The Indonesia economic growth has been getting better over the years motivates both domestic and foreign investors to do the investment. One of the best return investment instruments in Indonesia is equity fund. Not all business sectors perform well at the same time, so sector rotation could be an appropriate option in an attempt to beat the market. This research aims to identify the relationship between business cycle and selected stocks performance in Indonesia Stock Exchange. Sharpe ratio, holding period return, and geometric average return are applied as the proxy to measure the effectiveness of sector rotation implementation. The secondary data such as Jakarta Composite Index, Sectoral Index, Indonesia GDP Growth, and Inflation Rate is taken to analyze business cycle identification. The author makes sector choice analysis and selects the stock based on LQ45 Index. Portfolio backdated simulation is built after defining the weight of each stock in specific business cycle phase. The results proved that sector rotation strategy are effective for maximizing investors' wealth in comparison with passive strategy. It is also possible to be implemented into the real investment world.
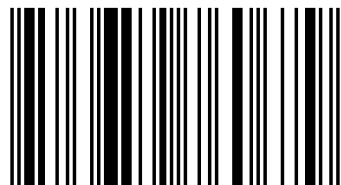
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An Empirical Study of Indonesia Stock Exchange

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CHAPTER 1
INTRODUCTION

1.1. Background

Along with the development of globalization is rapidly increasing, the importance of economic improvement is also increasingly felt in the future. Although it is regularly criticized because of the limitations of economic growth in improving living quality standards may conflict with the environment and social condition, but economic growth is still very important for almost everyone within that economy in dealing with several problems such as poverty, unemployment, government budget deficits, and competitiveness with other countries.

There are some factors that affect economic growth like productivity, demographic changes, and technology innovation. Productivity advancement generates economic growth by making products and services less expensive to increase market demand. Demographic changes means there are some changes in population, age, and gender that also affect production, consumption, and business activity. Technology innovation creates the business process activity became more effective and efficient.

The economic growth can be measured by the growth rate of Gross Domestic Product (GDP). GDP is the total market value of all the goods and services produces over a specified time period to determine the health of a country's economy. It is not only normally used to assess the economic performance of a whole country or region, but can also evaluate the relative contribution of an industry sector and specified area.

The calculation of GDP can be solved in three ways: production approach, income approach, or expenditure approach. Investopedia argues the expenditure method is the most common approach and is calculated by adding total consumption, investment, government spending and net exports. As we can see on the next page's chart, the Indonesia GDP growth rate in 2005-2015 created unique pattern: increased continuously from Q1 to Q3 but declined in the last quarter (Q4).

GDP = Consumption + Investment + Government Spending + Net Export

Figure 1.1 Indonesia GDP Growth Rate (Source: www.tradingeconomics.com)

The Indonesia economic growth which has been getting better over the years indicated that there is significant improvement for the material wealth of country (real assets and financial assets). In fact, Indonesia annual economic growth from 2009 to 2012 is larger than the world's. According to Litbang Kompas, some investment sectors such as mining, telecommunication, and transportation have good benefits in the next years. Bloomberg News Consensus Surveys also recognizes that Indonesia GDP Growth of 2015 is forecasted 5th largest growth in the world. The 2015 Indonesia's new government, leaded by President Joko Widodo, could support the macroeconomic more powerful and generate new hopes for the investors. Furthermore, Indonesia also commit to hasten the establishment of the AEC (ASEAN Economic Community) by 2015 and ready to transform ASEAN into a region with free movement of goods, services, investment, skilled labor and freer flow of capital.

From these situations, both domestic and foreign investors are motivated to do the investment in Indonesia as the current commitment of money or other resources in the expectation of reaping future benefits (Bodie, Marcus, & Kane, 2010, Pg 2). One of the best return investment instruments in Indonesia is equity fund. The essence of this financial asset instrument is to achieve long-term growth through capital gains and dividends. Although the equity investments provide no guarantees on income or capital growth, but they can protect against Indonesia inflation rate.

Nevertheless, some investors suffer difficulties in investing on their financial portfolio. Investors usually use investment strategy as important guideline to select investment portfolio: some of them will decide to maximize expected returns by investing in risky assets, others will go for minimizing risk, but most will struggle to

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hit a balance between maximizing their profits from their portfolio and risk they are willing to take by diversification. While passive strategies (index fund) are regularly applied to reduce transaction costs, active strategies such as market timing are an effort to get optimal returns. Unfortunately, countless studies show that inexpert investors do not trust these rules and expect to have low risk and high return. As a result, they often finish up with a "buy-high, sell-low" strategy.

An active strategy that can be applied to accomplish the excellent return is **sector rotation**. The concept in managing portfolio is implying the money transfer from one industry sector to another in an attempt to beat the market. Due not all sectors of the economy perform well at the same time, investors take advantages by investing more funds in some industries or sectors that are going up and avoiding them that are falling down. Investors can predict which corporations will be successful in the coming stages of a business cycle by identifying informative signs from aggregate production, trade, and activity over several months or years in a market economy. In general, business cycle is categorized into the following four basic phases: peak, downturn, trough, and upturn (Collander, 2004, Pg 495).
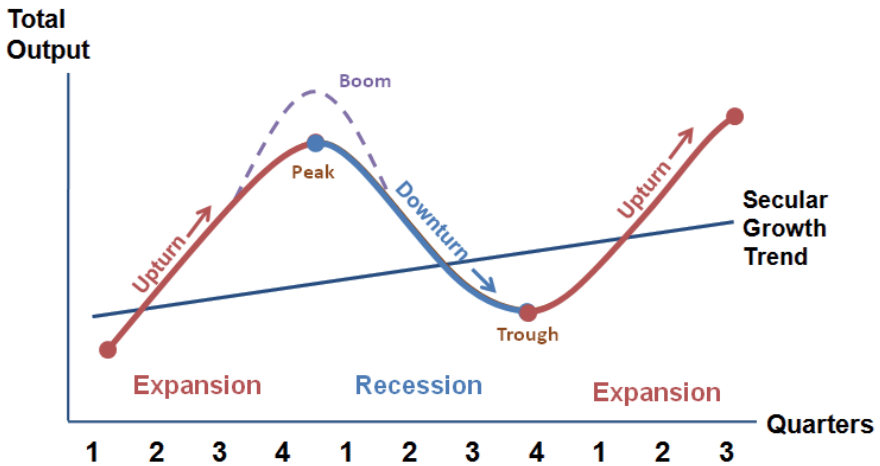
Figure 1.2. Business Cycle Phase (Source: Collander, D. C. (2004). *Economics Fifth Edition.* McGraw-Hill).

The business cycle can be rationally used to arrange one's stock collection. For example, during the early expansion phase, cyclical stocks in sectors such as commodities and technology tend to outperform. On the other hand, the defensive groups like health care, consumer staples and utilities outperform in the recession period because of their steady cash flows and dividend yields. Hence, this research plans to capture the pattern of relationship between business cycle and particular stocks in Indonesia Stock Exchange. In addition, this research also wants to formulate investment portfolio optimization by selecting based on industry sectors.

