2 + \ldots + \beta_k Factor_k$$

In other equation,

$$E(r_i) = \sum_{n=1}^{k} \beta_n Factor_n$$

Where,

β_n: the exposure of stock i to factor n

$Factor_n$: the factor forecast for factor n

After the APT was published and got attention from academic scholars, many researchers have tested in order to find the other factors which affect the stock return because the APT doesn't specify other risk factors except for the market risk. Among various multi-factor models, Fama and French three-factor model is a well known multi-factor model academically and empirically.

In the previous section, we knew that the average return on stocks is related to firm-specific information such as size, earning/price, cash flow/price, book-to-market equity, past sales growth, etc. Therefore, the CAPM cannot explain the stock returns due to the patterns in

average returns related to those factors which are called anomalies. Fama and French (Fama & FrencH, 1996) showed the anomalies are mostly captured by three main factors – size, book-to-market equity, and the market, and developed the three-factor model. They assert that the expected return can be explained by the return to three factors which are the market premium which is the same concept of CAPM, the size effect which is the difference between the return on a portfolio of small capitalization stocks and the return on a portfolio of large capitalization stocks, and the value premium which is the difference between the return on a portfolio of high book-to-market equity and the return on a portfolio of low book-to-market equity. Therefore, the expected return on portfolio i is,

$$E(r_i) = R_f + \beta_i[E(R_m) - R_f] + s_i E(SMB) + h_i E(HML)$$

Where,

β_i: the exposure of stock i to the market factor

$[E(R_m) - R_f]$: market premium

s_i: the exposure of stock i to size factor

E(SMB): small minus big (the expected difference of the return on small stocks and the return on big stocks)

h_i: the exposure of stock i to value factor

E(HML): high minus low (the expected difference of the return on high book-to-market equity and the return on low book-to-market equity)

We already discussed the reason why value stocks generally record a higher average return than growth stocks in the previous section. Although there is some criticism asserted by Kothari et al (Kothari et al., 1995) that the premium of high book-to-market firms is due to survivor bias by the data source, the empirical evidence of value premium is robust

in many developed countries and in different time periods.

The size premium is more intuitive. The investors require more premiums on the small sized firms than on the large sized firms to compensate for the high risk embedded in the small stocks. Many empirical researches for alpha strategies show that the investors make the constant alpha return when they make the portfolio constructed by value strategy combining with the size factors. As a result, through Fama and French three-factor model, investors believe that they can capture the constant excess return on the individual stocks which cannot be explained by the CAPM and achieve the active portfolio management with the constant alpha return.

However, we need more research to get empirical evidence whether this three-factor model is also well adapted in the emerging capital market. Practically, a few companies have been growing rapidly under the government aid in the first stages of the past growth period of most emerging markets, especially in Asia. Then, those companies have expanded and diversified their businesses. As a result, those companies have classified the large capitalization group and the stock prices of those companies also have increased rapidly. In this point of view, we need to verify whether the size factors in the emerging markets work in the same direction as in the developed market. In a later chapter, we will run the empirical test of multi-factor model brought by Fama and French three-factor model in order to verify whether a portfolio using multi-factor model in the emerging market creates sustainable alpha return in the emerging markets.

3.1. 3. Residual earnings Model/Abnormal earnings growth Model

In the sense of Efficient Market Hypothesis, we acknowledge the emerging market is not supported by the semistrong-form efficiency. Therefore, investors can make the constant alpha using the firm's published accounting information. According to modern finance theory, the firm's current price reflects on the present value of the future expected dividends. The dividend discount valuation model is a very powerful tool to decide whether the stock price is undervalued or overvalued. However, forecasting dividends is very difficult especially for high growth firms which rarely pay dividends. Moreover, management decides how much the company will pay. Because of the discretionary decision made by management, it is another reason why investors have trouble forecasting future dividends. To overcome these shortcomings, many scholars focused on creation of wealth rather than distribution of wealth. Therefore, the concept of free cash flow is introduced. Free cash flow is cash flow from operations that results from investments minus cash used to make investments. Nowadays, most analysts and money managers use the Discount cash flow valuation model to estimate the firm's value. However, the free cash flow is not a value-added concept because a firm reduces free cash flow by increasing investments which add value and increases free cash flow by reducing investments. Additionally, the free cash flow fails to recognize value generated that does not involve cash flows. Therefore, other scholars focused on value drivers with the accounting-based information to improve the DCF valuation model.

From the viewpoint of value creation rather than value distribution, earning (net income) is the basic indicator to evaluate value creation. Therefore, many analysts still try to estimate the firm's net income in order to judge the proper price. Practically, most active

portfolio managers constructed their portfolio with low forward price-to-earnings ratio a decade ago in Korea and this concept is widely used in the early stages of most emerging markets. Basically, the first step of currently widely used DCF valuation model is to estimate the firm's earnings. Therefore, a firm's earnings is the most important and essential variable in the valuation. However, as the emerging markets are widely opened to international investors and are more and more efficient, it is quite difficult for investors to get a constant alpha return using only earnings forecasting. Therefore, even in the emerging markets, the investors need to consider not just quantitative earning numbers but the quality of earnings. We look at how much earnings the firm creates after paying the cost of equity through the residual income concept.

Ohlson (OHLSON, 1995; Ohlson, 2001) introduced the accounting-based (residual income) valuation model using contemporaneous and future accounting data such as earnings, book values, and dividends. In the sense of accounting theory, the financial statements show the information of the changes in owner's equity. Through the bottom-line items -book value and earnings- in the balance sheet and income statements, we know that the change in book value is equal to current earnings minus dividends which are the net of capital contribution. Ohlson refers to this relation among book value, earnings, and dividends as the clean surplus relation. He developed the residual income model by replacing dividends with earnings and book value in the dividend discount model. Analytically, the dividend discount model is expressed as

$$P_t = \sum_{i=1}^{\infty} \frac{E_t[D_{t+i}]}{(1+r)^i}$$

Where

P_t: firm value at the beginning of time t

$E_t[\cdot]$: expectation operator conditioned on time t information

D_t: net dividends paid at time t

(1+r): constant discount rate

As we mentioned before, the residual income model assumes the clean surplus relation which is

$$B_t = B_{t-1} + X_t - D_t$$

Where

B_t: book value of equity at time t

X_t: earnings for the period from t-1 to t

Ohlson also defined the residual (or abnormal) earnings as earnings minus a charge for the use of capital as measured by beginning of book value multiplied by the cost of capital which is

$$RI_t = X_t - rB_{t-1}$$

Where

RI_t: residual earnings at time t

r: cost of capital

B_{t-1}: book value of equity at the beginning of time t

Since $E_t[D_{t+i}]$ is substituted to $E_t[B_{t-1} + X_t - B_t]$, we can derive P_t as

$$P_t = \sum_{i=1}^{\infty} \frac{E_t[D_{t+i}]}{(1+r)^i} = \sum_{i=1}^{\infty} \frac{E_t[B_{t+i-1} + X_{t+i} - B_{t+i}]}{(1+r)^i}$$

Then, it can be

$$P_t = B_t + \sum_{i=1}^{\infty} \frac{E_t[X_{t+i} - rB_{t+i}]}{(1+r)^i} - \frac{E_t[B_{t+\infty}]}{(1+r)^{\infty}}$$

Ohlson assumes,

$$\frac{E_t[B_{t+\infty}]}{(1+r)^{\infty}} \to 0 \text{ as } i \to \infty$$

We obtain

$$P_t = B_t + \sum_{i=1}^{\infty} \frac{E_t[RI_{t+i}]}{(1+r)^i}$$

Under the clean surplus relation, firm value is decided by current book value and the present value of expected residual earnings. The residual income is somewhat similar to the excess return concept. The residual income refers to the excess return after paying the required return on equity. In other words, the residual income means the value added beyond the market expectation. As a result, the price of firms with high expected residual income not just high net income should reflect the high quality of earnings intuitively if the market is the semistrong-form efficient about the firm's reported financial statements. Otherwise, investors can make the active portfolio using the mispricing based on the residual income valuation model. Mostly, the reported earnings are rapidly reflected on the price even in the emerging markets. However, there is not enough evidence that the firm values which are similar reported earnings are differentiated by earning quality in the emerging markets due to the high portion of individual investors of total market participants. In a later chapter, we verify

whether the evaluation of earnings quality gives investors sustainable alpha returns through empirical tests in the emerging markets.

3. 2. Technical trading Strategy

Technical trading strategy is the one of two main streams of the portfolio management field. The basic concept of technical trading strategy is that the future return on stocks is closely related to the past return on stocks. According to Efficient Market Hypothesis, even in the emerging markets, many researchers insist that the emerging market is weak-form efficient which means the current stock price reflects all information about the past returns. However, this controversial issue is not over yet because many other scholars show the robust excess return by the technical analysis through various empirical tests. Among numerous technical analysis methods, we will study two well-known and outstanding technical trading strategies which is based on other technical analysis: momentum trading strategy introduced by Jegadeesh, Titman (N. Jegadeesh, Titman, & National Bureau of Economic Research., 1999; N. Jegadeesh & Titman, 1993), DeBont, and Thaler (Bondt & Thaler, 1985; DE BONDT & THALER, 1987) and moving average trading strategy introduced by Brock, Lakonishok, and LeBaron (Brock, Lakonishok, & LeBaron, 1992).

Of course, there are other breakthrough technical strategies such as Innovation Regime-Switching Model. However, in this paper, we focus on the traditional technical strategies in order to verify whether the investors still have a chance to make the sustainable excess return by information from past returns especially in the emerging markets rather than optimize or maximize the portfolio return using sophisticated technical analysis.

3. 2.1. Momentum Trading Strategy

In capital markets history, numerous studies examine whether the stock returns are related to past performance because if so, investors could achieve abnormal excess returns by the trading strategies. Through various academic studies, stock returns are followed by random work theory in a short moment. However, in a longer time period, research shows the stock returns are predictable based on past returns. The strategies using past performance are called momentum trading strategy.

Basically, the momentum trading strategy generating abnormal excess returns depends on the time horizon, volume, level of market development, etc. Empirically many researchers have tested the predictability of future returns from past returns under the different time horizons and in various markets. Among those empirical studies, the studies by Jegadeesh and Titman (N. Jegadeesh & Titman, 1993) and DeBont and Thaler (Bondt & Thaler, 1985; DE BONDT & THALER, 1987) are very interested in the opposite results by different time horizon. DeBont and Thaler insist on mean reversion due to the overreaction to information that the long-term past losers outperform long-term past winners over the subsequent three to five years. By contrast, Jegadeesh and Titman assert momentum consistency due to delayed price reactions to firm-specific information. Therefore, they insist that firms with high returns over the past three to twelve months continue to outperform firms with low past returns over the same period.

In this paper, we are not going to find out whose research is more applicable in the market. The most important fact of their studies is that the momentum strategies that select

stocks based on their past returns can generate abnormal excess returns regardless of whether stock prices overreact or underreact to information. Additionally, we need to consider whether the trading strategies using the past returns are applicable for the emerging market too. Studies conducted by Jegadeesh and Titman (1993) and DeBont and Thaler (1985, 1987) were tested in the US market. Rouwenhorst (Rouwenhorst, 1998) broadened the empirical test of the momentum strategy internationally. He tested 12 European nations using the same method with Jegadeesh and Titman and had results that were similar to theirs

Actually, as the market goes in a more efficient way, it is more and more difficult for investors to find suitable momentum strategies using the past returns. Thus, the momentum trading strategy might not be a good strategy for active portfolio management in the current developed market. However, we need to verify whether the momentum strategies are still useful for generating alpha in the emerging markets. In a later chapter, we will run an empirical test whether the momentum trading strategy can drive constant alpha returns through the similar method conducted by Jegadeesh and Titman in the emerging market.

3. 2.2. Moving average technical trading rule

Another well-known technical analysis is the moving average technical trading rule introduced by Brock, Lakonishok, and LeBaron (Brock et al., 1992). As we mentioned in the earlier section, technical analysts attempt to forecast prices by the study of past prices in that the market's behavior patterns do not change much over time and the market has the long-term trends. Although future events are very different from past events, investors tend to respond to those events in a similar manner as in past events.

In the emerging markets where the market is not fully efficient yet, many institutional investors have constructed their portfolio using the trading rule by technical analysis. Many technicians or chartists try to find constant trends or patterns from past performance. Nowadays, among various trading rules, almost all technicians frequently use the moving average technical trading rules for their portfolios.

In 1992, Brock et al (Brock et al., 1992) empirically studied two of the simplest and most popular technical rules which are moving average oscillator and trading range break in order to verify whether the technical analysis is useless or not in the US market. Through the tests, they concluded that it is possible for investors to predict equity returns from past returns. In this paper, we consider only the moving average trading rule except for the trading range break rule because the moving average trading rule is more general and widely used in the emerging market. The moving average trading rule they conducted is very simple. Buy and sell signals are generated by two moving averages: a long-period average and a short-period average. The most popular moving average rule is 1-200 which is 1 day short-period average and 200 days long-period average. The 1-200 trading rule indicates buy signal whenever the price (1 day short-period average) climbs above 200 days long-period average and sell signal whenever the price drops below 200 days long-period average. Brock et al tested numerous variations of the trading rule: 1-50, 1-150, 5-150, 1-200, and 2-200 in order to find optimized combination to generate alpha returns.

A typical moving average rule can be written as

$$MA_t = \frac{1}{N}\sum_{i=1}^{n-1} P_{t-i}$$

Buy signal: $P_t > MA_t$, Sell signal: $MA_t > P_t$

Where,

MA_t : moving average at time t

N : time period

P_{t-i} : stock price at time t-i

Many investors still impart a good meaning to the buy signal by the moving average trading rule which is called golden cross in most emerging markets. However, it is so controversial that the technical analysis, especially the moving average trading rule which depends on the long term trends can generate constant excess return in the emerging market due to unique characteristics of the emerging markets such as high volatility by external effects, economic instability, the change of market participants, etc. All these factors interrupt to sustain market trends. Actually, the moving average trading rule is not directly related to the active portfolio management as we mentioned in the earlier chapters. It is more close to the implementation method using the trading technique. However, we add the moving average trading rule to a possible alpha generating strategy using the technical analysis in that the trading rule depends on the past return factor.

