CHAPTER III

RESEARCH METHODOLOGY

3.1 Type of Data

Type of data being used in this study is secondary data that gathered by observing stock market indexes from five different countries in Southeast Asia during 2010-2014 period. Emunza et al conveyed that the use of the correlation between indexes of stock markets to see the advantages of diversification can make the occurrence overstate the potential gains obtained. The advantage should be gained by comparing the returns that can be obtained by diversifying the domestic assets and returns of diversified assets in overseas capital markets (as cited in Maneschiold, 2005).

3.2 Population and Sample Design

This research study took specific purpose of comparing performance of International diversified portfolio with and without hedging policy in Southeast Asia to domestic as a benchmark. Thus this research study uses the population of Southeast Asia Indexes including Indonesia and uses Indonesia Composite Index only for domestic benchmark.

By using purposive sampling which is sample selection method with certain criteria (Cooper & Emery, 1995), the samples data of this study are taken from several criteria.
Criteria of sample countries that used in this research study:

1. Countries selected in this research are included in Southeast Asia area

2. Each country has at least one stock index that actively operate during January 2010 to December 2014

3. Availability of weekly data from each country is easily access in Indonesia.

Countries that are included in those criteria are given by:

1. Singapore
2. Malaysia
3. Philippine
4. Thailand
5. Indonesia

Meanwhile, domestic benchmark of this study only uses Indonesia Composite Index as the sample.

3.3 Research Variables

Based on previous discussion of this study, the variables of this study are:
Table 3.1 Conceptual variables of research study

<table>
<thead>
<tr>
<th>No.</th>
<th>Variables</th>
<th>Population</th>
<th>Portfolio Construction</th>
<th>Performance Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fully Hedged International Diversified</td>
<td>Southeast Asia</td>
<td>EQW, MVP, TG</td>
<td>$R^h_p$ (return of portfolio)</td>
</tr>
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</tr>
<tr>
<td>3.</td>
<td>Domestic</td>
<td>Indonesia</td>
<td>None</td>
<td>$R^h_p$ (return of portfolio)</td>
</tr>
</tbody>
</table>

3.4 Technique of Analysis

Analysis methods for this study are focused on finding return and risk of three different portfolios, which are hedged international portfolio of Southeast Asia, unhedged international portfolio of Southeast Asia, and domestic portfolio.

The period of observation are divided into weekly holding period from 2010-2014. The purpose of weekly holding period is to get comprehensive observation from each holding periods towards return and risk of stock markets from each country.

3.4.1 Local Stock Market Return and Risk

This study compares the average arithmetic returns and standard deviations of local stock markets, exchange rates towards Indonesia Rupiah, and unhedged/hedged totals from
each country. Logarithmic return is used to provide time-consistency in continuously periodic compounded rate of returns. The following equation of logarithmic return is:

Formula 3.1

\[ R_{it} = \ln\left(\frac{P_{it}}{P_{it-1}}\right) \times 100\% \]

Where:

- \(R_{it}\): Rate of return of \(i\) index in \(t\) period
- \(\ln\): Natural logarithm function
- \(P_{it}\): Price of \(i\) stock in \(t\) period

For risk of local stock market, this study uses standard deviation. The following equation for standard deviation of local stock market returns is:

Formula 3.2

\[
\sigma = \sqrt{\frac{\sum_{t=1}^{n}(R_{it} - E(R_i))^2}{n}}
\]

Because this study uses \textit{ex post} analysis, the expected return of local stock market can be calculated as arithmetic mean:
Formula 3.3

\[ E(R_i) = \frac{\sum_{i=1}^{n} R_i}{n} \]

Where:

\( R_i \): Rate of return local stock market

\( n \): Number of sample

### 3.4.2 International Diversified Portfolio Construction without Hedging Strategy

One of critical issues in international diversification without hedging strategy is exchange rate. The following equation to examine rate of return in different currency is stated below:

Formula 3.4

\[ R_{i, IDR} = \frac{S_i P_i}{S_{i-1} P_{i-1}} - 1 = (1 + R_i)(1 + e_i) - 1 = R_i + e_i + R_i e_i \]

Where:

\( R_{i, IDR} \): Rate of return of \( i \) asset in Indonesia Rupiah currency

\( R_i \): Rate of return of \( i \) equity index

\( e_i \): Rate of return of \( i \) currency
For examining rate of return of foreign currency, this study simply uses the same calculation as examining return of index. The following equation that used is stated below:

Formula 3.5

\[ e_{i, IDR} = Ln\left(\frac{s_{it}}{s_{it-1}}\right) \times 100\% \]

Where:

- \( e_i \) : Rate of return of \( i \) currency to Indonesia Rupiah
- \( Ln \) : Logarithmic function
- \( s_{it} \) : Spot price of \( t \) period

Variance of stock index return is used to determine standard deviation of unhedged stock index return. The following equation is stated below:

Formula 3.6

\[ \sigma^2_{IDR} = \left[ \sum_{i=1}^{n} \left( R_{i, IDR} - E(R_{i, IDR}) \right)^2 \right] / n \]

Where:

- \( \sigma^2 \) : Variance of \( i \) stock index in Indonesia Rupiah currency
- \( R_{i, IDR} \) : Unhedged index return
- \( E(R_{i, IDR}) \) : Expected return of unhedged index
In order to determine the performance of an international multi-asset portfolio, this study extends the equation as follows:

\[ R_p = \sum_{i=1}^{n} X_i R_{i, IDR} \]