1.2.   Problem Identification

With the purpose of maximizing return and diversifying financial assets, every investor would use special strategy to select. Sector rotation strategy should not be simplified and have to be examined since business cycle of each nation has different effects to the industry sectors. In that case, the outcome of this study is expected to fulfill these problems below:

1. How is the pattern of relationship between business cycle and selected stocks performance in Indonesia Stock Exchange?
2. Does sector rotation strategy give better investment portfolio result rather than passive strategy?
3. What recommendations and solutions for investors in achieving optimal investment portfolio in the future?

1.3.   Research Objectives

The main objectives of this research are explained below:

1. Identify the pattern of relationship between business cycle and selected stocks performance in Indonesia Stock Exchange.
2. Measure the effectiveness of sector rotation strategy implementation to investment portfolio by comparing with passive strategy.
3. Provide recommendations and solutions that should be taken for investors in achieving optimal investment portfolio in the future.

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1.4. Research Limitations

This research is limited through several scopes and assumptions as follows:

1. The historical data of research is selected from Q1/2000 to Q4/2014 as identification of Indonesia business cycle because it is not uniform and ranging between 2 and 10 years.
2. The period of Q1/2000 to Q4/2007 is used for sector selection as well as Q1/2008 to Q4/2014 for investment portfolio simulation.
3. Equity funds that will be applied in this research are taken from Jakarta Composite Index (JCI) stocks by diversification using sector rotation investment strategy. The initial investment is Rp 100,000,000 each for active strategy and passive strategy.
4. Investment stock alternative that selected in this research is based on LQ45 Index 2007-2008 on each sector that provided in Jakarta Composite Index (JCI).
5. Market capitalization, positive annual growth rate, and sufficient historical market price are included in selection criteria for forecasting optimal portfolio in period of Q1/2008-Q4/2014.
6. The research assumed that there is no transaction fee in stock replacement. In fact, there will be additional cost for transaction such as buying fee, selling fee and switching fee.
7. Portfolio switching can be done instantly: all stocks in portfolio can be sold at one price and at one time. In addition, the simulation is assumed one price (daily adjusted close price) in buying and selling stocks.
8. To make the calculation easier, the stock can be bought per share not per lot as well as buying and selling process not affecting the stock price. Actually, buying and selling stock in Indonesia Stock Exchange must be done in lot size (since 2004, one lot is equal with 100 shares compared with 500 shares before).
9. Optimal portfolio construction follows the rule to maximize the Sharpe ratio scenario since Sharpe ratio shows how much reward, excess return, for certain level of risk investors will obtain.

1.5.   Work Structure

Chapter 1 Introduction

This chapter describes the background, research questions, research objectives, research limitations as well as the writing structure of the author's chosen topic.

Chapter 2 Theoretical Foundations

The chapter explains all theories that support the research and previous studies from several researchers which have similar or related topic to this research.

Chapter 3 Methodology

This chapter shows how the research will be performed. To be more specified, it also describes the whole process from data gathering and data processing until the final conclusion by using graphs and flowcharts.

Chapter 4 Data Analysis

This chapter is the main part of this research which contains results and discussions from all data obtained for helping the reader to understand the author's findings.

Chapter 5 Conclusion and Recommendation

This is the last part of this research with the purpose to conclude and summarize all the research from the beginning to the final conclusion and recommendation.

CHAPTER 2
THEORETICAL FOUNDATION

2.1. Capital Market

Capital market is investment transfer system from providers (retail and institutional investors) to users (businesses, governments and individuals) by using investment instruments like equity and debt securities. Equity security (stock) is an instrument that signifies an ownership position in an organization and represents a claim on its proportional share in the corporation's assets and profits. In contrast, debt security (treasury bills, bonds and commercial paper) refers to money borrowed that must be repaid which has a fixed amount, a maturity date, and usually a specific rate of interest. Moreover, capital markets consist of primary markets and secondary markets. In primary markets, new stock and bond issues are directly allocated to institutions, businesses, or individual investors. In secondary markets, existing securities are exchanged in standardized markets such as Indonesia Stock Exchange (IDX).

2.2. Business Cycle

Business cycle is recognized as the asymmetrical up-and-down movement in economic activities that can be measured by real gross domestic product (GDP) and other macroeconomic factors. These fluctuations occur along with a long-term growth trend, and typically categorized by four phases—peak, downturn, trough, upturn—that imitate themselves over a period of time. However, economists state that the duration of business cycles can be anywhere from about two to twelve years, with most cycles averaging six years in length. The business cycle can be a critical determinant of equity sector performance over the intermediate term (Stangl, Jacobsen, & Visaltanachoti, 2009).

Previous study has gone into identifying business cycles and setting official reference dates for the beginnings and ends of *contractions* (the part of the business cycle below the long-term trend) and *expansions* (the part of the cycle above the long-term trend). As a result, business cycles have been divided into several stages and an explicit terminology has been developed nowadays. Business cycles have changeable

durations and intensities, but economies have developed a terminology to describe all business cycles and just about any position on a given business cycle.
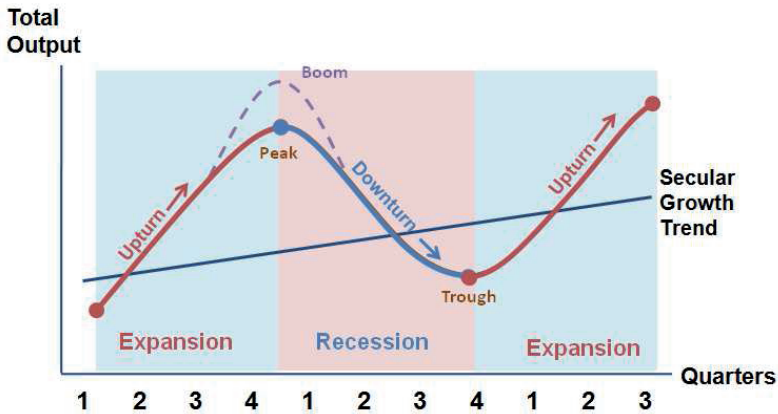
Source: Collander, D. C. (2004). *Economics Fifth Edition.* McGraw-Hill.

The top of a cycle can be defined as the *peak*, while a *boom* is a higher peak that denotes a big jump in output. A *downturn* depicts the phenomenon of economic activity starting to fall from a peak. A *recession* is commonly known as a decline in real output that lasts for more than two consecutive quarters of a year which causes many people are out of a job, while a *depression* is a large recession which is much longer and more severe than a recession. The bottom of a recession or depression is named the *trough*. Once total output begins to enlarge, the economy automatically comes out of the trough; which economists identify as an *upturn*. An *expansion* is signed as an upturn that persists at least two consecutive quarters of a year which leads business cycle back up to the peak again (Collander, 2004, Pg 495).

2.3. Leading Indicators

Leading indicators are a set of signs that have been developed by economist that point out when the business cycle phases about to occur. They consist of several tools such as average workweek, unemployment claims, new orders for consumer goods, vendor performance, index of consumer expectations, new orders for capital goods, building permits, stock prices, interest rate spread, and money supply (M_2). Although stock prices categorized as one of them, it does not look very far into the future – a few weeks or months at most.