4. Empirical Evidence of alpha generating strategy in the emerging markets

4.1. Sample, Portfolio Strategies and Evaluating Methodology

In this chapter, we run the empirical tests about 3 fundamental strategies and 1 technical strategy. All those 4 strategies are nothing special. Many researchers already have done lots of empirical tests in the developed markets and in some emerging markets. We don't expect to find out the new alpha evidence in the emerging markets from those strategies. Our goal is to analyze various emerging markets and to confirm which strategy is well adapted in which emerging market. Each strategy probably works differently according to the market size, level of development of the capital market, economic growth, etc. Therefore, we are going to design the tests with the past 10-year data (from 12/31/01 to 1/31/11) in the emerging markets. Afterwards, we define an emerging market and gather the data to get ready for tests.

4.1.1. Data

For empirical estimation and tests of the alpha strategies in the emerging markets, we need to define the emerging markets available. Practically, investors use the representative emerging market index as MSCI Emerging markets index. It consists of indices in 26 emerging economies: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, the Philippines, Poland, Russia, South Africa, Taiwan, Thailand, Turkey and Venezuela. Among those 26 countries, we will test stock exchange markets in 14 countries which have

available and applicable indices according to the level of market capitalization and development: Argentina, Brazil, China, Czech Republic, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Philippines, Poland, Taiwan, and Thailand. For testing alpha strategies, we need to set the market index as benchmark index in order to compare with the active portfolio. In the below table, we choose the nation's representative index and comment on each definition.

Table 1. Benchmark Indices

Country	Benchmark	definition
Argentina	The Argentina Merval Index	a basket weighted index, is the market value of a stock portfolio, selected according to participation in the Buenos Aires Stock Exchange, number of transactions and trading value.
Brazile	The Bovespa Index	The Bovespa Index is a total return index weighted by traded volume and is comprised of the most liquid stocks traded on the Sao Paulo Stock Exchange.
China	Shenzhen Composite Index	Shenzhen Composite Index is an actual market-cap weighted index (no free float factor) that tracks the stock performance of all the A-share and B-share lists on Shenzhen Stock Exchange.
czech republic	The PX index	The PX index is the official index of the Prague Stock Exchange. The index was calculated for the first time on March 20, 2006 when it replaced the PX50 and PX-D indices. The index took over the historical values of the PX50 index. ThePX Index is a price index and dividend yields are not considered in the calculation.
Hungary	The Budapest Stock Exchange Index	The Budapest Stock Exchange Index is a capitalization-weighted index adjusted for free float. The index tracks the daily price only performance of large, actively traded shares on the Budapest Stock Exchange.
India	The Bombay Stock Exchange Sensitive Index (Sensex)	The Bombay Stock Exchange Sensitive Index (Sensex) is a cap-weighted index. The selection of the index members has been made on the basis of liquidity, depth, and floating-stock-adjustment depth and industry representation.
Indonesia	The Jakarta Stock Price Index	The Jakarta Stock Price Index is a modified capitalization-weighted index of allstocks listed on the regular board of the Indonesia Stock Exchange.
Korea	The KOSPI Index	The KOSPI Index is a capitalization-weighted index of all common shares on the Korean Stock Exchanges.
Malaysia	The FTSE Bursa Malaysia KLCI Index	The FTSE Bursa Malaysia KLCI Index comprises of the largest 30 companies by full market capitalisation on Bursa Malaysia's Main Board.
Mexico	The Mexican IPC index (Indice de Precios y Cotizaciones)	The Mexican IPC index (Indice de Precios y Cotizaciones) is a capitalization weighted index of the leading stocks traded on the Mexican Stock Exchange.
Philippine	The Philippine Stock Exchange PSEi Index	The Philippine Stock Exchange PSEi Index is a capitalization-weighted index composed of stocks representative of the Industrial, Properties, Services,Holding Firms, Financial and Mining & Oil Sectors of the PSE.
Poland	Warsaw Stock Exchange WIG INDEX	Warsaw Stock Exchange WIG INDEX is a total return index which includes dividendsand pre-emptive rights (subscription rights). Index includes all companies listed on the main market, excluding foreign companies and investment funds.
Taiwan	The TWSE, or TAIEX, Index	The TWSE, or TAIEX, Index is capitalization-weighted index of all listed common shares traded on the Taiwan Stock Exchange.
Thailand	The Bangkok SET Index	The Bangkok SET Index is a capitalization-weighted index of stocks traded on the Stock Exchange of Thailand.

Source: Bloomberg

To empirically test for 4 alpha strategies, we need to have basic data sets of historical stock returns and volatilities and firm's specific financial information such as book-to-market value, ROE, NI, etc. I will get the data for the past 10 years (from 12/31/01 to 1/31/11) from FactSet database and run empirical tests using alpha testing method provided by FactSet. In a later chapter, I explain the research design for the 3 fundamental strategies and 1 technical strategy with 3 different time-periods in detail.

4.1.2. Research Design

Value and Growth strategy

To evaluate alpha testing, we set each country's index as a universe and also as a benchmark. For example, in Korea, we use the KOSPI index as a universe and benchmark. We analyze the relationship between the stock's monthly return and book-to-market factor in order to evaluate value and growth strategy. Because most emerging countries calculate their market index based on the market capitalization, we make the market weighted active portfolio to calculate return and risk. We divide all stocks consisted of index into 5 fractiles from the highest book-to-market ratio to the lowest book-to-market ratio. All stocks consisting of each fractile make 1 active portfolio based on the market capitalization. Finally, we analyze each portfolio to calculate IR, IC, residual alpha, and residual risk. To avoid look-ahead bias, we need to calculate book-to-market ratio from Book value with a 45-day lag which is equal to the date the company has to report its earnings. Also, we exclude the N/A (not available) in our tests.

Fama-French three factor model

Fama-French three factor model postulates one of some well-known multi-factor models. Among various factors, Fama and French focus on the value effect and size effect. Actually, we need to analyze the Fama-French three factor model using APT portfolio optimizing tool for an accurate analysis. Basically, Fama-French three factor model was made for estimating more accurate stock price than the estimation from the CAPM. However, the goal of this paper is not to estimate accurate stock price but to verify whether the active portfolio selected by value and size factor can make sustainable alpha return. Therefore, we use the multi-factor ranking utility for analyzing the utility of 2 factors, book-to-market and size, in Fama-French three factor model. To run the multi-factor ranking tool, we need to determine the weight for each factor. We can assign a constant weight for each factor or the relative weight for each factor according to the results of the prior period. In this paper, we can set the same weight for both factors for the simplicity. After we rank each stock by equal weighted multi-factor ranking system, we divide all stocks into 5 fractiles from the top 20% ranked stock group to the bottom 20% ranked stock group. In this case, the 1^{st} fractile represents the small stocks with high book-to-market ratio. Except for using the multi-factor ranking system, other conditions are the same as value and growth test. We analyze the same emerging markets, use the same benchmark index, and test the same time period as the prior test.

Residual Earning Model

Recently, investors focus on the earning quality to evaluate firms in developed countries. Although earnings is a key driver of the firm's future growth, it is not easy for investors to derive the qualified information from the reported earnings numbers. Among

various trials, we can capture the earnings quality using residual earnings model. To test for residual earning factor, we have to get the company's net income in the current year, book value in the previous year, and cost of capital. We can get net income and book value from the company's financial statement. However, we need an assumption to calculate the company's cost of capital. In this test, we calculate the cost of equity from the CAPM model. We use the country's interest rate as a risk-free rate and 3-year average historical beta for each company. The problem is to find proper risk premium for each country. However, the most emerging stock index and interest rate have fluctuated extremely. According to the historical method to calculate risk premium which is market return minus interest rate, some countries have extremely high or low risk premium. Therefore, we use the risk premium with the constant value in those 14 countries. Generally, people believe that the risk premium is decided within the band from 6% to 7%. In this test, we set the risk-premium as 6.5%. As a result, we set the factor formula: residual earning per share = $\frac{(NI_t - r * BV_{t-1})}{\#\text{ of share}}$ where r is the cost of equity from the CAPM formula.

After we set the residual earnings factor, other conditions are the same as before tests. We divide 5 fractiles from high residual earning per share to low residual earning per share and look at the IR, IC, residual return, and risk using the alpha testing tool. One different setting from before tests is the time period for portfolio rebalancing. Because companies publish financial statements on a quarterly basis, we rebalance the portfolio on a quarterly basis rather than monthly basis.

Momentum strategy

Momentum strategy is the representative technical strategy. Technical strategy

depends on only 1 factor which is the past price information. Price momentum strategies are constructed through various ways according to the basis of the return period and the holding period. Academically, Jagadeesh and Titman analyzed the momentum effect with the past return and holding period in the 3- to 12-month timeframe. On the other hand, De Bondt and Thaler analyzed the mean-reversal effect with a longer time period (over 3- to 5-years). Other researchers focus on trading strategy based on the short-time period (1 week or 1 month). In this paper, we test the technical strategy based on the research by Jagadeesh and Titman rather than De Bondt and Thaler because the capital market history of most emerging markets is not enough to test such a long time horizon. Moreover, the emerging stock markets have higher volatility than the developed markets and the investors usually rebalance their portfolio on a quarterly basis in the emerging markets. Therefore, we need to recognize that the 3- to 12-month not as the short-term but as the mid-term. Thus, in the empirical test in the momentum strategy, we analyze the 3 strategies: 1-week/1-month strategy, 1-month/3-month strategy, and 3-month/6-month strategy. For example, 1-week/1-month strategy refers to a portfolio that selects stocks on the basis of returns over the past 1 week and holds them for 1 month.

In a nut shell, we run the alpha testing with only the past return information for the momentum strategy. We divide the portfolio into 5 fractiles as we did before the tests. If the portfolio in the 1^{st} fractile has a higher IR, IC, and residual earning than that in the 5^{th} fractile, we can conclude that there is an evidence for the emerging markets to be affected by the momentum factor. On the other hand, if the alpha testing derives the direct opposite results, we can insist that there is an evidence for the emerging markets to be affected by the mean reversion effect.

4.1.3. The results of empirical tests

Value and Growth strategy

In the emerging markets, the value strategy shows better results than the growth strategy to generate alpha in the empirical tests (see Table2). Especially, in Asia, the active portfolios selected by the high book-to-market ratio have high information ratio with positive information coefficient and residual return. Only in Poland, the active portfolio with low book-to-market ratio shows positive IR and IC but those numbers are not high enough to have a meaningful result.

Even though 4 countries out of 14 record IR by over 0.5 and 9 countries record positive IR in the active portfolio from value strategy, ICs which represent the correlation between the actual return and the forecasting factor are still low. In other words, the value factor which represents the skill we have, doesn't have strong forecasting power for generating alpha in the emerging markets. Moreover, portfolios in the 2^{nd} or 3^{rd} fractiles have higher IR than those in the 1^{st} fractiles in most emerging countries which have positive IR. In other words, the top 20% stocks with the highest book-to-market ratio do not guarantee the highest alpha in the emerging market. In conclusion, there is not enough evidence for us to conclude that the value strategy makes constant alpha return in the emerging markets. However, it is helpful for us to find another factor to aid value factor in order to generate robust alpha return in the active portfolio because value strategy contributes some level of alpha return in most emerging markets.

Table 2. Summary

Value Portfolio (1st fractile)

Country	IR	IC	Residual Alpha*	Residual Risk**
Argentina	(0.07)	(0.06)	(3.10)	46.60
Brazile	(0.31)	(0.03)	(21.68)	14.69
China	0.63	0.02	6.72	10.69
czech republic	(0.23)	0.12	(9.56)	41.71
Hungary	(0.11)	0.11	(3.50)	30.72
India	0.39	(0.11)	9.38	23.83
Indonesia	(0.09)	0.01	(2.46)	28.78
Korea	0.45	0.00	8.87	19.71
Malaysia	0.56	0.02	9.18	16.41
Mexico	0.51	0.02	12.31	24.18
Philippine	0.47	(0.01)	14.49	30.84
Poland	0.10	0.04	2.39	24.82
Taiwan	0.92	0.04	18.70	20.25
Thailand	0.05	0.03	0.87	16.88

Growth Portfolio (5th fractile)

Country	IR	IC	Residual Alpha*	Residual Risk**
Argentina	0.01	(0.06)	0.46	31.06
Brazile	(0.41)	0.01	(29.30)	11.67
China	(0.98)	0.01	(11.07)	11.28
czech republic	(0.70)	0.04	(14.84)	21.21
Hungary	(0.26)	(0.19)	(5.10)	19.33
India	(0.74)	0.06	(11.09)	14.96
Indonesia	(0.72)	0.03	(9.42)	43.64
Korea	(0.33)	0.04	(2.69)	8.05
Malaysia	(0.39)	0.01	(2.37)	6.05
Mexico	(0.18)	0.03	(1.48)	8.27
Philippine	(0.51)	0.08	(6.44)	12.55
Poland	0.28	0.02	4.84	17.35
Taiwan	(0.69)	0.00	(4.71)	6.78
Thailand	(0.27)	0.06	(2.85)	10.47

* Residual alpha: annulized excess return

** Residual Risk: annulized standard deviation of excess return

sourse: FactSet

When we categorize countries according to the continents, those countries are divided into 4 regions: Latin America, North East Asia, Eastern Europe, and South Asia. We analyze the validity of the value growth strategy to generate alpha at the national level within each region.

First, there are three main emerging countries in the Latin American region: Argentina, Brazil, and Mexico (see Table 3). Among the three nations, Argentina and Brazil have negative IR and IC in value portfolio (1st fractile). Therefore, we can conclude that the active portfolio with value strategy cannot generate constant alpha in both nations. From the view of growth strategy, even though Argentina has positive IR and residual return, there is no robust evidence to generate alpha because it has negative IC which means that there is negative correlation between the residual return and factor. In the case of Mexico, value strategy using high book-to-market ratio makes positive alpha return according to positive IR, IC, and residual return. However, compared with the portfolio in 1st fractile, the portfolio in 2nd fractile has higher Sharpe ratio and IR. As a result, we can conclude that investors can

make alpha generating portfolio from value strategy but they need additional factors for robust alpha generation.