Formula 3.7 (Song)

Where:

- \( R_p \): Total return on unhedged portfolio
- \( X_i \): Assets’ weight allocation of i index
- \( R_{i, IDR} \): Return in Indonesia Rupiah

The variance of the portfolio return is given by the following equation:

\[
\sigma_p^2 = \sum_{j=1}^{N} w_j^2 \sigma_j^2 + \left[ \sum_{j=1}^{N} \sum_{k \neq j}^{N} w_j w_k \sigma_{jk} \right]
\]

Formula 3.8

Where:

- \( w^2 \): Squared weight of j index
- \( \sigma^2 \): Variance of j index
- \( w \): Weight allocation of j index
\( w \) : Weight allocation of k index

\( \sigma_{jk} \) : Covariance between index j and k

### 3.4.3 International Diversified Portfolio Construction with Hedging Strategy

While in hedging strategy, exchange risk is completely avoidable in international diversification by managing some forward contracts. The price of forward contract is called forward price where it must be added in measuring the potential return of individual underlying assets.

\[
R_{i, IDR}^h = R_{i, IDR} + h_i (f_i - e_i) = R_i + e_i f_i + h_i (f_i - e_i)
\]

Where:

- \( R_{i, IDR}^h \): Rate of return with hedging strategy in Indonesia Rupiah
- \( h_i \): Hedged ratio; \( h_i = 1 \) means using fully hedged strategy, \( h_i = 0 \) means using no hedged strategy
- \( f_i \): Forward premium (discount)

Forward premium (discount) is calculated by using equation:
Formula 3.10

\[ f_i = \frac{F_0}{S_0} - 1 \]

Where:

- \( F_0 \): Forward price or forward exchange rate
- \( S_0 \): Spot price (rate)

Forward exchange rate equation is given by:

Formula 3.11

\[ F_0 = S_0 e^{(r-r_f)T} \]

Where:

- \( F_0 \): Forward exchange rate
- \( S_0 \): Spot rate
- \( e \): Exponential function
- \( r \): Risk-free rate of domestic currency
- \( r_f \): Risk-free rate of foreign currency
- \( T \): Time of maturity (in years)
The return of portfolio in which Indonesian investor hedges some part of currency exposure with foreign exchange forward contracts. The following equation is:

Formula 3.12

\[ R_p^h = R_p + \sum_{i=1}^{N} h_i x_i (f_i - e_i) \]

Where:

- \( R_p^h \) : Return on hedged portfolio
- \( h_i \) : Hedging ratio
- \( x_i \) : Assets’ weight allocation
- \( e_i \) : Return of foreign currency

For risk-free rate of domestic, this study uses BI rate during the period of observation. Meanwhile, 10 year government bonds of each foreign country are used for risk free rate of foreign countries.

Based on that information, this study constructs portfolio strategies to overseeing and comparing the potential benefits of international diversification in Southeast Asia. The strategies that used in this study are equally weighted (EQW) optimization, minimum variance portfolio (MVP) optimization, and tangency portfolio (TG) optimization.
In favor to have comprehensive result for overseeing potential returns, equally weighted (EQW) portfolio allocation is considered in this study. Although EQW strategy is referred to as the naïve diversification, the same fractions of the investment budget are invested into each stock market. It can be regarded as the simplest way to benefit from international diversification without using any information on security returns, risks and co-movements. Since this study is interested in the impact of currency hedging on portfolio performance, this study calculates the EQW-strategy without hedging and with fully hedging the currency risk.

Minimum Variance Portfolio optimization is stated below:

\[
\begin{align*}
\text{min} \ Var(R^h_p; x_i, h_i) \\
\text{subject to} \\
\sum_{i=1}^{N} x_i = 1 \\
0 \leq x_i \leq 1; \ 0 \leq h_i \leq 1 \quad i = 1, 2, ..., N
\end{align*}
\]

Portfolio construction can be done by minimizing the variance of portfolio; portfolio variance represents risk carried by portfolio. Mean-Variance portfolio construction is the most suitable portfolio strategy for risk adverse investor which mostly prefer to lowest risk.

In order to solving the problem Mean-Variance portfolio equation above for some level of portfolio expected return requires \(2N - 1\) Variables. For example, \(N\) investment
proportions and \( N - 1 \) hedge ratio can be determined. The optimal investment proportions commonly depends on the hedged ratios, which themselves are affected by currency positions. The unhedged can also be handled by setting all the hedged ratios to be equal to \( h_i = 0 \) and for the hedged is \( h_i = 1 \), with respect to \( N \) variables which are the investment proportion only (Bugar & Maurer, 2002).

Tangency Portfolio is stated below:

\[
\text{Formula 3.14}
\]

\[
\max S(x_i, h_i) = \frac{E(\bar{R}_r) - r_f}{\sqrt{\text{Var}(\bar{R}_r)}}
\]

For the tangency portfolio (TG), this study is looking for allocation of assets which maximizes the Sharpe-ratio. Sharpe (1966) proposed the risk-adjustment performance measured by excess return over the risk-free to volatility. This strategy specifically uses the information of the expected returns and covariance matrix of the different investments. This strategy is used both for international diversification with hedging strategy and without hedging strategy.