2.4. Investment Strategy

In finance, most of knowledgeable investors usually use investment strategy as important guideline to select investment portfolio: some of them will decide to maximize expected returns by investing in risky assets, other will go for minimizing risk, but most will choose a plan somewhere in between. Unfortunately, countless studies show that inexpert investors do not believe these rules and expect to have low risk and high return. Consequently, they often finish up with a "buy-high, sell-low" strategy.

Investors struggle to hit a balance between maximizing their profits from their portfolio and risk they are willing to take by diversification. While passive strategies are regularly applied to reduce transaction costs, active strategies such as market timing are an attempt to get optimal returns. The examples of better-known investment strategies can be described below:

- **Sheep Strategy** (trades on emotion and the suggestions of others),
- **Buy and Hold** (in the long run, equity markets give a good rate of return despite periods of volatility or decline),
- **Past Performance** (select mutual funds based on past performance),
- **Value Investment** (seek stocks of companies that are undervalued),
- **Growth Investment** (look higher growth potential of a company than others in the same industry or market),
- **Dollar Cost Averaging** (aimed at reducing the risk of incurring substantial losses resulted when the entire principal sum is invested just before the market falls),
- **Top-down** (choosing assets based on a big theme – macroeconomic condition),
- **Bottom-up** (choose stocks based on the strength of an individual company – microeconomic condition),
- **Fundamental Analysis** (evaluating all the factors that affect an investment's performance),
- **Technical Analysis** (choosing assets based on prior trading patterns),
- **Contrarian Investment** (determine the market's consensus about a company or sector and then bet against it),
- **Dividend Investment** (dividend funds as a regular payout for investors' income).

2.5. Sector Rotation

An alternative effective strategy that can be applied to accomplish the excellent return is **sector rotation**. Sector rotation is an investment plan based on business cycle approach which provides a framework for apportioning to sectors showing the strongest performance over a particular time period. It is quite popular to improve risk-adjusted returns and automate the investing process according to the probability they will outperform or underperform. In this context, a sector is recognized as a group of stocks representing companies in related lines of business industry. Each stage of business cycle is different, and so are the relative performance patterns among equity sectors. However, using a disciplined business cycle approach, it is possible to detect key phases in the economy, and to use those signals in an effort to achieve active returns from sector allocation (Emsbo-Mattingly, Hofschire, Litvak, & Lund-Wilde, 2014).

2.6. Stock Market Indices

Stock price indices are the guidelines for investors to invest their funds in the stock market. It is also reflecting the stock price movements. As we acknowledged nowadays, Indonesia Stock Exchange currently has 11 types of stock price index, which is continuously broadcasted through print and electronic media. These indices are described as follows:

- *Jakarta Composite Index (IHSG)*
  This index uses all listed companies as the components for its index calculation. In order to reveal fair market condition, IDX has the privilege to remove and/or omit one or several listed companies from the calculation of JCI.

- *Sectoral Index*
  Sectoral Index applies all of listed companies included in each industry sector. As we can see on the table below, there are 9 sectors which consists of several sub-sector categories.

No.	Sector	Sub-sector
1	Agriculture	Crops; Plantation; Animal Husbandry; Fishery; Forestry; Others.
2	Mining	Coal Mining; Crude Petroleum & Natural Gas Production; Metal and Mineral Mining; Land / Store Quarrying; Others.
3	Basic Industry and Chemicals	Cement; Ceramics, Glass, Porcelain; Metal and Allied Products; Chemicals; Plastics & Packaging; Animal Feed; Wood Industries; Pulp & Paper; Others.
4	Miscellaneous Industry	Machinery and Heavy Equipment; Automotive and Components; Textile, Garment; Footwear; Cable; Electronics; Others.
5	Consumer Goods Industry	Food and Beverages; Tobacco Manufacturers; Pharmaceuticals; Cosmetics and Household; Housewares; Others.
6	Property, Real Estate and Building Construction	Property and Real Estate; Building Construction; Others.
7	Infrastructure, Utilities & Transportation	Energy; Toll Road, Airport, Harbor and Allied Production; Telecommunication; Transportation; Non-Building Construction; Others.
8	Finance	Bank; Financial Institution; Securities Company; Insurance; Investment Fund / Mutual Fund; Others.
9	Trade, Services & Investment	Wholesale (Durable & Non-Durable Goods); Retail Trade; Restaurant, Hotel & Tourism; Advertising, Printing & Media; Health Care; Computer and Services; Investment Company; Others.

- *LQ45 Index*

  Market capitalization-weighted index captures the liquidity performance of TOP 45 listed companies. The LQ45 Index covers at least 70% of the stock market capitalization and transaction values in the Indonesia Stock Market. Evaluation and stock replacement is done every 6 months.

2.7. Return

Return is the gain or loss percentage from a security in a particular period return. It contains any adjustment in value, and interest or dividends or other such cash flows which the investor receives from the investment. The examination of various conventions for measuring and reporting rates of return will be explained as below.

2.7.1. Holding Period Return

The total **holding-period return (HPR)** of a share of stock depends on its price movement over the investment period as well as on any dividend income has provided. It is simple and clear measure of investment return over a single period (Bodie, Kane, & Marcus, 2013, Pg 111).

$$HPR = \frac{Ending\ Price - Beginning\ Price + Cash\ Dividend}{Beginning\ Price}$$

(2.1)

2.7.2. Arithmetic Average Return

When the financial assets experienced both cash inflows and outflows over longer periods of time, it is important to accumulate those returns into one overall return for ease of comparison and understanding. The arithmetic average is return earned in average period over multiple periods.

$$\bar{r} = \frac{1}{n}\sum_{i=1}^{n} r_i = \frac{1}{n}\ (r_1 + \cdots + r_n)$$

(2.2)

Where $\bar{r}$ is average returns from investment, n is number of data, and r_i is the i th data.

2.7.3. Geometric Average Return

Geometric average is average compound return per period over multiple periods. The geometric average will be less than the arithmetic average unless all the returns are equal. The arithmetic average is overly optimistic for long horizons, while the geometric average is overly pessimistic for short horizons. The geometric average is very useful in describing the actual historical investment experience.

$$\bar{r} = [(1 + r_1)\ x\ \dots\ x + (1 + r_n)]^{(\frac{1}{n})} - 1$$

(2.3)

Where $\bar{r}$ is average returns from investment, n is number of data, and r_i is the i th data.

2.8. Risk

Risk is defined as the probability that an investment's actual return will be different than expected: losing some or even all of your original investment. Low levels of uncertainty (low risk) are associated with low potential returns as well as high levels of uncertainty (high risk) are associated with high potential returns. The risk/return tradeoff is the balance between the desire for the lowest possible risk and the highest possible return. Investment risks can be divided into two categories: systematic and nonsystematic. By diversified optimal investment portfolio, we can eliminate the nonsystematic risk.