Table 3. Latin America region

Latin America

Argentina

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	1.63	14.24	0.1	-0.07	-0.06	*0.09*	-0.26	12.7	0.59	*0.2*	49.09	21.56	266
2	0.58	13.23	0.03	-0.35	0.2	*0.17*	-1.53	12.34	0.44	*0.13*	45	45.72	277
3	0.75	11.37	0.05	-0.35	0.09	*0.05*	-1.29	10.19	0.46	*0.2*	45	43.43	361
4	1.3	10.65	0.11	-0.22	0.05	*-0.01*	-0.58	7.81	0.67	*0.46*	44	43.65	352
5	1.64	12.94	0.11	0.01	-0.06	*0.02*	0.04	8.85	0.87	*0.53*	50	24.92	274

Brazile

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	0.52	17.36	0.02	-0.31	-0.03	*-0.07*	NA	14.69	0.4	*0.28*	46.36	21.05	1113
2	3.07	12.28	0.24	-0.08	0	*0.02*	NA	11.69	0.16	*0.09*	55	50.23	1155
3	-0.64	16.92	-0.05	-0.29	0	*-0.03*	NA	14.34	0.39	*0.28*	47	55.03	1215
4	0.29	80.86	0	0.12	0	*0.03*	2.21	66.45	1.99	*0.32*	49	40.17	1190
5	1.27	13.06	0.08	-0.41	0.01	*0.07*	NA	11.67	0.25	*0.2*	47	16.36	1126

Mexico

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	2.29	10.86	0.2	0.51	0.02	*0.07*	0.97	6.81	1.22	*0.61*	51.82	17.57	605
2	2.42	9.05	0.25	0.83	-0.03	*-0.07*	1.04	4.54	1.13	*0.75*	61	36.43	663
3	1.29	8.3	0.14	-0.11	-0.01	*-0.07*	-0.12	3.71	1.07	*0.8*	46	34.45	715
4	1.18	7.66	0.13	-0.29	0.03	*0.18*	-0.24	2.88	1.02	*0.86*	51	28.3	666
5	1.34	6.9	0.17	-0.18	0.03	*0.06*	-0.12	2.34	0.93	*0.88*	46	14.11	624

source: FactSet

The second region is Northeast Asia including China, Korea, and Taiwan which has the fastest economic growth rate in the world (see Table 4). In all three countries, the active portfolio using value strategy generates robust alpha return which has high IR by over 0.5. The same is the case with Mexico, the value portfolio in the 1st fractile does not mean the best active portfolio with the highest IR in both China and Korea stock market. Actually, value factor has low IC in all three countries' stock markets. Therefore, IR depends on the Breadth which is estimated by the turnover ratio. Usually, portfolios in 2nd and 3rd fractiles have higher turnover ratio with similar IC than that in 1st fractle. Therefore, there is a certain limit to explain everything with only value factor. On the other hand, in Taiwan stock market, there

is robust evidence to generate alpha from value strategy in that there is high IR, IC, and residual return according to the order of fractiles.

Table 4. North East Asia region

Northeast Asia

China

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	1.53	10.64	0.13	0.63	0.02	*0.24*	0.54	3	1.08	*0.92*	53.64	22.68	14095
2	1.46	10.41	0.12	0.71	0.01	*0.17*	0.47	2.25	1.07	*0.95*	53	50.16	14147
3	1.55	9.78	0.14	0.91	0.02	*0.18*	0.52	2.01	1.01	*0.96*	65	57.71	14191
4	0.84	9.8	0.07	-0.3	0.01	*0.06*	-0.19	2.18	1.01	*0.95*	44	49.05	14172
5	0.16	9.09	0	-0.98	0.01	*0.16*	-0.97	3.11	0.9	*0.88*	37	26.14	14117

Korea

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	2	11.11	0.17	0.45	0	*0.05*	0.71	5.64	1.09	*0.74*	53.64	19.55	13782
2	2.18	9.15	0.22	0.69	0	*0.05*	0.79	4.06	0.93	*0.8*	57	41.67	13823
3	1.84	10.1	0.17	0.53	0.02	*0.24*	0.55	3.66	1.07	*0.87*	64	45.44	13870
4	1.73	8.87	0.18	0.55	0.01	*0.13*	0.36	2.31	0.97	*0.93*	56	37.52	13846
5	1.08	9.37	0.1	-0.33	0.04	*0.5*	-0.23	2.31	1.03	*0.94*	37	16.75	13805

Taiwan

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	2.06	11.25	0.17	0.92	0.04	*0.42*	1.44	5.23	1.36	*0.78*	48.18	20.9	14715
2	1.31	9.13	0.13	0.56	0	*-0.01*	0.58	3.52	1.15	*0.85*	49	45.78	14754
3	1.2	7.74	0.13	0.55	0.01	*0.15*	0.4	2.56	0.99	*0.89*	56	49.04	14800
4	0.89	7.24	0.1	0.15	0.02	*0.26*	0.07	1.57	0.96	*0.95*	55	41.37	14779
5	0.41	7.4	0.03	-0.69	0	*0.02*	-0.4	1.95	0.97	*0.93*	43	18.8	14740

source: FactSet

The third region is Eastern Europe including Czech Republic, Hungary, and Poland (see Table 5). This is the same as the Latin America region, there is no positive relationship between the return and value factor especially in Czech Republic and Hungary because there is no certain pattern according to the order of fractiles. However, Poland is very different from all emerging countries. In Poland, the growth strategy is more valuable than the value strategy. The growth portfolio which is in the 5th fractile shows the highest IR and residual return under the lowest residual risk. Even though the IR by 0.28 is not high enough to conclude the growth strategy is a good strategy in Poland, it is a meaningful fact that the growth portfolio is more valuable than the value portfolio in certain emerging markets.

Table 5. Eastern Europe region

Eastern Europe

Czech republic

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	0.89	16.18	0.04	-0.23	0.12	*NA*	-0.83	11.68	1.35	*0.48*	43.64	9.17	160
2	2.93	12.49	0.22	0.57	-0.1	*0.58*	1.13	7.05	1.25	*0.68*	52	34.4	181
3	1.43	10.12	0.13	-0.31	-0.13	*0.24*	-0.5	5.41	1.03	*0.71*	44	42.97	246
4	2.14	11.1	0.18	0.1	-0.1	*0.08*	0.21	7.2	1.02	*0.58*	45	46.33	212
5	0.66	10.03	0.05	-0.7	0.04	*NA*	-1.33	6.11	0.96	*0.63*	43	24.77	160

Hungary

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	1.28	10.9	0.1	-0.11	0.11	*NA*	-0.3	8.4	0.71	*0.41*	50	33.03	182
2	1.23	13.85	0.08	-0.09	-0.13	*NA*	-0.29	11.36	0.81	*0.33*	44	48.62	220
3	0.95	10.03	0.08	-0.28	-0.17	*-0.18*	-0.45	5.23	0.87	*0.73*	50	46.02	260
4	0.1	9.88	-0.01	-0.91	0.02	*0.16*	-1.22	4.25	0.91	*0.82*	43	34.1	244
5	0.88	10.47	0.07	-0.26	-0.19	*NA*	-0.43	5.5	0.91	*0.72*	52	15.6	194

Poland

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	1.16	12.33	0.08	0.1	0.04	*0.2*	0.2	7.05	1.14	*0.67*	42.73	23.91	4025
2	1.34	10.55	0.11	0.18	-0.01	*-0.04*	0.28	5.35	1.03	*0.74*	53	48.17	4060
3	1.2	9.98	0.1	0.15	0.03	*0.13*	0.17	3.9	1.04	*0.85*	45	50.97	4112
4	1.2	9.83	0.11	0.12	0	*-0.02*	0.14	4.13	1.01	*0.82*	54	43.78	4090
5	1.48	10.05	0.13	0.28	0.02	*0.14*	0.39	5.01	0.99	*0.75*	53	22.68	4043

source: FactSet

The last region is South Asia which includes India, Indonesia, Malaysia, the Philippines, and Thailand (see Table 6). Except for India, most South Asian countries have relatively small capital market. Most countries except for Indonesia show the meaningful fact that the value strategy is better than the growth strategy in that the portfolio generates alpha return. However, all fractiles of these countries show low or negative IC, so only value factor does not have strong forecasting power for alpha return.

Table 6. South Asia region

South Asia

India

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	2.45	13.51	0.17	0.39	-0.11	*-0.26*	0.75	6.22	1.32	*0.79*	48.18	27.08	539
2	2.71	10.74	0.24	0.76	0.06	*0.17*	0.84	3.88	1.11	*0.87*	59	43.01	574
3	1.96	10.4	0.17	0.05	0	*-0.02*	0.06	4.37	1.04	*0.82*	45	34.2	620
4	2.43	8.77	0.26	0.3	0.04	*0.01*	0.37	4.13	0.85	*0.78*	54	32.49	581
5	1.1	8.4	0.11	-0.74	0.06	*0.06*	-0.97	3.99	0.82	*0.77*	43	17.39	553

Indonesia

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	2.11	13.65	0.14	-0.09	0.01	*0.05*	-0.21	8.22	1.13	*0.64*	45.45	20.61	6837
2	2.04	10.95	0.17	-0.22	0.01	*0.05*	-0.32	5.07	1	*0.79*	46	41.09	6876
3	2.77	10.57	0.25	0.29	-0.02	*-0.11*	0.38	4.61	0.98	*0.81*	54	42.41	6929
4	2.67	10.32	0.24	0.42	-0.01	*-0.07*	0.33	2.82	1.03	*0.93*	48	33.09	6895
5	1.61	9.82	0.15	-0.72	0.03	*0.22*	-0.82	3.72	0.94	*0.86*	44	15.33	6857

Malaysia

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	1.78	8.49	0.19	0.56	0.02	*0.09*	0.73	3.98	1.52	*0.78*	54.55	16.39	2078
2	1.89	6.38	0.27	0.87	-0.01	*-0.06*	0.76	3.06	1.13	*0.77*	55	33.72	2111
3	1.25	5.59	0.19	0.18	0.02	*0.09*	0.1	1.96	1.06	*0.88*	47	33.3	2157
4	1.08	5.06	0.18	-0.18	0.04	*0.18*	-0.09	1.76	0.96	*0.88*	50	27.76	2123
5	0.97	5.09	0.16	-0.39	0.01	*0.06*	-0.2	1.74	0.97	*0.88*	47	13.12	2087

Philippine

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	2.5	12.95	0.18	0.47	-0.01	*-0.1*	1.13	8.61	1.3	*0.56*	56.36	19.31	561
2	1.82	10.7	0.15	0.28	0.08	*0.3*	0.44	5.13	1.27	*0.77*	48	37.19	610
3	1.97	8.95	0.2	0.36	0.09	*0.22*	0.45	4.45	1.05	*0.75*	55	38.83	662
4	1.93	7.98	0.22	0.36	-0.02	*0*	0.37	3.58	0.96	*0.8*	52	40.18	610
5	1.06	7.05	0.13	-0.51	0.08	*0.15*	-0.55	3.4	0.83	*0.77*	42	20.84	595

Thailand

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	*IC T-stat*	residual alpha(M)	residual risk(M)	Beta	*R2 beta*	%>BM	% turnover	# of securities
1	1.88	9.66	0.18	0.05	0.03	*0.23*	0.07	4.84	1.07	*0.75*	49.09	19.42	8438
2	2.11	8.64	0.23	0.27	0.01	*0.1*	0.27	3.44	1.02	*0.84*	54	39.19	8479
3	1.91	8.27	0.21	0.06	-0.01	*-0.12*	0.05	2.91	1	*0.88*	53	41.79	8524
4	1.97	8.12	0.22	0.22	0	*0.01*	0.12	1.88	1.02	*0.95*	56	34.29	8498
5	1.64	8.16	0.18	-0.27	0.06	*0.49*	-0.24	3.02	0.98	*0.86*	44	16.08	8464

source: FactSet

Fama-French three factor model

Strictly speaking, we run the multi-factor model test based on Fama and French research that the stock return can be explained by three factors: market factor, value factor, and size factor. In this paper, we focus on the alpha generating strategy and define alpha as the excess return of the market based on Sharpe's theory. Sharpe already considered the

market factor to determine the stock price in the CAPM formula. Therefore, we do not need to estimate the accurate stock price from the Fama-French three factor model but we only need to verify whether the portfolio selected by the combination of value and size factor has an excess return in the market portfolio in the empirical test. Therefore, we do the alpha testing using the multi-factor ranking system based on the data of book-to-market ratio and of market capitalization.

We obtain interesting results from the multi-factor model in the emerging market. In previous tests, we analyzed the possibility of alpha generating using the single-factor which is book-to-market ratio. From the tests, we got different results according to the regions where the emerging markets are based. Most countries in Asia have a positive relationship between the residual return and book-to-market ratio although the relationship is not robust. As we see the below table, we get more robust IR in the Asian countries from adjusting the portfolio with the size factor. However, other regions such as Latin America and Eastern Europe do not have any positive impact from adjusting the portfolio with the size factor because those countries show no correlation between the value strategy and residual alpha. As a result, we may conclude that we can create alpha generating portfolio from the multi-factor concepts based on Fama-French three factor model in the emerging countries in the Asia region where the value strategy shows a positive relationship with the alpha generating.