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2.8.1. Variance and Standard Deviation

Uncertainty surrounding the investment is a function of both the magnitudes and the probabilities of the possible surprises. In order to summarize risk with a single number, **variance** can be used as the expected value of the *squared* deviation from the mean.

$$Var(r) \equiv \sigma^2 = \sum_{s=1}^{S} p\,(s)\,[r(s) - E(r)]^2$$

(2.3)

Where $p\,(s)$ is probability of stock return, $r(s)$ is stock return, and $E(r)$ is expected return. In addition, the author also uses the **standard deviation** to give the measure of risk the same dimension as expected return (%), defined as the square root of the variance:

$$SD\,(r) \equiv \sigma = \sqrt{Var\,(r)} = \sqrt{\sum_{s=1}^{S} p\,(s)\,[r(s) - E(r)]^2}$$

(2.4)

2.9. Covariance and Correlation

To construct optimal portfolio from risky assets, it is important to know how the uncertainties of asset return interact. **Covariance** measures the *average* tendency of two investments to act in similar way. The negative value for the covariance indicates that the two assets, on average, vary inversely, when one performs well, the other tends to perform poorly.

$$Cov\,(r_S, r_B) = \sum_{i=1}^{S} p(i)\,[r_S(i) - E(r_S)][r_B(i) - E(r_B)]$$

(2.5)

Where $p(i)$ is the probability of each scenario, r_S is return of asset s, r_B is return of asset b, and $E(r)$ is expected return. An easier statistic to interpret the relationship of two assets is the correlation coefficient, which is a pure number and can range from values of -1 to +1. A correlation of -1 indicates that one asset's return varies perfectly inversely with the others. Conversely, a correlation of +1 would indicate perfect positive correlation. A correlation of zero indicates that returns on the two assets are unrelated.

$$Correlation\ coefficient = \rho_{SB} = \frac{Cov\ (r_S, r_B)}{\sigma_S \sigma_B} \tag{2.6}$$

Where $Cov\ (r_S, r_B)$ is covariance between asset s and asset b as well as $\sigma_S \sigma_B$ is the multiplication of asset s and asset b.

2.10. Beta

The security's beta is a historical measure of the risk an investor is exposed to by holding a particular stock portfolio as compared to the market as a whole. A value greater than 1 would indicate a *cyclical* stock with greater sensitivity to the economy than the average stock. Betas less than 1 indicate below-average sensitivity and therefore are known as *defensive stocks*.

$$\beta = \frac{Cov\ (R_i, R_m)}{\sigma_m{}^2} = \frac{\rho_{i,m} \sigma_i}{\sigma_m} \tag{2.7}$$

2.11. Performance Measurement

Investors require the accurate indicator for measuring the success of their portfolio performance. Since the 1960s, investors have known how to quantify and measure risk with the variability of returns, but no single measure actually looked at both risk and return together. Thus, we currently have numerous sets of performance measurement tools to assist us with our portfolio evaluations as we can see as below.

2.11.1. Treynor Measure

In order to find a performance measure that could apply to all personal risk preferences of investors, Treynor suggested two components of risk: the risk produced by fluctuations in the market and the risk arising from the fluctuations of individual securities. Treynor ratio from the concept of Security Market Line (SML) can be easily defined by dividing portfolio's risk premium with systematic risk.

$$Treynor\ Ratio = \frac{R_p - R_f}{\beta_p}$$

(2.8)

Where R_p is return of portfolio, R_f is risk free rate, and β_p is beta of portfolio. However, this measure only uses systematic risk which is assumed that the investor already has an adequately diversified portfolio. Without considering the unsystematic risk, it should really only be used by investors who hold diversified portfolio.

2.11.1. Sharpe Measure

The Sharpe Ratio (referred to **reward-to-volatility** ratio) diligently follows Bill Sharpe's work on Capital Asset Pricing Model (CAPM) and by applying total risk to match portfolios to the capital market line. This measure will be used for this research to assess the portfolio manager on the basis of both rate of return and diversification. Thus, the measure is more appropriate for well-diversified portfolios, because it more accurately takes into account the risks of the portfolio.

$$Sharpe\ Ratio = \frac{R_p - R_f}{\sigma_p}$$

(2.9)

Where R_p is portfolio return, R_f is risk-free rate, and σ_p is portfolio standard deviation.

2.11.2. Jensen Measure

According to CAPM theory, Michael C. Jensen create this measure to calculate the excess return that a portfolio generates over its expected return. Jensen's alpha is used to determine how much of the portfolio's rate of return is attributable to the investor's ability to deliver above-average returns, adjusted for market risk. When the portfolio represents one subportfolio of many, Jensen can be the appropriate performance measures. The formula is broken down as follows:

$$Jensen's\ Alpha\ (\alpha_p) = R_p - [R_f + \beta_p(R_m - R_f)]$$

(2.10)

Where R_p is portfolio return, $[R_f + \beta_p(R_m - R_f)]$ is the benchmark portfolio return.

2.12. Previous Studies

Macroeconomic factors which affect investment portfolio performance is indicated in historical researches. Fauzan Anhar (2007) findings indicated that economic growth has a significant effect on mobility of Composite Stock Price Index (CSPI) in capital market of Indonesia as well as Renny Wijaya (2013) findings proved that macroeconomic variables simultaneously influenced Jakarta Composite Index. In addition, Popy Citra, Yunia Wardi, Hasdi Aimon (2013) showed that the exchange rate, money supply, interest rate SBI and economic growth significant effect on stock price index in Indonesia. Since the business cycle was measured by macroeconomic factors of GDP, it can be indicated that there is a relationship between Jakarta Composite Index and business cycle adjusted to each particular pattern in each phase of cycle.

This research is conducted in order to obtain optimal investment portfolio based on sector rotation strategy that can be applied by investors to generate superior return in Indonesia Stock Exchange. In prior research, Ambarita and Soekarno (2014) use global GDP, Indonesia GDP, and inflation rate to identify business cycle before doing stock selection and portfolio simulation. Several prior studies that are related to this research listed as follows:

Study	Title	Data	Methodology	Major Findings
Abdillah Pahresi (2003)	Performance Assessment Analysis of Six Agribusiness Company Listed On Stock Market	A forestry company, three plantation companies and two fishing companies from initial public offering period in 2000-2001, except PT Bakrie Sumatera Plantations Tbk and Subsidiaries (Plantation) of 1995 and PT PP London Sumatra Indonesia Tbk of 1997.	Correlation between Economic Value Added (EVA) and relative performance of stock by using SPSS as well as theoretical and calculation results.	The most desirable companies by investors during recovery phase in Indonesia are agribusiness which has a high export market and domestic resources.
Fauzan Anhar (2007)	The Effect of Economic Growth and Interest Rate of Deposit on CSPI in Capital Market of Indonesia	Secondary data such as time series data of quarter period beginning from 1996 to 2006 obtained from Badan Pusat Statistik (BPS) Medan and Bank Indonesia Medan.	Multiple linear regression and Ordinary Least Square (OLS) method.	Interest rate of deposit has not a significant effect, while economic growth has a significant effect on mobility of Composite Stock Price Index (CSPI) in capital market of Indonesia.