Table 7. Summary

	Multi-Factor (Book-to-market, size)				Single-Factor (Book-to-market)			
Country	IR	IC	Residual Alpha*	Residual Risk**	IR	IC	Residual Alpha*	Residual Risk**
Argentina	(0.15)	(0.08)	(7.20)	48.71	(0.07)	(0.06)	(3.10)	46.60
Brazile	0.14	(0.02)	10.95	76.03	(0.31)	(0.03)	(21.68)	14.69
China	0.80	0.00	13.74	17.08	0.63	0.02	6.72	10.69
czech republic	(0.12)	0.04	(5.52)	45.32	(0.23)	0.12	(9.56)	41.71
Hungary	(0.05)	0.00	(1.53)	32.35	(0.11)	0.11	(3.50)	30.72
India	0.74	(0.03)	18.88	25.34	0.39	(0.11)	9.38	23.83
Indonesia	0.28	(0.02)	6.47	23.08	(0.09)	0.01	(2.46)	28.78
Korea	0.81	0.02	16.50	20.27	0.45	0.00	8.87	19.71
Malaysia	0.72	0.02	14.36	19.97	0.56	0.02	9.18	16.41
Mexico	0.60	0.04	13.01	21.78	0.51	0.02	12.31	24.18
Philippine	1.07	0.01	33.90	31.79	0.47	(0.01)	14.49	30.84
Poland	0.53	0.01	18.85	35.39	0.10	0.04	2.39	24.82
Taiwan	1.16	0.03	24.68	21.26	0.92	0.04	18.70	20.25
Thailand	0.60	0.01	10.48	17.47	0.05	0.03	0.87	16.88

* Residual alpha: annulized excess return

** Residual Risk: annulized standard deviation of excess return

sourse: FactSet

From the previous empirical test, there was no robust evidence for the relationship between the value factor and alpha return in the Latin America region. Basically, because the Fama-French three factor model also uses the book-to-market ration as an input source, these multi-factor tests have similar results. Especially, multi-factor ranking factors in Argentina and Mexico are highly correlated by the book-to-market factor. Therefore, Argentina which already has negative IR in value strategy testing does not show the evidence that this multi-factor portfolio can generate constant alpha. However, in Mexico, the empirical test shows robust results for generating alpha compared with the value strategy when we just add another factor which is size factor. In other words, in the previous tests, Mexico has positive relationship between residual alpha and book-to-market factor even though the results are not quite robust. However, when we supplement the value factor with the size factor, the tests show more concrete results. In the case of Brazil, we decide to ignore the test results because there are some outliers of data and the results are distorted due to those outliers.

Table 8. Latin America region

Latin America

ARGENTINA

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	1.31	15.03	0.08	-0.15	-0.08	-0.62	13.44	0.62
2	1.14	13.69	0.07	-0.22	0.05	-0.92	12.57	0.5
3	-0.81	13.23	-0.07	-0.6	0.01	-2.8	12.43	0.42
4	2.13	9.94	0.2	0.06	-0.07	0.15	7.4	0.61
5	1.22	11.88	0.09	-0.21	0.02	-0.41	6.39	0.92

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	-0.17	0.7	NA	NA	NA
	2	1.33	-0.34	-0.21	NA	NA
	3	NA	-0.77	-0.65	0.25	NA
	4	NA	NA	0.22	-0.44	0.45
	5(low)	NA	NA	-0.74	-0.31	-0.34

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.95	0.77
Book-to-Market	0.95	1	0.66
size	0.77	0.66	1

BRAZIL

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	3.58	13.96	0.24	0.14	-0.02	NA	12.87	0.23
2	-3.63	19.97	-0.19	-1.63	0.05	NA	14.79	0.58
3	3.93	209.28	0.02	0.1	0.04	4.37	185.46	4.18
4	0.42	13.5	0.02	-0.49	0.01	NA	12.12	0.26
5	2.15	11.13	0.18	-0.27	-0.02	NA	10.2	0.19

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	-0.07	0.07	-0.29	0.28	NA
	2	-0.19	-0.02	-0.55	-0.14	-0.04
	3	-0.15	-0.21	-1.28	0.01	-0.01
	4	-1.21	-0.56	-1.32	-0.46	-0.43
	5(low)	-0.43	-0.06	-0.24	-0.26	-1.39

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.56	0.82
Book-to-Market	0.56	1	0.16
size	0.82	0.16	1

MEXICO

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	2.34	10.43	0.21	0.6	0.04	1.02	6.1	1.22
2	1.89	9.53	0.18	0.43	-0.01	0.58	4.68	1.2
3	1.89	8.1	0.21	0.5	0.1	0.48	3.46	1.06
4	1.08	7.66	0.12	-0.39	0.02	-0.35	3.05	1.01
5	1.25	6.96	0.16	-0.37	0.01	-0.2	1.84	0.97

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	0.64	-0.02	NA	NA	NA
	2	-0.07	0.46	-0.07	NA	NA
	3	0.39	0.46	0.13	0.46	NA
	4	NA	1.62	-0.26	-0.65	0.05
	5(low)	NA	-2.66	-2.84	-0.28	-0.2

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.94	0.71
Book-to-Market	0.94	1	0.53
size	0.71	0.53	1

Sourse: FactSet

In North East Asia region, where the value strategy generates positive correlation with alpha return, the multi-factor model driven by Fama-French three factor model shows robust results for generating alpha in all three countries. The active portfolios in the 1st fractile which is the portfolio composed of stocks with the top 20% of high book-to-ratio and

low market capitalization, have high IR by over 0.8 and high monthly residual return. As a result, we may conclude that investors can generate long term alpha from the multi-factor model in the region with fast economic and capital market growth.

Table 9. North East Asia region

Northeast Asia

CHINA

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	2.07	11.37	0.17	0.8	0	1.08	4.88	1.07
2	1.24	11.27	0.1	0.24	0	0.28	4	1.1
3	1.22	10.66	0.1	0.22	0	0.21	3.38	1.06
4	0.91	10	0.07	-0.18	0.01	-0.12	2.26	1.02
5	1.03	9.36	0.09	-0.09	-0.01	-0.06	2.02	0.96

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	0.78	0.7	0.44	-0.07	0.12
	2	0.1	0.21	0.16	0.26	0.04
	3	0.4	0.42	0.35	-0.2	-0.25
	4	0.13	0.51	0.08	-0.37	-0.72
	5(low)	0.35	0.5	1.06	-0.23	-0.73

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.5	0.84
Book-to-Market	0.5	1	0.09
size	0.84	0.09	1

KOREA

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	2.64	10.56	0.23	0.81	0.02	1.28	5.85	1
2	1.56	10.18	0.14	0.22	0.02	0.26	4.26	1.05
3	1.75	9.98	0.16	0.32	0.01	0.41	4.5	1.01
4	1.58	10.35	0.14	0.26	-0.01	0.3	4	1.08
5	1.3	8.74	0.13	-0.35	0	-0.05	0.45	0.99

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	0.62	0.81	0.97	0.18	NA
	2	0.24	0.35	0.07	0.03	-1.41
	3	0.91	0.35	0.14	-0.24	-0.11
	4	0.12	0.58	0.42	0.25	-0.22
	5(low)	-0.02	0.56	0.34	0.64	-0.24

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.72	0.94
Book-to-Market	0.72	1	0.52
size	0.94	0.52	1

TAIWAN

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	2.49	11.33	0.21	1.16	0.03	1.86	5.61	1.34
2	1.67	9.56	0.16	0.9	0	0.98	3.67	1.2
3	1.08	9.1	0.1	0.44	0.01	0.37	2.71	1.18
4	0.95	8.33	0.09	0.32	0.01	0.2	2.12	1.1
5	0.62	7	0.07	-0.72	-0.01	-0.21	0.89	0.94

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	1.19	0.89	-1.14	NA	NA
	2	0.51	1.04	0.56	NA	NA
	3	0.45	0.16	0.39	0.18	NA
	4	0.02	0.06	0.24	0.06	0.35
	5(low)	-1.72	0.28	0.5	0.03	-0.71

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.94	0.64
Book-to-Market	0.94	1	0.44
size	0.64	0.44	1

Sourse: FactSet

Similar to the Latin American region, countries in Eastern Europe do not enhance the test results from adding size factor. In other words, we do not prove that there is a relationship between the alpha return and the multi-factor ranking which combines book-to-market ratio with market capitalization. The Czech Republic has positive IR only in the 3rd and 4th fractile and other fractiles record negative IR and residual alpha with high residual risks. Even though Hungary shows that the 5th fractile has the highest IR, IC, and residual alpha, we need to analyze in more detail in order to confirm that in the stock market in Hungary, the portfolio made up of the growth and big stocks constantly outperform the market because the 4th fractile records the lowest IR, IC, and residual alpha. In the previous tests, only in Poland, the growth strategy records higher IR and IC than the value strategy. However, the test results are reversed when we use the multi-factor model. The portfolio with high book-to-market ratio but small sized firms outperforms the market and records the highest IR and positive IC.

Table 10. Eastern Europe region

Eastern Europe

CZECH REPUBLIC

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	1.28	16.91	0.07	-0.12	0.04	-0.47	12.78	1.34
2	1.67	11.2	0.13	-0.12	0.17	-0.29	8.01	0.95
3	1.89	13.01	0.13	0.06	0.07	0.13	7.05	1.32
4	2.78	10.49	0.25	0.55	-0.08	0.87	5.71	1.06
5	1.17	8.28	0.12	-0.69	-0.12	-0.88	4.05	0.87

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	-0.05	0.2	-2.81	NA	NA
	2	NA	-0.23	-0.34	0.34	NA
	3	27	0.78	-0.79	0.06	0.7
	4	0.01	1.46	0.77	-0.04	-0.44
	5(low)	NA	-1.05	-0.85	-0.44	-0.32

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.81	0.57
Book-to-Market	0.81	1	0.21
size	0.57	0.21	1

HUNGARY

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	1.39	11.51	0.11	-0.05	0	-0.13	8.97	0.74
2	0.47	12.74	0.02	-0.33	-0.09	-1.08	10.41	0.75
3	0.93	10.1	0.08	-0.27	0.05	-0.53	6.28	0.81
4	0.95	9.42	0.08	-0.38	0.05	-0.46	3.83	0.88
5	1.53	11.21	0.12	0.3	0.07	0.37	4.3	1.06

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	-0.05	-0.16	NA	NA	NA
	2	0.16	-0.36	-0.67	NA	NA
	3	NA	0.87	-0.18	-0.27	-1.2
	4	NA	1.44	0.31	-1.03	0.12
	5(low)	NA	NA	-0.28	0.02	0.63

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.89	0.75
Book-to-Market	0.89	1	0.53
size	0.75	0.53	1

POLAND

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	2.28	14.57	0.15	0.53	0.01	1.45	10.07	1.19
2	1.67	10.31	0.15	0.37	0	0.57	5.5	0.99
3	1.78	10.01	0.16	0.51	-0.01	0.7	4.91	0.99
4	1.21	9.74	0.11	0.1	0	0.13	4.45	0.98
5	1.13	9.86	0.1	0.14	0.02	0.12	2.91	1.07

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	0.54	-0.17	NA	NA	NA
	2	-0.32	0.45	0.15	NA	NA
	3	-0.07	0.36	0.42	0.06	NA
	4	-0.5	0.35	-0.14	-0.13	0.53
	5(low)	0.21	0.02	0.31	0.3	-0.15

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.87	0.69
Book-to-Market	0.87	1	0.41
size	0.69	0.41	1

Sourse: FactSet

The last region is the South Asia region. In this region, most countries except for Indonesia have similar results in that the portfolio in the 1st fractile records the best IR score and positive residual alpha. Among those countries, Malaysia, Philippines, and Thailand record overwhelming IR in the 1st fractile. However, the results do not show the linear trends from the 1st fractile to 5th fractile. For example, in the case of Thailand, only the 1st and 5th fractiles record positive residual alpha and IR but the 2nd, 3rd, and 4th fractiles have negative results. In the case of the Philippines, 4th fratile has positive IR while 3rd and 5th has negative ones. Therefore, we conclude that in the South Asian region countries, active managers may need to consider the additional factors to help the portfolio get the constant alpha return.

Table 11. South Asia region

South Asia

INDIA

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	3.12	14.04	0.21	0.74	-0.03	1.45	6.47	1.38
2	2.83	12.49	0.21	0.7	0.02	1.08	5.26	1.25
3	2.97	11.14	0.25	0.78	0.02	1.12	5.22	1.09
4	1.85	8.57	0.2	-0.18	0	-0.18	3.26	0.88
5	1.09	9.19	0.1	-0.86	0.06	-0.89	3.35	0.95

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	0.58	0.54	0.66	2.77	NA
	2	0.15	0.24	0.56	2.96	NA
	3	0.19	0.32	0.75	0.25	-0.24
	4	-0.21	0.02	-0.93	-0.03	0.23
	5(low)	1.18	0.13	-0.77	-0.15	-0.75

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.71	0.78
Book-to-Market	0.71	1	0.24
size	0.78	0.24	1

INDONESIA

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	3.1	10.08	0.29	0.28	-0.02	0.52	6.39	0.81
2	3.26	11.09	0.28	0.37	0.02	0.75	7.18	0.87
3	2.51	9.45	0.25	0	-0.02	0	4.37	0.87
4	2.19	9.43	0.21	-0.25	-0.01	-0.3	3.95	0.88
5	2.31	9.84	0.22	-0.14	-0.05	-0.04	0.96	1.01

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	0.22	0.35	7.42	NA	NA
	2	0.24	0.42	-0.49	-0.82	NA
	3	0.12	0.09	0	-0.75	-0.16
	4	0.06	-0.48	0.2	-0.24	-0.82
	5(low)	-0.56	-0.58	-0.22	0.72	-0.31

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.81	0.8
Book-to-Market	0.81	1	0.45
size	0.8	0.45	1

MALAYSIA

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	2.14	9.42	0.21	0.72	0.02	1.12	4.83	1.64
2	1.25	7.41	0.15	0.15	-0.01	0.16	3.52	1.32
3	1.24	6.02	0.18	0.14	0.01	0.1	2.38	1.12
4	1.36	6.02	0.2	0.4	0	0.24	1.95	1.15
5	1.09	4.62	0.2	-0.37	0.03	-0.09	0.74	0.92

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	0.54	0.5	0.27	0.21	0.15
	2	0.37	-0.06	-0.46	0.42	0.64
	3	0.12	0.36	0.18	-0.1	0
	4	0.03	0.42	0.68	-0.25	-0.4
	5(low)	2.09	0.66	-0.09	-0.08	-0.34

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.52	0.99
Book-to-Market	0.52	1	0.48
size	0.99	0.48	1

PHILLIPINE

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	3.92	12.57	0.3	1.07	0.01	2.46	9.09	1.17
2	2.73	10.82	0.24	0.78	0	1.31	6.05	1.21
3	1.3	8.61	0.13	-0.17	0.03	-0.24	4.9	0.95
4	1.74	8.25	0.19	0.21	-0.04	0.21	3.53	1.01
5	1.22	7.27	0.15	-0.48	-0.02	-0.34	2.35	0.93

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	0.77	0.46	0.23	-0.47	-1.46
	2	0.36	0.16	0.37	-0.07	0.67
	3	-0.57	0.01	-0.31	-0.47	0.04
	4	3.27	-0.39	0.16	0.62	-0.31
	5(low)	NA	-1.65	0.43	-0.22	-0.49

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.69	0.97
Book-to-Market	0.69	1	0.58
size	0.97	0.58	1

THAILAND

Fractile	Portfolio return	Standard deviation	Sharpe ratio	IR	IC	residual alpha(M)	residual risk(M)	Beta
1	2.78	8.35	0.31	0.6	0.01	0.83	4.93	0.86
2	1.91	7.13	0.25	-0.07	0	-0.07	3.56	0.79
3	1.72	6.88	0.23	-0.26	0	-0.27	3.13	0.79
4	1.9	7.55	0.23	-0.04	0.02	-0.03	3	0.89
5	1.87	8.11	0.21	0.13	-0.01	0.03	0.76	1.04

IR		Size factor				
		1(low)	2	3	4	5(high)
Book-to-Market factor	1(high)	0.72	-0.29	NA	NA	NA
	2	-0.03	-0.05	-0.3	-0.06	NA
	3	0.3	-0.11	-0.31	-0.41	-1.22
	4	-0.28	0.49	0.06	-0.18	-0.52
	5(low)	-0.92	0.01	-0.14	0.4	-0.3

Factor data correlation	MFR Factor 1	market to book	size
MFR Factor 1	1	0.84	0.84
Book-to-Market	0.84	1	0.52
size	0.84	0.52	1

Sourse: FactSet

Residual Earning model

As seen in the below table (see table 12), people may think that the residual earning factor may generate alpha in some countries due to the positive IR and residual alpha. However, we need to focus on both IR and IC. Ironically, the portfolio which has positive IR, records negative IC. As we mentioned before, Information ratio (IR) is the ratio of residual return the manager can achieve for every level of residual risk assumed and information coefficient (IC) is the correlation coefficient between the factor rank and the return rank for all companies in the fractile for a specific period. Countries which have positive IR record the negative correlation coefficient between the factor and return. Otherwise, countries which have negative IR record the positive IC. Therefore, we may conclude that we cannot explain the alpha generating strategy with only IR in this residual earning model. Actually, when we look at the detailed alpha analysis country by country or fractile by fractile, we can get a more certain conclusion.

Table 12. Summary

Country	Portfolio return	Portfolio risk	sharpe ratio	IR	Residual Alpha(Q)*	Residual Risk(Q)**	IC
Argentina	7.76	23.57	0.31	0.07	0.91	21.74	(0.24)
Brazile	6.67	21.48	0.29	0.00	(0.06)	16.55	(0.04)
China	5.42	20.54	0.24	0.52	1.73	7.39	(0.01)
czech republic	4.63	17.48	0.24	(0.27)	(1.77)	12.51	0.50
Hungary	3.19	22.59	0.12	0.00	0.01	11.45	(0.18)
India	8.40	18.79	0.42	0.23	1.18	10.83	(0.07)
Indonesia	5.94	18.49	0.29	(0.44)	(2.17)	9.18	0.11
Korea	4.42	15.90	0.25	(0.05)	(0.22)	8.60	0.01
Malaysia	3.50	7.63	0.39	(0.18)	(0.35)	2.92	0.02
Mexico	4.51	12.98	0.31	(0.11)	(0.35)	6.09	0.08
Philippine	5.38	13.30	0.37	(0.05)	(0.16)	5.33	(0.06)
Poland	5.76	16.05	0.33	0.95	2.42	4.92	(0.03)
Taiwan	3.18	10.19	0.26	0.01	0.03	5.03	(0.05)
Thailand	7.07	15.84	0.42	0.52	1.16	4.45	0.01

* Residual alphal(Q): quarterly excess return
** Residual Risk(Q): quarterly standard deviation of excess return
sourse: FactSet

For a detailed analysis of the residual earning model, we do not need to classify the countries by the region because there is no common phenomenon according to the regions. All countries except for China do not show any clue that the portfolio with high residual earning always outperforms the portfolio with a lower one. In many countries, we can see the portfolios in the 2nd or 3rd fractile record higher IR than the portfolio in the 1st fractile. Moreover, in some countries, the portfolio in the 5th fractile has the highest IR so we consider mean-reversion effect which means that the high residual earning will converse the historical mean of the residual earnings so the stock price will drop afterwards. However, we can easily deny this assumption because there is no pattern to explain that 5th fractile always outperforms 4th factile and so on.

As a result, we conclude that there is no reasonable clue that the portfolio using the residual earning factor will generate constant alpha return. Actually, the earning factor is not a good indicator to explain stock return in the emerging markets because the earnings in most emerging companies fluctuate in each period and are dissimilar to the developed markets.

Moreover, in the emerging markets, they adapt different accounting methods by company. Therefore, we cannot evaluate the earnings in the same manner. This is the main reason why the residual earning factor does not work to construct alpha generating portfolio.

Table 13. Country analysis

Argentina

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	3.69	49.81	0.31	**0.07**	(0.24)	30.09	22,984	0.99
2	(6.56)	34.36	0.06	(0.19)	0.10	60.65	20,189	0.23
3	(8.09)	43.84	0.17	(0.18)	**0.14**	79.17	1,598	(0.04)
4	(31.81)	48.16	(0.16)	(0.66)	(0.31)	85.65	1,267	(0.19)
5	(20.81)	50.47	0.00	(0.41)	(0.12)	62.96	2,602	(0.48)

Brazile

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	(0.24)	53.84	0.29	0.00	(0.04)	40.05	15,682	0.80
2	3.92	50.47	0.28	**0.08**	(0.09)	63.26	27,438	0.31
3	(1.44)	45.48	(0.13)	(0.03)	**0.12**	73.78	69,916	0.05
4	(11.36)	39.37	(0.15)	(0.29)	**0.12**	74.00	149,072	(0.22)
5	(21.44)	49.55	(0.10)	(0.43)	0.02	39.55	26,767	(1.39)

Mexico

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	(1.39)	12.89	0.31	(0.11)	0.08	47.27	7,726	0.32
2	(2.97)	12.95	0.17	(0.23)	(0.07)	71.35	9,162	0.09
3	3.36	10.28	0.37	**0.33**	(0.06)	72.69	10,418	0.04
4	2.49	24.68	0.23	0.10	**0.15**	52.12	5,022	(0.02)
5	5.58	24.58	0.22	0.23	(0.02)	23.61	1,922	(0.31)

China

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	7.11	13.80	0.24	**0.52**	(0.01)	49.76	1,026	0.04
2	1.95	8.85	0.15	0.22	**0.04**	70.75	587	0.00
3	1.47	17.13	0.12	0.09	**0.04**	99.47	390	(0.01)
4	(6.04)	15.28	0.05	(0.40)	0.01	66.71	354	(0.02)
5	(6.06)	20.02	0.05	(0.30)	0.00	46.28	333	(0.07)

Korea

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	(0.88)	17.52	0.25	(0.05)	0.01	36.47	436	3.85
2	(0.69)	18.85	0.25	(0.04)	0.01	61.39	145	0.20
3	2.12	22.14	0.20	**0.10**	0.01	67.93	72	(0.06)
4	(6.28)	21.40	0.07	(0.29)	(0.02)	68.14	105	(0.39)
5	(0.69)	45.82	0.15	(0.02)	**0.06**	36.14	77	(4.07)

Taiwan

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	0.12	12.50	0.26	0.01	(0.05)	60.36	3,050	0.10
2	5.82	15.74	0.26	**0.37**	(0.01)	90.31	1,113	0.02
3	3.36	17.37	0.21	0.19	0.00	105.25	898	0.00
4	(2.31)	14.90	0.07	(0.16)	0.04	97.92	795	(0.02)
5	(1.88)	20.68	0.08	(0.09)	**0.08**	67.18	630	(0.09)

Czech republic

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	(6.88)	25.72	0.24	(0.27)	**0.50**	50.00	6,607	6.46
2	1.19	20.36	0.29	0.06	(0.29)	86.11	8,246	2.37
3	2.85	27.58	0.31	0.10	(0.19)	79.17	6,979	0.71
4	6.97	31.77	0.26	**0.22**	0.00	86.11	4,037	(0.58)
5	0.10	52.58	0.12	0.00	0.00	50.00	1,707	(6.91)

Hungary

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	0.04	18.97	0.12	**0.00**	(0.18)	51.39	5,751	6.04
2	(9.54)	25.21	0.02	(0.38)	**0.27**	61.11	3,092	2.25
3	(8.15)	19.50	0.04	(0.42)	0.11	68.06	2,313	0.37
4	(5.83)	19.73	0.10	(0.30)	(0.08)	81.02	1,736	(0.47)
5	(20.34)	33.94	(0.06)	(0.60)	0.24	52.78	849	(2.05)

Poland

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	10.06	10.55	0.33	**0.95**	(0.03)	34.28	1,980	1.80
2	3.06	15.39	0.19	0.20	0.02	71.25	1,493	0.20
3	(3.86)	20.05	0.08	(0.19)	(0.04)	79.67	1,336	0.02
4	14.78	23.46	0.26	0.63	0.01	72.12	326	(0.12)
5	(6.87)	18.81	0.02	(0.36)	**0.05**	46.72	538	(0.92)

India

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	4.80	20.49	0.42	0.23	(0.07)	27.78	10,471	1.12
2	(4.44)	20.76	0.24	(0.21)	(0.18)	51.85	11,987	0.60
3	(10.64)	24.49	0.18	(0.43)	**0.29**	54.17	12,008	0.30
4	(1.93)	27.88	0.21	(0.07)	0.18	47.22	9,756	0.10
5	18.04	42.19	0.32	**0.43**	(0.03)	37.96	7,879	(0.23)

Indonesia

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	(8.41)	19.18	0.29	(0.44)	**0.11**	76.27	1,068	0.07
2	1.50	14.59	0.38	**0.10**	0.03	100.56	276	0.00
3	(2.14)	21.62	0.31	(0.10)	0.10	105.44	124	0.00
4	(14.72)	25.60	0.12	(0.58)	0.07	108.23	93	0.00
5	(12.66)	20.33	0.14	(0.62)	(0.02)	81.90	137	(0.02)

Malaysia

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	(1.40)	7.68	0.39	(0.18)	0.02	30.94	3,317	0.16
2	1.83	8.45	0.34	0.22	0.05	60.32	2,265	0.03
3	7.04	10.97	0.34	**0.64**	**0.14**	64.86	1,162	0.01
4	(0.63)	15.16	0.20	(0.04)	0.11	65.62	747	(0.01)
5	(4.66)	13.13	0.11	(0.36)	0.00	39.03	637	(0.08)

Philippine

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	(0.62)	11.65	0.37	(0.05)	(0.06)	22.82	2,629	0.79
2	3.22	16.10	0.37	0.20	**0.10**	45.79	1,035	0.02
3	(0.80)	21.21	0.25	(0.04)	0.06	58.61	871	0.00
4	(3.76)	20.86	0.15	(0.18)	0.02	51.81	770	0.00
5	5.80	17.04	0.28	**0.34**	(0.03)	29.21	1,007	(0.07)

Thailand

fractile	Residual Alpha(A)	Residual Risk(A)	sharpe ratio	IR	IC	turnover rate	avg. mcap	factor avg
1	4.71	9.09	0.42	**0.52**	0.01	23.31	876	0.17
2	(1.85)	12.31	0.33	(0.15)	0.04	49.56	220	0.02
3	(0.90)	14.50	0.25	(0.06)	0.05	58.28	167	0.01
4	(11.27)	15.83	0.11	(0.71)	**0.06**	54.95	110	0.00
5	(12.03)	14.24	0.08	(0.85)	(0.01)	38.94	140	(0.04)

Source: FactSet

Technical Analysis: Momentum

Generally, much research verifies that the emerging markets are weak-form efficient. In other words, technical strategy which depends on the past price information does not make alpha return because the price already reflects on the historical price information. From the alpha testing for the momentum strategy, we support the weak-form efficiency hypothesis in the emerging market. As we see in the below table (see table 15), we cannot deduce any conclusive robust common results either for the momentum effect or for the mean reversion effect among the emerging countries. However, in most countries, mean reversion factor has higher IR and IC than the momentum factor in the short term. In other words, stocks which outperform the benchmark in a weekly return tend to converse the mean return. Therefore, the portfolio selected by weak performance in the last week outperforms the market during the next month. On the other hand, when we test the technical strategy with a longer time period, there is no reasonable relationship between the factor, either momentum or mean reversion, and the residual return. Even though most countries show the 5^{th} fractile outperforms the 1^{st} fractile in a short-run, it doesn't mean the portfolio in the 5^{th} fractile records the highest IR and residual return. While the results are different from country to

country, the portfolio in 3rd fractile records the highest or lowest IR and residual alpha in the short-term strategy in the most emerging countries. From these observations, although we cannot find any common fact that the technical strategy helps investors to make alpha generating portfolio in the whole emerging market either in the short- or mid-term, we need to analyze each strategy (1-week/1-month strategy, 1-month/3-month strategy, and 3-month/6-month strategy) in more detail country by country for robust results

.