Peixin (Payton) Liu, Kuan Xu and Yonggan Zhao (2011)	Market Regimes, Sectorial Investments, and Time-varying Risk Premiums	The daily returns on the sector ETFs from January 3, 2005 to September 30, 2009 are retrieved from Bloomberg.	The original FF model is augmented to include three additional macro factors – market volatility, yield spread, and credit spread. Then, the FF model is extended to a model with a Markov regime switching mechanism for bull, bear, and transition market regimes.	It is found that all market regimes are persistent, with the bull market regime being the most persistent, and the bear market regime being the least persistent. Both the risk premiums of the Sector Select ETFs and their sensitivities to the risk factors are highly regime dependent.
Renny Wijaya (2013)	The Impact of Macroeconomic Fundamentals on Stock Index of Indonesia Stock Exchange 2002-2011 Period.	Monthly JCI, monthly inflation rate, monthly exchange rate of rupiah per 1 US dollar and the money supply from January 2002 to December 2011 as well as BI rate which applies formally as the benchmark interest rate in Indonesia from 5 July 2005 (rupiah time deposit rates used for 2002-2005).	Quantitative approach and multiple regression model analysis as well as some tests such as stationary test, classical assumption test, f-test, and t-test.	Macroeconomic variables simultaneously influenced JCI. Inflation, interest rate, and money supply (M2) are found to be insignificant towards JCI. Exchange rate negatively influenced the JCI.
Popy Citra, Yunia Wardi, Hasdi Aimon (2013)	The Analysis of Economic Growth and Stock Prices in Indonesia	Secondary data such as five macroeconomic variables (exchange rate, money supply, BI interest rates, investment and inflation rate) from Q1/2004 to Q4/2012.	Simultaneous equation model analysis tools using Indirect Least Squares (ILS).	Investment and exchange rate jointly significant effect on economic growth in Indonesia, while inflation is not significant and negative effect on economic growth in Indonesia. In addition, the exchange rate, money supply, interest rate SBI and economic growth significant effect on stock price index in Indonesia.

Wirata Adi Dharma and Subiakto Soekarno (2014)	Mutual Funds Investment Strategy Based On Business Cycle in Indonesia	Macro indicators such as GDP growth, domestic GDP growth, and inflation; three conventional mutual funds indexes in Indonesia compiled from the period of 2015 until 2012	Business cycle analysis, mutual fund performance analysis, optimal portfolio selection	Equity mutual funds is performing better both on early expansion and late expansion phase. Meanwhile, proportional amount of equity mutual fund and fixed income mutual fund perform better during recession.
Albert Parulian Ambarita and Subiakto Soekarno (2014)	Sector Rotation Investment Strategy in Indonesia Stock Exchange	Macroeconomic indicator that used to identify the business cycle are global GDP, Indonesia GDP, and inflation rate in Indonesia; sector performance data; selected LQ45 stocks from 2001 until 2012.	Business cycle construction criteria, sector performance analysis, portfolio construction	Sector rotation investment strategy is an optimal strategy that can be applied by investors to generate superior return in Indonesia Stock Exchange.

2.13. Research Hypotheses

Based on hardworking reviews on previous studies, there are hypotheses for this research:

1. The pattern of relationship between business cycle and selected stocks performance in Indonesia Stock Exchange can transform overtime, but particular sectors may dominate in the equivalent phase.
2. Sector rotation strategy gives significant superior result rather than passive strategy.
3. Although past performance of investment portfolio does not reflect the future performance, investors can forecast optimal investment portfolio in the future by using sector rotation investment strategy.

CHAPTER 3
METHODOLOGY

3.1. Research Design

The research will be conducted based on these steps taken by the author. Overall, there are five major steps that have to be taken in order to complete this research which are Problem Identification, Theoretical Foundation, Data Collection, Data Analysis, and Conclusion and Recommendation. The steps are mentioned in the diagram as follows:
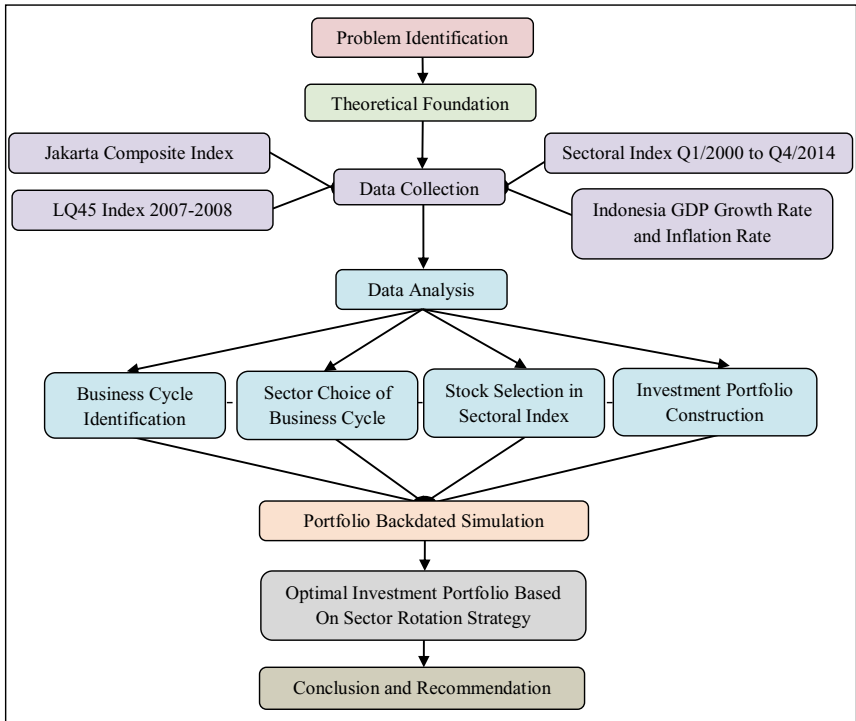
Figure 3.1 Research Design

First, the author determines the research problem, research objective, scope and limitation as well as writing structure. Second, theoretical foundation consists of literature review that proves the theoretical background of the research. Third, author constructs research framework and collects the data related to the research. Fourth, the author has to analyze the data to test hypotheses. Fifth, last but not least, the author concludes the result of the research as well as gives recommendations related to the research.

3.2. Problem Identification

Problem identification is the beginning critical step done by the author. In fact, the author had already scanned the situation and symptom as well as developed the probable problem in order to identify a very clearly defined and specific problem. By effectively applying the problem-solving process, the author can determine the goals to be achieved through research execution.

The author found out that some investors suffer difficulties in investing on equity fund in Indonesia capital market. This problem actually can be solved logically by using sector rotation strategy to formulate investment portfolio optimization. However, the author further realized that studies about sector rotation strategy in Indonesia that demonstrate the advantages of investing in capital market based on business cycle has been very limited. From these findings, the author pointed out the problems which become the basis of this research.