Table 15. Summary

Country	Momentum Effect						Mean-Reversion Effect					
	1-week/1-month		1-month/3-month		3-month/6-month		1-week/1-month		1-month/3-month		3-month/6-month	
	IR	*IC*	**IR**	*IC*	**IR**	*IC*	**IR**	*IC*	**IR**	*IC*	**IR**	*IC*
Argentina	**(0.85)**	*0.03*	**(0.17)**	*0.05*	**(0.29)**	*0.18*	**(0.18)**	*0.11*	**(0.61)**	*0.06*	**(0.52)**	*0.06*
Brazil	**(0.60)**	*(0.04)*	**(1.52)**	*0.00*	**(0.28)**	*0.05*	**0.11**	*(0.01)*	**0.16**	*(0.01)*	**(1.11)**	*0.03*
China	**(0.60)**	*(0.06)*	**(0.54)**	*(0.03)*	**(0.30)**	*(0.01)*	**0.14**	*0.04*	**0.63**	*0.00*	**0.23**	*0.00*
Czech Republic	**0.41**	*(0.04)*	**(0.22)**	*(0.23)*	**0.07**	*(0.23)*	**0.15**	*0.12*	**(0.34)**	*(0.02)*	**(0.36)**	*(0.02)*
Hungary	**(0.58)**	*0.07*	**(0.49)**	*0.04*	**0.15**	*0.05*	**0.53**	*(0.01)*	**(0.04)**	*0.00*	**(0.14)**	*0.13*
India	**(0.51)**	*(0.11)*	**(0.16)**	*0.05*	**(0.60)**	*(0.07)*	**0.20**	*(0.02)*	**0.09**	*(0.09)*	**0.28**	*(0.01)*
Indonesia	**0.69**	*(0.11)*	**(0.30)**	*(0.03)*	**(0.44)**	*(0.03)*	**(0.10)**	*(0.07)*	**(0.01)**	*0.00*	**(0.05)**	*0.00*
Korea	**(0.60)**	*(0.09)*	**0.28**	*(0.06)*	**0.37**	*(0.04)*	**1.05**	*0.04*	**0.11**	*0.04*	**(0.04)**	*0.04*
Malaysia	**(0.14)**	*(0.06)*	**0.33**	*(0.03)*	**0.06**	*(0.03)*	**0.44**	*(0.03)*	**0.22**	*(0.02)*	**0.01**	*0.02*
Mexico	**(0.50)**	*(0.05)*	**0.55**	*(0.07)*	**0.39**	*(0.02)*	**0.35**	*0.04*	**(0.01)**	*(0.01)*	**0.07**	*(0.02)*
Philipine	**(0.64)**	*(0.02)*	**(0.01)**	*(0.01)*	**(0.02)**	*0.04*	**0.66**	*(0.06)*	**0.52**	*0.00*	**0.20**	*(0.04)*
Poland	**(0.20)**	*(0.03)*	**0.36**	*(0.02)*	**0.91**	*(0.01)*	**0.69**	*0.00*	**0.06**	*0.02*	**(0.62)**	*(0.01)*
Taiwan	**(0.37)**	*(0.03)*	**0.27**	*(0.02)*	**0.43**	*(0.01)*	**0.89**	*0.01*	**(0.08)**	*0.02*	**0.03**	*0.01*
Thailand	**(0.09)**	*(0.10)*	**(0.33)**	*(0.06)*	**0.12**	*(0.03)*	**0.14**	*(0.02)*	**(0.53)**	*0.03*	**(0.80)**	*0.04*

Source: FactSet

1-week/1-month Strategy

Among 14 emerging countries, only 4 countries have meaningful results either in momentum or mean reversion strategy. All 4 countries which are Hungary, Korea, the Philippines, and Taiwan show the mean-reversion effect in the short term. However, except for Korea and Taiwan, other countries have negative IC in the last fractile which represents a weak correlation coefficient between residual return and factor return.

Table 16. 1-week/1-month Strategy: Mean-Reversion

Hungary

Fractile	Portfolio Return	Portfolio Risk	Sharpe Ratio	Residual Return	Residual Risk	IR	IC	beta
1	0.13	11.27	0	-1.26	6.93	-0.58	0.07	0.91
2	0.55	11.25	0.03	-0.79	6.56	-0.4	0.03	0.93
3	1.33	10.87	0.11	0.04	5.45	0.03	-0.15	0.96
4	1.41	12.36	0.1	0.19	7.39	0.09	-0.07	1.01
5	2.57	11.7	0.21	1.14	7.93	0.53	-0.01	0.88

Korea

Fractile	Portfolio Return	Portfolio Risk	Sharpe Ratio	Residual Return	Residual Risk	IR	IC	beta
1	0.76	9.41	0.06	-0.57	3.22	-0.6	-0.09	1
2	0.41	9.11	0.03	-0.94	2.87	-1.08	-0.02	0.98
3	1.2	9.45	0.11	-0.16	3.82	-0.14	-0.01	0.98
4	1.66	9.45	0.16	0.34	2.89	0.41	0.01	1.02
5	2.63	10.37	0.24	1.33	4.69	1.05	0.04	1.05

Philippine

Fractile	Portfolio Return	Portfolio Risk	Sharpe Ratio	Residual Return	Residual Risk	IR	IC	beta
1	0.49	9.11	0.04	-1.09	5.6	-0.64	-0.02	0.97
2	1.15	8.12	0.12	-0.44	4.25	-0.35	0.02	0.93
3	1.47	8.14	0.16	-0.11	4.36	-0.09	0	0.93
4	2.53	8.96	0.26	0.98	4.69	0.77	-0.01	1.03
5	2.51	10.83	0.22	1.08	5.87	0.66	-0.06	1.23

Taiwan

Fractile	Portfolio Return	Portfolio Risk	Sharpe Ratio	Residual Return	Residual Risk	IR	IC	beta
1	0.51	7.74	0.04	-0.27	2.62	-0.37	-0.03	0.99
2	0.79	7.55	0.08	-0.01	2.45	-0.02	-0.02	0.97
3	1.05	7.58	0.12	0.25	1.61	0.55	0.01	1.01
4	0.96	8.14	0.1	0.19	2.54	0.28	0	1.05
5	1.49	8.87	0.15	0.77	3.08	0.89	0.01	1.13

Source: FactSet

1-month/3-month Strategy

In the 1-month/3-month strategy, only two countries included in the Northeast Asia region show the opposite results (see table 17a.b). In Taiwan's capital market, where the loser stocks outperform the winner stocks on a weekly basis, shows the momentum effect in the

mid-term test. Different from the previous result, the winner stocks which have high or positive monthly return still outperform the loser stocks which have low or negative monthly return for the next 3 months.

Table 17a. 1-month/3-month Strategy: Momentum

Taiwan

Fractile	Portfolio Return	Portfolio Risk	Sharpe Ratio	Residual Return	Residual Risk	IR	IC	beta
1	1	8.78	0.1	0.25	3.22	0.27	-0.02	1.11
2	0.83	8.05	0.08	0.05	2.45	0.07	0	1.04
3	0.83	7.43	0.09	0.01	2.06	0.02	-0.01	0.97
4	0.35	7.81	0.02	-0.44	2.51	-0.59	0.01	1.01
5	0.68	8.55	0.06	-0.07	3	-0.08	0.02	1.09

Source: FactSet

China shows the mean-reversion effect in the mid-term test. In the short-term test, China has negative IR in the 1st fractile and positive IR in the 5th fractile but the results are not robust. When we test the portfolio selected by the past 1-month return and rebalance on a quarterly basis, China's capital market shows more robust results of the mean-reversion effect.

Table 17b. 1-month/3-month Strategy: Mean-Reversion

China

Fractile	Portfolio Return	Portfolio Risk	Sharpe Ratio	Residual Return	Residual Risk	IR	IC	beta
1	0.65	9.37	0.05	-0.45	2.73	-0.54	-0.03	0.94
2	0.85	9.93	0.07	-0.18	1.93	-0.32	0	1.02
3	1.14	10.12	0.1	0.12	2.05	0.21	-0.01	1.04
4	1.43	10.61	0.12	0.46	2.22	0.7	-0.01	1.09
5	1.64	10.44	0.14	0.62	3.51	0.63	0	1.03

Source: FactSet

3-month/6-month Strategy

Actually, we need to recognize the 3-month / 6-month strategy as a long-term test in the emerging markets where the market has high volatility and turnover. In the long-term test, we cannot pick any country to show the possibility of alpha generation. As seen in the below table (see the table18), all countries have different IR regardless of the fractiles. Also, we cannot find any common trends in either momentum fractile from1st fractile to 5th fractile in order or mean reversion fractile from 5th fractile to 1st fractile in order. Therefore, we conclude that there is no evidence of alpha generation using the portfolio constructed by long-term technical strategy that the stocks selected by 3 months historical return hold for the next 6 months.

Table 18. 3-month/6-month Strategy

Information Ratio							
Fractile	Latin America			NorthEast Asia			Eastern Europe
	Argentina	Brazil	Mexico	China	Korea	Taiwan	Czech Republic
1	-0.29	-0.28	0.39	-0.30	0.37	0.43	0.07
2	-0.17	-0.25	-0.02	-0.12	0.33	0.29	-0.59
3	-0.13	-1.37	-0.71	0.12	-0.03	-0.07	0.62
4	-0.30	0.04	0.70	0.48	0.15	-0.51	0.02
5	-0.52	-1.11	0.07	0.23	-0.04	0.03	-0.36

Fractile	Eastern Europe		South Asia				
	Hungary	Poland	India	Indonesia	Malaysia	Philippine	Thailand
1	0.15	0.91	-0.60	-0.44	0.06	-0.02	0.12
2	-0.27	-0.09	-0.15	-0.82	0.13	0.01	-0.12
3	-0.50	0.70	0.70	-0.07	0.41	0.07	0.20
4	-0.38	0.21	0.44	0.21	0.19	-0.18	-0.40
5	-0.14	-0.62	0.28	-0.05	0.01	0.20	-0.80

Source: FactSet

4.1.4. Empirical evidence of fundamental and technical analysis

In this chapter, we run the empirical tests for the 3 fundamental factors and 1 technical factor in the 14 emerging countries. Unfortunately, we cannot find the common factor to verify the alpha generating strategy in those countries. However, we can earn the

qualified information from these empirical tests.

First, from the technical strategy, we conclude that the emerging markets are weak-form efficient. Investors would not generate the alpha return from the historical pricing information because the expected return is not relevant from the historical price. However, we find out the mean reversion effect in most emerging countries as we test the technical strategy with a shorter time period even though the results are somewhat controversial.

Second, earnings are not an adaptable factor for the alpha testing in the emerging markets due to the sensibility of earnings in each time period. In modern finance, forecasting earning and evaluating for earning quality are the basic factors for estimating the firm's value even in the emerging markets. However, we conclude that it is restrictive for investors to use the earnings as the main factor to generate alpha even though they evaluate the earning quality in the area of the active portfolio management from the empirical test results. Moreover, due to different accounting methods and the unreliable auditing system in the emerging markets, it takes more time for investors to use the earning quality as a main factor to generate alpha portfolio.

Finally, among various fundamental analysis, value and growth concept is well-known and somewhat acknowledged strategy in the developed market. From the empirical tests conducted in the emerging market, we could get different results according to the regions. Most Asian countries show the relatively credible results for generating alpha through the value and growth factors. However, we cannot observe the robust evidence for generating alpha return only from the value and growth factor which represents the book-to-

market ratio. From this consequence, we test multi-factor model which adds the value and growth factor to the size factor affected by the Fama-French three factor model. As a result of the empirical tests, we earn the robust consequence that investors would make the alpha generating portfolio from the combination between value-growth factor and size factor in the Asian countries where the value and growth factor shows somewhat of a correlation coefficient with the alpha return. However, we find out the size factor is not the main factor but an ancillary factor because we cannot find any reasonable relationship between the alpha and the multi-factor in the other regions such as Latin America and Eastern Europe.

In conclusion, we find out several meaningful insights through the empirical tests country by country, even though there is no certain evidence to generate an alpha portfolio to be commonly adapted in all emerging markets. We gather useful information for active portfolio management adapted in some emerging countries from the empirical tests. However, we observe that the portfolio generated in high residual alpha exposures the high residual risk in most emerging countries. Therefore, we need to consider making the optimal portfolio from the alpha generating strategy to enhance alpha under the certain risk. In the later chapter, we will look over the implementation methods which is the efficient translation of research into portfolios.

5. Implementation methods for alpha generating strategies: Asset allocation

In the previous chapter, we look into various alpha generation strategies in the stock selection level. In this chapter, we are going to deal with the implementation methods to efficiently realize the alpha strategies. According to portfolio theory, the market portfolio is the most efficient combination in the risky assets. However, when we change the weight of risky assets to be different from the market weight according to our empirical test results, we may make the constant excess return with the lowest risk compared to the market return. If so, we can conclude that asset allocation strategy with active rebalancing will generate optimal alpha returns. In other words, we can generate the highest alpha return through overweighting the underpriced stocks and underweighting the overpriced stocks under the certain residual risk level.

5.1. Portfolio Construction

The final step to active portfolio management is to construct the optimal portfolio. Portfolio construction requires several inputs such as the current portfolio, alphas, covariance estimates, and an active risk aversion based on Markowitz's mean-variance portfolio theory. The key concept of the active portfolio construction is how to organize the residual alpha and risk from the alpha generating strategy into the current portfolio. Even though Markowitz's mean-variance portfolio optimization model is the start point for the portfolio construction, this model is not quite applicable for investors to realize the active portfolio management due to the input sensitivity. In this chapter, we introduce basic concepts of two active asset allocation methods as rational implementation tools for alpha strategy.

5.1.1. Treynor-Black Model

Practically, Treynor-Black Model (Treynor & Black, 1973) is the active portfolio strategy for using alpha concept based on the Markowitz and Sharpe theories. The Treynor-Black Model share the equilibrium assumptions of Sharpe in which there are no restrictions on borrowing and selling securities and there is no tax and investors have the same information.

The basic concept of Treynor-Black Model is quite simple. The success of active portfolio management depends on the forecasting ability of the security analysis. Through the precision of alpha forecasts, an active portfolio manager can make the active portfolio above the Capital Market Line. Treynor-Black Model provides an efficient way of implementing optimal investment strategy from the active portfolio by forecasting and the passive portfolio which is referred as the market portfolio. The simple algorithm of Treynor-Black Model is as in the following. First, active fund managers estimate alpha through market research and security analysis and form portfolios with abnormal alpha. Then, they compute beta, alpha, variance, and the expected return of the active portfolio. Finally, they combine market portfolio and active portfolio to form optimal portfolio which has the highest Sharpe ratio (figure 4 and 5). As a result, they invest the changed security's portfolio weight differently from the market weight. We try to find applicable alpha or active portfolio strategies in the previous chapter. Therefore, we can implement those alpha generating strategies using the Treynor-Black asset allocation model.

Figure 4

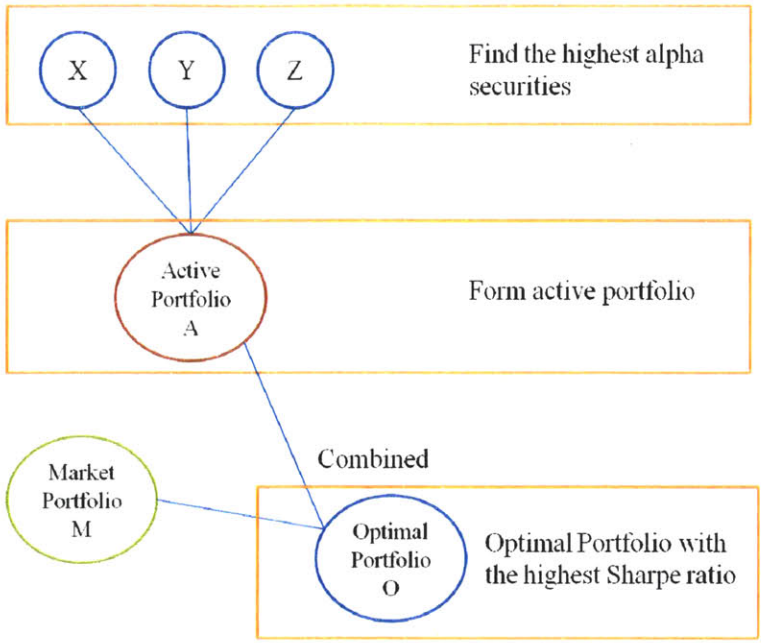
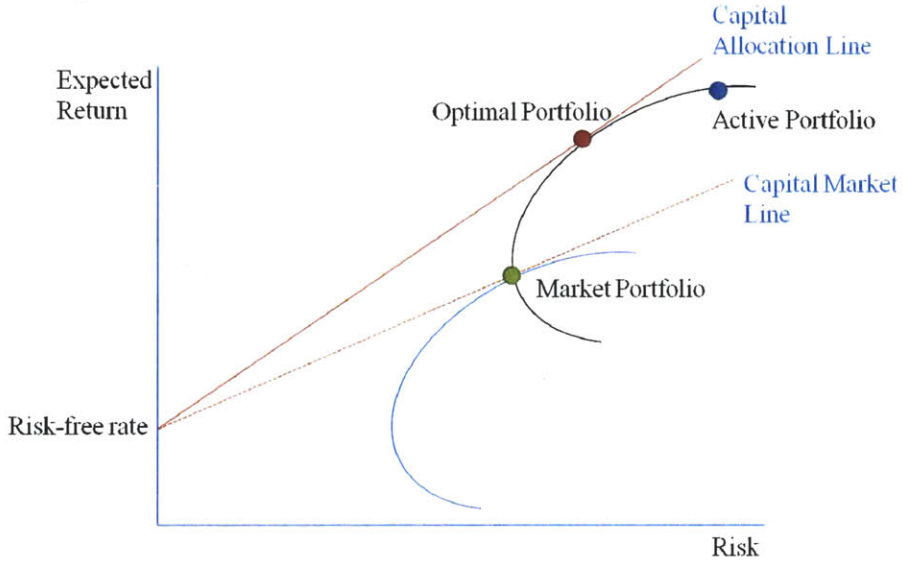


Figure 5



After understanding the basic concept, we look over the Treynor-Black model in detail. According to the basic concept of excess return on the CAPM formula, a regression of the excess return divides into two regression factors. The first is the market sensitivity which

is represented by beta and the remaining factor is the alpha except for statistical error term. Additionally, the expected remaining factor which is the alpha should be zero. Treynor and Black define the expected return by the CAPM as the explained return and the independent return to be excess return minus the explained return on their paper. We can express this concept analytically as,

$$y_i = \beta_i y_m + z_i$$

Where

y_i: excess return on security i (stock return minus risk free rate)

y_m: excess return on the market

$\beta_i y_m$: explained, or systematic, return on security i

z_i: independent return on security i

Here, we define the expected abnormal return, $E(z_i)$, as alpha, α_i. In the previous chapter, we look over the various strategies which have sustainable alpha. When we find the stocks with alpha return from those strategies, we get the new expected return which includes alpha return and standard deviation which includes residual standard deviation. From this information, we can find the optimal weights for the analyzed stocks obtained by maximizing the information ratio, that is, the ratio of optimal portfolio's expected abnormal return to its standard deviation. We call the combination of analyzed stocks the active portfolio A. Also, we express the maximizing information ratio as follow,

$$\max_h \frac{h'\alpha}{\sqrt{h'\Omega h}}, \text{subject to } h'\delta = 1$$

Where,

h: the weights of the analyzed stocks in active portfolio

Ω: N×N covariance matrix of the abnormal returns, z_i, of the analyzed stocks

α: the N×1 vector of α_i

δ: the N×1 vector of ones

the optimal weight is given by,

$$h^* = [\alpha'\Omega^{-1}\delta^{-1}]^{-1}\Omega^{-1}\alpha$$

After we construct the active portfolio and calculate the expected return and standard deviation of the active portfolio, the next step is to construct the optimal portfolio p by optimally mixing the active portfolio with the market portfolio. We can express the return as

$$r_p = wr_a + (1 - w)r_m$$

Where,

w: the optimal weight

r_p: the rate of return on the optimal portfolio

r_a: the rate of return on the active portfolio

r_m: the rate of return on the market portfolio

We can calculate the optimal weight between the active portfolio and the market portfolio by maximizing the Sharpe ratio.

$$\max_w S_p(w) = \frac{E(r_p(w))}{\sqrt{Var(r_p(w))}}$$

Through solving the maximization, we can get the optimal weight w,

$$w^* = \frac{\alpha_a\sigma_m^2}{(1 - \beta_a)\alpha_a\sigma_m^2 + \mu_m h^{*\prime}\Omega h^*}$$

Where,

$$\alpha_a = \sum_{i=1}^{N} h_i^* \alpha_i, \qquad \beta_a = \sum_{i=1}^{N} h_i^* \beta_i, \qquad \mu_m = E(r_m), \qquad \sigma_m^2 = var(r_m)$$

Additionally, we can decompose the square of the Sharpe ratio into two terms

$$S_p(w^*)^2 = \mu_m \sigma_m^{-2} \mu_m + \alpha_a' \Omega^{-1} \alpha_a$$

The first term, $\mu_m \sigma_m^{-2} \mu_m$, is the square of the Sharpe ratio of the market portfolio, S_m^2. It covered the contribution of the passive strategy. The second term, $\alpha_a' \Omega^{-1} \alpha_a$, is related to the active portfolio. Actually, this tern, $\alpha_a' \Omega^{-1} \alpha_a$, represents the squared information ratio of the active portfolio. Therefore, it measures the contribution of security analysis to the optimal portfolio.

In the previous chapter, we find several alpha strategies adaptable for each emerging country. We complete the active portfolio management through Treynor-Black model using the active return and risk resulted from the empirical tests in order to enhance the return on the active portfolio and simultaneously reduce the risk.

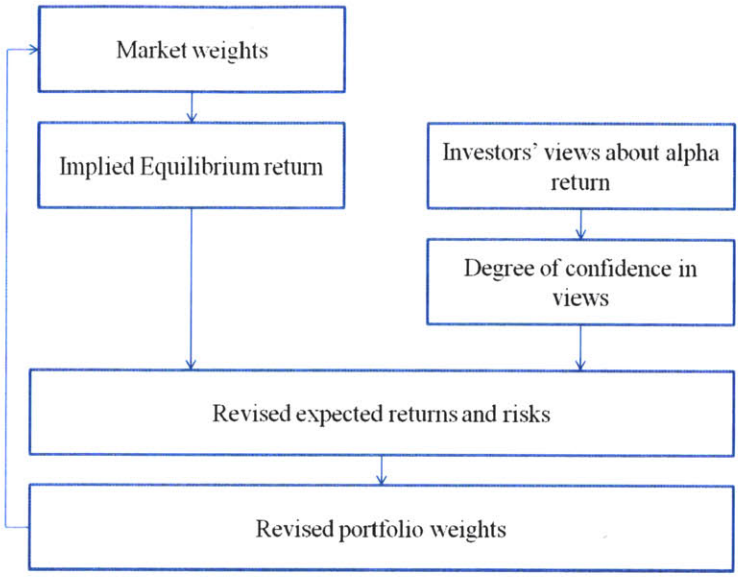
5.1.2. Black-Litterman Model

One well-known asset allocation strategy is the Black-Litterman Model. Practically, almost all investment banks in the emerging markets especially in Korea, use the Black-Litterman Model when they recommend to institutional or individual investors how to invest the money in the current market situation.

Practically, the crucial drawback of the mean-variance optimal portfolio is that small changes in input data such as the expected return lead to big changes in portfolio position. Therefore, the mean-variance concept is very genuine but it is hard for investors to implement their portfolio using the mean-variance optimization. Among various trials to overcome the drawback of the mean-variance optimization, Black and Litterman (Black & Litterman, 1992) provide an intuitive solution to the problem that plagued quantitative asset allocation model adapted in the global market and develop the Black-Litterman asset allocation model.

The Black-Litterman model uses a Bayesian approach to combine the relative or absolute excess return made by investors' alpha strategy with the expected return from the market equilibrium viewpoint to form a new expected return. After finding revised expected returns by the implied equilibrium returns and investors' active views, finally investors revise the portfolio weight to find an optimal portfolio using a new expected return and risk. The major steps of the Black-Litterman model can be expressed by the below figure 6.

Figure 6



We approach the Black-Litterman model step by step in more detail. First, the Black-Litterman model set the idealized market equilibrium returns as a neutral starting point. According to Litterman, equilibrium is an idealized state in which supply meets demand, equilibrium market represents the current market capitalization, and equilibrium returns are the set of returns that would clear the market. Black and Litterman derive the equilibrium returns from a reverse optimization method. They extract the vector of implied excess equilibrium returns from below formula.

Where,

: the vector of implied excess equilibrium returns (N×1 column vector)

: the risk aversion coefficient

: the covariance matrix of excess returns (N×N matrix)

w_m: the market capitalization weight (N×1 column vector) of the assets

This formula is equivalent to using a standard CAPM. Therefore, the risk aversion coefficient λ can be expressed as

$$\lambda = \frac{E(r_m) - r_f}{\sigma_m^2}$$

The vector of implied excess equilibrium returns, Π, is derived from the market capitalization weight and the risk aversion coefficient which divides the market risk premium by the market variance. Therefore, the Black-Litterman model makes the same conclusion as the optimal portfolio theory provided by Markowiz and Sharpe that the investors should hold the market portfolio as an optimal portfolio only if they do not have different views from the implied equilibrium return.

Secondly, the important point of the Black-Litterman model for the active portfolio managers is to put specific views regarding the expected excess return of the assets which differ from the implied equilibrium return. The Black-Litterman model can be used either for the absolute expected return or relative expected return. In other words, the active managers forecast the expected return on assets directly and also forecast the relative strengths between two assets. For example, the Black-Litterman model allows the absolute views that low book to market firms will have 3 percent alpha returns or the relative views that small size stocks will outperform big size stocks by 2 percent.

After specifying the view returns, the investors set a level of confidence of each view

in order to combine with the expected return of the views. The level of confidence is expressed by the standard deviation of the expected return of each view. Therefore, if the investors are confident in their views, the level of confidence is pretty small and vice versa. In other words, the level of confidence is the equal to the uncertainty of the views which is represented as normally-distributed error term vector (ε) with a mean of 0 and covariance matrix Ω. As a result, the expected returns on each asset can be estimated through this formula.

$$P \cdot E(R) = Q + \varepsilon$$

Where P is a k×n matrix, Q is a k×1 vector of the views, and e is a k×1 vector with error terms of the views assuming the investor has k different views of the n assets.

In detail, the Black-Litterman model requires P matrix, the expected returns of the views, and the level of confidence which form a diagonal covariance matrix Ω to apply the investors' view to the model analytically.

$$\text{P matrix} = \begin{bmatrix} w_1^1 & \cdots & w_1^n \\ \vdots & \ddots & \vdots \\ w_k^1 & \cdots & w_k^n \end{bmatrix}$$

Where w_k^n is the weight of asset n in the investors' view k.

$$Q = \begin{bmatrix} Q_1 \\ \vdots \\ Q_k \end{bmatrix}$$

Where Q_k is the expected return to the investors' view k.

$$\text{Covariance matrix } \Omega = \begin{bmatrix} \omega_1 & 0 & 0 \\ 0 & \ddots & 0 \\ 0 & 0 & \omega_k \end{bmatrix} = \begin{bmatrix} p_1 \Sigma p_1' & 0 & 0 \\ 0 & p_2 \Sigma p_2' & 0 \\ 0 & 0 & p_3 \Sigma p_3' \end{bmatrix}$$

Where ω_k is the variance of the error terms of the investors' view k.

As we mentioned before, the matrix Ω represents the level of confidence of the views. However, there is another constant variable, τ which is the weight-on view. The scalar (τ) determines how much weight is to be set on the investors' views in relation to the implied equilibrium return vector. It is inversely proportional to the relative weight given to the implied equilibrium return vector.

Many scholars insist on different ideas on how to set the scalar and there is weak reasoning in existing literature until now. Originally, Black and Litterman (Black & Litterman, 1992) set the scalar close to zero because the uncertainty in the mean is much smaller than the uncertainty in the return on their report. However, Satchell and Scowcroft (Satchell & Scowcroft, 2000) propose the opposite conclusion that the scalar is often set to 1. On the point of view of active portfolio management, Bevan and Winkelmann (Andrew Bevan, 2000) suggest that the scalar is often set in the range between 0.5 and 0.7 because the information ratio would exceed 2.0 only due to the scalar. We need to make an assumption about the value of the scalar when we implement the Black-Litterman model in the emerging market.