Based on the findings of problems, the author main objective of this research is to identify the pattern of relationship between business cycle and selected performance in Indonesia Stock Exchange. In addition, the author also plans to measure the effectiveness of sector rotation strategy implementation to investment portfolio by comparing with passive strategy. By doing this research, the author hopes that more people could understand the sector rotation strategy advantages to optimize their investment portfolio.

3.3. Theoretical Foundation

In order to further understand the basic knowledge and guidelines, the author has to build theoretical foundation of the research. The author has to collect literature review of relevant theory about the research through textbook, reliable journal, website, and article. Furthermore, the author has to evaluate the appropriate literatures that focused on the research data, scope and limitation, methodology, its major findings, and further research suggestion. Then, the author has to develop research hypotheses as a proposed explanation for phenomenon.

3.4. Data Collection

Data collection section describes type of data which will be needed and what kind of sampling method that will be chosen.

- *Jakarta Composite Index and Sector Index*
  Jakarta Composite Index and Sector Index are obtained on reliable website *finance.yahoo.com*. The author uses keyword such as *^JKSE* for Composite Index; *^JKAGRI* for Agricultural Index; *^JKMING* for Mining Index; *^JKBIND* for Basic Industry and Chemicals Index; *^JKMISC* for Miscellaneous Index; *^JKCONS* for Consumer Goods Index; *^JKPROP* for Construction, Property & Real Estate Index; *^JKINFA* for Infrastructure; *^JKFINA* for Finance Index, Utility & Transportation Index; and *^JKTRADE* for Trade & Service Index. The index data is compiled on daily adjusted close with the time frame from Q1/2000 to Q4/2014.

- *LQ45 Index 2007-2008*
  Benchmark data are required as a basis to compare the performance with the active investment strategy. The author chooses LQ45 Index as the market capitalization-weighted index that captures the performance of the 45 most liquid companies listed on the Indonesia Stock Exchange. The IDX Index which covers at least 70% of the stock market capitalization and transaction values in the Indonesia Stock Market is denominated in Indonesia rupiah ("IDR") and published throughout the trading hours of the IDX. This data can be found on Indonesia Stock Exchange official website *www.idx.co.id*.

- *Indonesia GDP Growth Rate*

  Indonesia real GDP growth rate database can be downloaded on Federal Reserve Economic Data (FRED) trustworthy website *www.research.stlouisfed.org*. The author selects GDP growth rate by Expenditure in Constant Prices from Q1/2000 to Q4/2014 because it offers a better perspective than nominal GDP when tracking economic output.

- *Indonesia Inflation GDP Deflator Rate*

  Like real GDP growth rate, Indonesia inflation rate is also acquired on FRED website from Q1/2000 to Q4/2014. The author decides to measure inflation by using GDP implicit price deflator which is an index of the price level of aggregate output relative to a base year.

- *Historical Stock Price and Market Capitalization*

  To define stock selection in simulation period, the author need sufficient historical stock price and market capitalization. Historical stock price (daily adjusted close price) will be obtained from *finance.yahoo.com* while market capitalization at year ended of 2007 will be taken from *www.sahamok.com* for calculating number shares of outstanding and stock price.

3.5. Data Analysis

As soon as all the data has been gathered, the author continues to analyze the research data which can be explained into several steps such as identifies business cycle, chooses appropriate sector in each of the business cycle stage, selects proper stock in sectoral index, constructs investment portfolio, and creates portfolio simulation.

3.5.1. Business Cycle Identification

In applying sector rotation investment strategy, every stage of business cycle must be identified first: expansion, peak, recession, or trough. The author uses macroeconomic indicators (Indonesia real GDP growth rate) as the first guideline to distinguish business cycle phases from Q1/2000 to Q4/2014 as the following figure:

Figure 3.2 Business Cycle Phases Identification

In addition, there are also other indicators such as Indonesia inflation rate and Jakarta Composite Index which could support the author to decide business cycle phase. The explanation of these indicators is explained below.

Real GDP Growth Rate	Inflation Rate		Jakarta Composite Index	Business Cycle Phases
	Percentage	Category		
Negative (2 quarters)	More than 3%	Very High	Negative	Recession
	Between 2% and 3%	High		
Positive (2 quarters)	Between 1% and 2%	Medium	Positive	Peak/Trough
	Between 0% and 1%	Low		
	Less than 0%	Deflation		Expansion

3.5.2. Sector Choice of Business Cycle

Before select the specific sector of every business cycle phase, the author should summary the sectoral index performance analysis by comparing each Sectoral Index with Jakarta Composite Index from Q1/2000 to Q4/2007. Then, the author will conduct assessment analysis by scoring the rank position to define top 3 sector of each business cycle phase.

3.5.3. Stock Selection in Sectoral Index

The next step of data analysis is to determine several stocks in the sector choice which have to be taken. The author will consider the stock based on market capitalization and transaction value in the Indonesia Stock Market from LQ45 Index in period of August 2007 until January 2008. In addition, the author will choose appropriate stocks based on sufficient historical stock price, largest market capitalization, and positive annual growth in simulation period to construct investment portfolio.

3.5.4. Investment Portfolio Construction

In this part, the author will construct investment portfolio in order to achieve Sharpe ratio optimization. For defining the weight of each stock in specific business cycle phase, the author uses three methods such as optimal portfolio by Solver, modified optimal portfolio by Solver, and balance weight. Then, the weighted of every stock will be applied for portfolio backdated simulation.

3.6. Portfolio Backdated Simulation

The author will start portfolio simulation with the amount of Rp 100,000,000 as investment capital from Q1/2008 to Q4/2014 in order to generate higher ending investment value by using several method based on sector rotation strategy as guideline such as optimal portfolio by Solver, modified optimal portfolio by Solver, and balance weight. With the same initial fund of Rp 100,000,000, the author also simulates passive strategy by investing in Jakarta Composite Index.

3.7. Optimal Investment Portfolio Based on Sector Rotation Strategy

A strict model of optimal portfolio selection which is embodying diversification principles has been published by Harry Markowitz in his 1990 Nobel Prize in Economics. His pattern is specifically step one of portfolio management: the identification of the *efficient frontier of risky assets* (Bodie, Kane, & Marcus, 2011, Pg 239). The fundamental idea of his theory explains the two equivalent methods of defining the best risk-return combinations: highest expected return for any risk level or lowest standard deviation for any target expected return. For that reason, optimal portfolio can be created by investment simulation to achieve certain optimizations, whether to maximize return, to minimize risk, or else to maximize Sharpe ratio (Dharma & Soekarno, 2014).

3.8. Conclusion and Recommendation

The result of analysis is the solution for the problem that occurs in this research. The author should make effort to identify the relationship between business cycle and selected stocks performance as well as measure the effectiveness of sector rotation strategy implementation to investment portfolio in comparison with passive strategy. Furthermore, the author should make the best conclusion and recommendation that will be taken by investors in achieving optimal investment portfolio in the future.