The third step of the Black-Litterman methodology is to calculate the combined return vector (E[R]). When K represents the number of views and N represents the number of assets, the formula for the new combined return vector is

$$E[R] = [(\tau\Sigma)^{-1} + P'\Omega^{-1}P]^{-1}[(\tau\Sigma)^{-1}\Pi + P'\Omega Q]$$

Where,

E[R]: the new combined return vector (N×1 column vector)

τ: a scalar

Σ: the covariance matrix of excess return ($N \times N$ matrix)

P: a matrix that identifies the assets with the investors' view ($K \times N$ matrix)

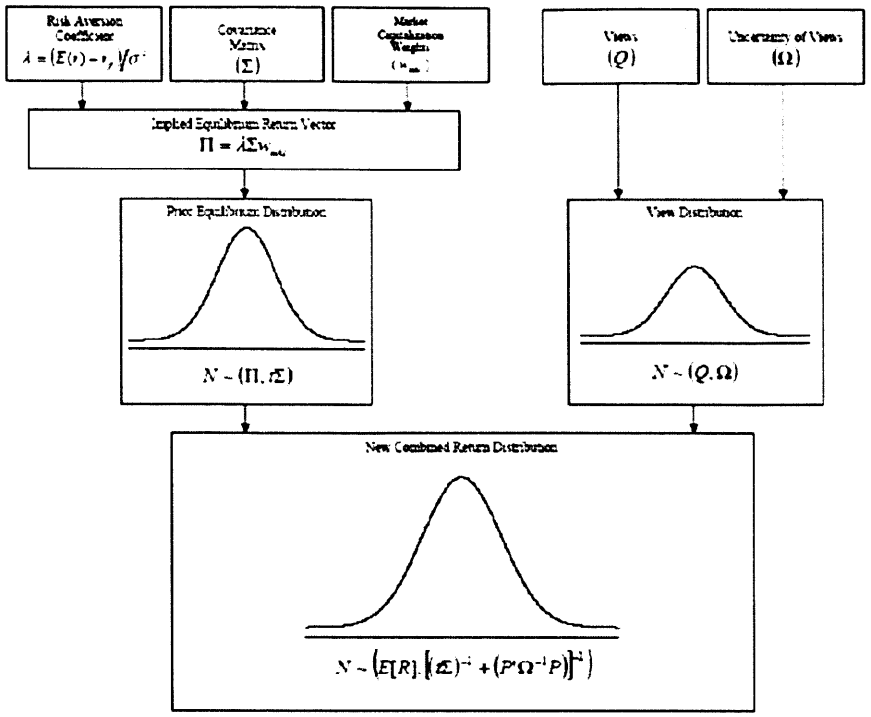
Ω: a diagonal covariance matrix of error terms of the expected views

Π: the implied equilibrium return vector ($N \times 1$ column vector)

Q: the investors' view vector ($K \times 1$ column vector)

By solving the formula, investors can get the new combined return vector from two sources of information. We can catch the process of driving the new combined return vector easily from below figure derived in Satchell and Scowcroft (Satchell & Scowcroft, 2000).

Figure 7



The final step is to drive new recommended weights from the new combined return vector using the mean-variance optimization process.

As we mentioned earlier in this section, the black-Litterman model can effectively overcome the drawbacks of traditional mean-variance optimization model. Therefore, most top tier institutional banks in the emerging markets use the Black-Litterman model in order to enhance their portfolio return using their unique alpha strategies. If we use the Black-Litterman model as a platform to implement alpha strategies especially in the emerging market, we expect that the Black-Litterman asset allocation model contributes to enhance the alpha strategies under the limited risk.

6. Conclusions

Active portfolio management consists of three major steps: the definition of alpha, the stock selection from alpha generating strategy, and the implementation for alpha generating strategy. Additionally, in this paper, we focus on the active portfolio management especially adapted for the emerging markets.

In the first step, we define the active portfolio management from the basic concepts

of portfolio theory, asset pricing, and efficient market hypothesis. The CAPM and Markowitz's mean-variance portfolio optimization are the starting points to define the active portfolio management because those two theories make the foundation of the passive portfolio management. The active portfolio management is a relative concept which is compared with the benchmark. As a benchmark, the market portfolio is optimal according to the CAPM and portfolio theory. Therefore, we can easily define the alpha return as the residual excess return above the market return. Moreover, we can measure the quality of alpha return with the information ratio which represents the residual return per residual risk.

After defining the active portfolio management, the next step is to find possible alpha generating strategies for stock selections. Among various theoretical researches, we choose three fundamental valuation strategies which are value and growth strategy, Fama-French three-factor model, and the residual earning model and two technical trading strategies which are the momentum strategy and the moving average trading rule. Those 5 alpha generating strategies are well-known and are still under investigation by many researchers.

One of the main goals of the paper is to confirm whether those strategies are adapted by the emerging markets through the empirical tests. Therefore, for alpha testing, we choose 14 emerging countries: Argentina, Brazil, and Mexico from the Latin America region, China, Korea, and Taiwan from Northeast Asia region, Czech Republic, Hungary, and Poland from Eastern Europe, and India, Indonesia, Malaysia, Philippine, and Thailand from South Asia.

From alpha testing of the value and growth strategy, we get partially affirmative results. In Latin America and Eastern Europe region, no countries show the positive

relationship between alpha return and the value-growth factor. On the other hand, in the Asia region, the test results show the possibility of alpha generation from the value-growth factor. However, we cannot confirm that the portfolio constructed by the value-growth factor will generate constant alpha return in those Asia countries due to lack of robustness. Intuitively, if there is another factor to adjust value-growth factor, we hypothesize that the portfolio may generate more robust alpha return in the same countries. Our inference is confirmed by multi-factor model using the concept of Fama-French three factor model. When we make the portfolio by multi-factor which is value-growth factor and size factor, the results show the robust alpha return in most Asian countries, especially, in the Northeast Asian countries. Of course, the multi-factor model works only in the Asia region. In the other regions where the value-growth factor doesn't affect the alpha generating, the multi-factor strategy doesn't show the reasonable results for alpha generating. Final alpha testing for fundamental valuation strategy is the strategy using the residual earnings model. The consequence is that there is no positive correlation between alpha return and residual earning factor in any emerging countries. Actually, earnings as a factor are poor indicators especially in the emerging countries due to high volatility for each period and the possibility of earning manipulation based on accounting methods. Even though we use not reported earnings but residual earnings measuring for earning quality as a factor, it is not sufficient to adjust those risks. Therefore, we conclude that investors need more time to use the residual earnings as a main factor for alpha generating strategy in the emerging markets.

In the test of technical strategy, we run the empirical tests with three different time periods: the short-term (1-week/1-month), the mid-term (1-month/3-month), and the long-term (3-month/6-month). Even though a 6-month holding period is not exactly long term, it is

reasonable for the emerging markets with high turnover rate and short rebalancing cycle. As a result of the empirical tests for technical strategy, we observe some interesting phenomena. In contrast to the developed market, the emerging market shows the mean-reversion effect rather than the momentum effect in a short period. In other words, stocks with below average market return outperform stocks with above average market return in the next 1 month period in most emerging countries. Although the results are not quite robust, we may generate robust alpha return from the technical strategy if we adjust past return factor with the other factor such as trading volume.

In conclusion, through the empirical tests, we find useful alpha generating strategies adapted in the emerging markets: multi-factor models in Asian countries and mean-reversion effect in a short period of time in most emerging countries. After finding available alpha generating strategies in each emerging country, we need to consider how to construct the optimal portfolio to complete the active portfolio management. Implementation for alpha generating strategies means portfolio construction which is based on the portfolio theory introduced by Markowitz. However, we need more advanced portfolio optimization model for adapting the residual return and risk. Therefore, we deal with two asset allocation models: Treynor-Black model and Black-Litterman Model. Those two models allow us to input the residual return and risk from empirical tests directly or indirectly. With these models, we complete the active portfolio management in the emerging markets.

In this paper, we mainly focus on alpha generating strategies adapted in the emerging markets through empirical tests while we deal with the full process for the completion of the active portfolio management in the emerging markets. To avoid diversion from the subject,

we determine to keep open the questions about the empirical results from the asset allocation models in the emerging markets because the models need other assumptions for testing. However, we assess that it is meaningful research in that we find several factors to generate alpha well adapted in the emerging markets under the full process of the active portfolio management.

List of References

Alexakis, C., Patra, T., & Poshakwale, S. (2010). Predictability of stock returns using financial statement information: Evidence on semi-strong efficiency of emerging greek stock market. *Applied Financial Economics, 20*(16), 1321-1326.

Andrew Bevan, K. W. (2000). *Using the black-litterman global asset allocation model: Three years of practical experience.*

Antoniou, Ergul, Holmes, & Priestley. (1997). Technical analysis, trading volume and market efficiency: Evidence from an emerging market. *Applied Financial Economics, 7*(4), 361-365.

Aquino, R. (2006). Efficiency of the philippine stock market. *Applied Economics Letters, 13*(7), 463-470.

Balaban, E., & Kunter, K. (1997). A note on the efficiency of financial markets in a developing country. *Applied Economics Letters, 4*(2), 109-112.

Barber, B. M., & Lyon, J. D. (1997). Firm size, book-to-market ratio, and security returns: A holdout sample of financial firms. *Journal of Finance, 52*(2), 875-883.

Bark, H. K. (1991). Risk, return, and equilibrium in the emerging markets: Evidence from the korean stock market. *Journal of Economics and Business, 43*(4), 353-362.

Black, F., & Litterman, R. (1992). Global portfolio optimization. *Financial Analysts Journal, 48*(5)

Bondt, W. F. M. D., & Thaler, R. (1985). Does the stock market overreact? *Journal of Finance, 40*(3), 793-805.

Brock, W., Lakonishok, J., & LeBaron, B. (1992). Simple technical trading rules and the stochastic properties of stock returns. *Journal of Finance, 47*(5), 1731-1764.

Capaul, C., Rowley, I., & Sharpe, W. F. (1993). International value and growth stock returns. *Financial Analysts Journal, 49*(1), 27-36.

Chan, Y. (1997). Multivariate testing of the capital asset pricing model in the hong kong stock market. *Applied Financial Economics, 7*(3), 311-316.

Chen, A., & Fang, S. (2009). Uniform testing and portfolio strategies for single and multifactor asset pricing models in the pacific basin markets. *Applied Economics, 41*(15), 1951-1963.

Cheung, K., & Coutts, J. A. (2001). A note on weak form market efficiency in security prices: Evidence from the hong kong stock exchange. *Applied Economics Letters, 8*(6), 407-410.

Cheung, Y., & Wong, K. (1992). An assessment of risk and return: Some empirical findings from the hong kong stock exchange. *Applied Financial Economics, 2*(2), 105-114.

Cheung, Y., Wong, K., & Ho, Y. (1993). The pricing of risky assets in two emerging asian markets-korea and taiwan. *Applied Financial Economics, 3*(4), 315-324.

Cooray, A., & Wickremasinghe, G. (2008). The efficiency of emerging stock markets: Empirical evidence from the south asian region. *The Journal of Developing Areas, 41*(1), 171-183.

DE BONDT, W.,F.M., & THALER, R. H. (1987). Further evidence on investor overreaction and stock market seasonality. *Journal of Finance, 42*(3), 557-581.

Dowen, R. (1988). Beta, non-systematic risk and portfolio selection. *Applied Economics, 20*(2), 221-228.

Fama, E. F. (1964). The behavior of stock-market prices. University of Chicago).

Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *Journal of Finance, 47*(2), 427-465.

Fama, E. F., & French, K. R. (1996). The CAPM is wanted, dead or alive. *The Journal of Finance., 51*(5), 1947.

Fama, E. F., & FrencH, K. R. (1996). Multifactor explanations of asset pricing anomalies. *Journal of Finance, 51*(1), 55-84.

Fama, E. F., & French, K. R. (2007). The anatomy of value and growth stock returns. *The Financial Analysts Journal., 63*(6), 44.

Fama, E. F., & MacBeth, J. D. (1973). Risk, return, and equilibrium: Empirical tests. *The Journal of Political Economy, 81*(3), 607-636.

Graham, B., & Dodd, D. L. (1934). *Security analysis,*. New York: Whittlesey House, McGraw-Hill Book Co.

Grieb, T., & Reyes, M. G. (1999). Random walk tests for latin american equity indexes and individual firms. *The Journal of Financial Research the Journal of the Southern Finance Association and the Southwestern Finance Association., 22*(4), 371.

Grinold, R. C., & Kahn, R. N. (2000). *Active portfolio management : A quantitative approach for providing superior returns and controlling risk.* New York: McGraw-Hill.

Jegadeesh, N., Titman, S., & National Bureau of Economic Research. (1999). *Profitability of momentum strategies : An evaluation of alternative explanations.* Cambridge, MA: National Bureau of Economic Research.

Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance, 48*(1), 65-91.

Kahn, R. N., & Rudd, A. (1995). Does historical performance predict future performance? *Financial Analysts Journal, 51*(6), 43-52.

Kawakatsu, H., & Morey, M. R. (1999). An empirical examination of financial liberalization and the efficiency of emerging market stock prices. *The Journal of Financial Research the Journal of the Southern Finance Association and the Southwestern Finance Association., 22*(4), 385.

Kothari, S. P., Shanken, J., & Sloan, R. G. (1995). Another look at the cross-section of expected stock returns. *Journal of Finance, 50*(1), 185-224.

Lakonishok, J., Shleifer, A., & Vishny, R. W. (1994). Contrarian investment, extrapolation, and risk. *Journal of Finance, 49*(5), 1541-1578.

Markowitz, H. (1952). Portfolio selection. *Journal of Finance, 7*(1), 77-91.

OHLSON, J. A. (1995). Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research, 11*(2), 661-687.

Ohlson, J. A. (2001). Articles - earnings, book values, and dividends in equity valuation: An empirical perspective. *Contemporary Accounting Research : The Journal of the Canadian Academic Accounting Association = Recherche Comptable Contemporaine : La Revue De l'Association Canadienne Des Professeurs De Comptabilité., 18*(1), 107.

Ozdemir, Z. A. (2008). Efficient market hypothesis: Evidence from a small open-economy. *Applied Economics, 40*(5), 633-641.

Rouwenhorst, K. G. (1998). International momentum strategies. *Journal of Finance, 53*(1), 267-284.

Satchell, & Scowcroft. (2000). A demystification of the black-litterman model: Managing quantitative and traditional portfolio construction. *Journal of Asset Management, 1*(2), 138-150.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance, 19*(3)

Siourounis, G. (2002). Modelling volatility and testing for efficiency in emerging capital markets: The case of the athens stock exchange. *Applied Financial Economics, 12*(1), 47-55.

Stephen A. Ross. (1976).

The arbitrage theory of capital asset pricing. *Journal of Economic Theory, 13*(3), 341-360.

Tobin, J. (1958). Liquidity preference as behavior towards risk. *The Review of Economic Studies, 25*(2), 65-86.

Treynor, J. L., & Black, F. (1973). How to use security analysis to improve portfolio selection. *Journal of Business, 46*(1), 66-86.

Wong, K. A., & Tan, M. L. (1991). An assessment of risk and return in the singapore stock market. *Applied Financial Economics, 1*(1), 11-20.