CHAPTER 4
DATA ANALYSIS

4.1. Business Cycle Identification

This section explains about business cycle classification from Q1/2000 to Q4/2014 by using indicators such as Indonesia real GDP growth rate, Indonesia inflation rate, and Jakarta Composite Index. The phases of business cycle are Recession, Trough, Expansion, and Peak.

4.1.1. Recession Phase

Quarterly Date	Indonesia GDP (%)		Business Cycle
Q4/1997	-0,513921%	Negative	Recession
Q1/1998	-7,357210%	Negative	
Q2/1998	-7,838990%	Negative	
Q3/1998	-1,114245%	Positive	
Q4/1998	-2,792811%	Negative	
Q1/1999	5,647681%	Positive	
Q2/1999	-0,054983%	Negative	
Q3/1999	0,273417%	Positive	
Q4/1999	0,107212%	Negative	
Q1/2000	3,147464%	Positive	

Due to the unavailability data of Jakarta Composite Index and Indonesia Inflation from Q4/1997 to Q1/2000, the business cycle phase can only be indicated through Indonesia GDP growth rate. Because there is negative Indonesia real GDP growth rate in period of Q4/1997-Q2/1998, this business cycle phase is categorized as recession.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q3/2002	**-16,97%**	Negative	1,69%	Medium	1,283531%	Negative	Recession
Q4/2002	1,35%	Positive	1,04%		1,081072%		
Q1/2003	**-6,34%**	Negative	3,98%	Very High	1,305113%	Positive	
Q2/2003	27,01%	Positive	-1,56%	Deflation	1,133864%	Negative	
Q3/2003	18,23%	Negative	0,92%	Low	1,047590%		

The business cycle phase from Q3/2002 to Q3/2003 is defined as recession because of negative Indonesia GDP growth in several years. It is also supported by significant negative Jakarta Composite Index in Q3/2002 and Q1/2003.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q4/2005	7,72%	Positive	9,57%	Very High	1,421165%	Positive	Peak
Q1/2006	13,79%		0,80%	Low	1,321219%	Negative	Recession
Q2/2006	-0,96%	Negative	1,34%	Medium	1,276789%		Trough

Q1/2006 is classified as recession phase since there is negative Indonesia GDP growth in two consecutive quarters of year (Q1/2006-Q2/2006) as well as very high Indonesia Inflation in the previous quarter (Q4/2005).

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q3/2007	10,28%	Negative	2,93%	High	1,576563%	Negative	Recession
Q4/2007	16,39%	Positive	4,33%	Very High	0,866016%		
Q1/2008	-10,87%	Negative	6,18%		2,074667%	Positive	
Q2/2008	-4,01%	Positive	4,45%		1,483493%	Negative	
Q3/2008	-21,99%	Negative	3,99%		1,526719%	Positive	
Q4/2008	-26,04%		1,69%	Medium	0,343023%	Negative	
Q1/2009	5,80%	Positive	-0,72%	Deflation	1,401183%	Positive	

The period of Q3/2007-Q1/2009 is grouped as recession stage because of negative Indonesia GDP growth rate in several years. In addition, it is confirmed by high to very high Indonesia Inflation and negative Jakarta Composite Index.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q1/2011	-0,67%	Negative	2,91%	High	1,483304%	Negative	Recession
Q2/2011	5,71%	Positive	0,94%	Low	1,451684%		
Q3/2011	-8,73%	Negative	2,38%	High	1,491991%	Positive	
Q4/2011	7,69%	Positive	1,06%	Medium	1,483432%	Negative	
Q1/2012	7,84%		1,19%		1,538727%	Positive	
Q2/2012	-4,03%	Negative	0,90%	Low	1,467214%		
Q3/2012	7,76%	Positive	-0,89%	Deflation	1,394951%	Negative	
Q4/2012	1,27%	Negative	0,45%	Low	1,365970%		
Q1/2013	14,46%	Positive	1,97%	Medium	1,397780%	Positive	
Q2/2013	-2,47%	Negative	1,01%		1,349621%		
Q3/2013	-10,43%		2,36%	High	1,302850%	Negative	
Q4/2013	-0,97%	Positive	2,29%		1,270813%		
Q1/2014	11,56%		0,62%	Low	1,166115%		
Q2/2014	2,31%	Negative	1,06%		1,212047%	Positive	
Q3/2014	5,31%	Positive	1,02%	Medium	1,211799%	Negative	
Q4/2014	1,74%	Negative	1,03%		1,244334%	Positive	

From Q1/2011 to Q4/2014, there are several indicators that explain recession phase such as negative Indonesia GDP growth, high Indonesia Inflation, and negative Jakarta Composite Index as we can see on the table above.

4.1.2. Trough Phase

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q1/2000					3,147464%	Positive	Recession
Q2/2000	-11,69%	-	4,16%	Very High	-0,574924%	Negative	Trough
Q3/2000	-18,20%	Negative	2,42%	High	2,436407%	Positive	Expansion
Q4/2000	-1,19%	Positive	2,28%		2,875613%		

Trough phase in Q2/2000 is marked with significant negative Indonesia real GDP growth rate before starting expansion phase in the next quarters.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q2/2003	27,01%	Positive	-1,56%	Deflation	1,133864%	Negative	Recession
Q3/2003	18,23%	Negative	0,92%	Low	1,047590%	Negative	Recession
Q4/2003	15,77%	Negative	0,94%	Low	0,985597%		Trough
Q1/2004	6,33%		3,49%	Very High	1,174988%		Expansion
Q2/2004	-0,45%		2,90%	High	1,195908%	Positive	Expansion
Q3/2004	11,98%	Positive	2,43%	High	1,216830%	Positive	Expansion
Q4/2004	21,96%	Positive	2,33%	High	2,814066%		Expansion

Although the Indonesia Inflation is low in Q4/2003, but negative Indonesia GDP growth and negative Jakarta Composite Index indicate trough before expansion phase in the next quarters.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q1/2006	13,79%	Positive	0,80%	Low	1,321219%	Negative	Recession
Q2/2006	-0,96%	Negative	1,34%	Medium	1,276789%	Negative	Trough
Q3/2006	17,12%	Positive	3,00%	Very High	1,611895%	Positive	Expansion
Q4/2006	17,65%	Positive	3,20%	Very High	1,594384%	Negative	Expansion
Q1/2007	1,41%	Negative	2,82%	High	1,626360%	Positive	Expansion

Trough phase in Q2/2006 is signed by negative Indonesia GDP growth rate, medium Indonesia Inflation, and negative Jakarta Composite Index.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q4/2008	-26,04%	Negative	1,69%	Medium	0,343023%	Negative	Recession
Q1/2009	5,80%	Positive	-0,72%	Deflation	1,401183%	Positive	Recession
Q2/2009	41,33%	Positive	1,54%	Medium	0,765688%	Negative	Trough
Q3/2009	21,75%	Negative	1,04%	Medium	1,712660%	Positive	Expansion
Q4/2009	2,71%	Negative	2,78%	High	1,596191%	Negative	Expansion

Even though the Jakarta Composite Index gives significant positive result in Q2/2009, the business cycle stage in this quarter is still defined as trough because of negative Indonesia GDP growth rate and medium Indonesia Inflation.

4.1.3. Expansion Phase

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q3/2000	-18,20%	Negative	2,42%	High	2,436407%	Positive	
Q4/2000	-1,19%	Positive	2,28%		2,875613%		
Q1/2001	-8,47%	Negative	**4,45%**	Very High	**-0,712596%**	Negative	
Q2/2001	14,85%	Positive	6,50%		1,022895%	Positive	Expansion
Q3/2001	-10,31%	Negative	0,77%	Low	0,020739%	Negative	
Q4/2001	-0,11%	Positive	0,16%		1,416301%	Positive	
Q1/2002	22,89%		1,60%	Medium	1,219099%	Negative	

Although the Indonesia Inflation is high and the Jakarta Composite Index is negative in Q3/2000, the business cycle from Q3/2000 to Q1/2002 is categorized as expansion phase because of positive Indonesia GDP in two consecutive quarters (Q3/2000-Q4/2000).

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q1/2004	6,33%	Negative	3,49%	Very High	1,174988%	Positive	
Q2/2004	-0,45%		2,90%		1,195908%		
Q3/2004	11,98%	Positive	2,43%	High	1,216830%		
Q4/2004	21,96%		2,33%		2,814066%		Expansion
Q1/2005	7,99%	Negative	3,12%	Very High	0,811018%	Negative	
Q2/2005	3,91%		3,69%		1,145210%	Positive	
Q3/2005	-3,84%		3,08%		1,101902%	Negative	

Although the Indonesia Inflation and Jakarta Composite Index do not give strong signal, the business cycle phase in period of Q1/2004-Q3/2005 is still categorized as expansion since there is positive Indonesia real GDP growth in four consecutive quarters of year.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q3/2006	17,12%	Positive	3,00%	Very High	1,611895%	Positive	
Q4/2006	17,65%		3,20%		1,594384%	Negative	Expansion
Q1/2007	1,41%	Negative	2,82%	High	1,626360%	Positive	

The business cycle in Q3/2006-Q1/2007 is considered as expansion phase because of consistent Indonesia GDP growth rate (the difference between each quarter is below than 0.05%) and significant positive Jakarta Composite Index in two consecutive quarters of year.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q3/2009	21,75%	Negative	1,04%	Medium	1,712660%	Positive	
Q4/2009	2,71%		2,78%	High	1,596191%	Negative	
Q1/2010	9,59%	Positive	2,19%		1,653744%	Positive	Expansion
Q2/2010	4,91%	Negative	1,63%	Medium	1,565582%	Negative	
Q3/2010	20,17%	Positive	0,50%	Low	1,514722%		

The business cycle in Q3/2009-Q4/2010 is identified as expansion phase because of several considerations such as steady Indonesia GDP growth rate, low-medium-high Indonesia Inflation, and high Jakarta Composite Index.

4.1.4. Peak Phase

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q1/2002	22,89%	Positive	1,60%	Medium	1,219099%	Negative	Expansion
Q2/2002	4,82%	Negative	1,35%		1,285429%	Positive	Peak
Q3/2002	-16,97%		1,69%		1,283531%	Negative	Recession
Q4/2002	1,35%	Positive	1,04%		1,081072%		

Peak phase in Q2/2002 is achieved by positive Indonesia GDP growth and medium Indonesia Inflation before starting recession phase in the next quarters.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q3/2005	-3,84%	Negative	3,08%	Very High	1,101902%	Negative	Expansion
Q4/2005	7,72%	Positive	9,57%		1,421165%	Positive	Peak
Q1/2006	13,79%		0,80%	Low	1,321219%	Negative	Recession
Q2/2006	-0,96%	Negative	1,34%	Medium	1,276789%		Trough

Although the Indonesia Inflation is very high in Q3/2005-Q4/2005, but positive Indonesia GDP growth rate and positive Jakarta Composite Index strongly indicate peak stage.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q1/2007	1,41%	Negative	2,82%	High	1,626360%	Positive	Expansion
Q2/2007	16,84%	Positive	1,61%	Medium	1,666702%		Peak
Q3/2007	10,28%	Negative	2,93%	High	1,576563%	Negative	Recession
Q4/2007	16,39%	Positive	4,33%	Very High	0,866016%		

Peak phase in Q2/2007 is signed with positive Indonesia GDP growth, medium Indonesia Inflation, and significant positive Jakarta Composite Index before starting recession phase in the next period.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q2/2010	4,91%	Negative	1,63%	Medium	1,565582%	Negative	Expansion
Q3/2010	20,17%	Positive	0,50%	Low	1,514722%		
Q4/2010	5,78%	Negative	2,06%	High	1,594368%	Positive	Peak
Q1/2011	-0,67%		2,91%		1,483304%	Negative	Recession
Q2/2011	5,71%	Positive	0,94%	Low	1,451684%		

Even though the Jakarta Composite Index is negative and Indonesia Inflation is high, the business cycle stage in Q4/2010 is still defined as peak because of positive Indonesia GDP growth.

4.1.5. Business Cycle Identification Summary

The business cycle identification from Q1/2000 to Q4/2014 is listed below.

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q1/2000					3,147464%	Positive	Recession
Q2/2000	-11,69%	-	4,16%	Very High	-0,574924%	Negative	Trough
Q3/2000	-18,20%	Negative	2,42%	High	2,436407%	Positive	Expansion
Q4/2000	-1,19%	Positive	2,28%		2,875613%		
Q1/2001	-8,47%	Negative	4,45%	Very High	-0,712596%	Negative	Expansion
Q2/2001	14,85%	Positive	6,50%		1,022895%	Positive	
Q3/2001	-10,31%	Negative	0,77%	Low	0,020739%	Negative	
Q4/2001	-0,11%	Positive	0,16%		1,416301%	Positive	
Q1/2002	22,89%		1,60%		1,219099%	Negative	
Q2/2002	4,82%	Negative	1,35%	Medium	1,285429%	Positive	Peak
Q3/2002	-16,97%		1,69%		1,283531%	Negative	Recession
Q4/2002	1,35%	Positive	1,04%		1,081072%		
Q1/2003	-6,34%	Negative	3,98%	Very High	1,305113%	Positive	
Q2/2003	27,01%	Positive	-1,56%	Deflation	1,133864%		
Q3/2003	18,23%	Negative	0,92%	Low	1,047590%	Negative	
Q4/2003	15,77%		0,94%		0,985597%		Trough
Q1/2004	6,33%		3,49%	Very High	1,174988%		Expansion
Q2/2004	-0,45%		2,90%	High	1,195908%	Positive	
Q3/2004	11,98%	Positive	2,43%		1,216830%		
Q4/2004	21,96%		2,33%		2,814066%		
Q1/2005	7,99%		3,12%		0,811018%	Negative	
Q2/2005	3,91%	Negative	3,69%	Very High	1,145210%	Positive	
Q3/2005	-3,84%		3,08%		1,101902%	Negative	
Q4/2005	7,72%	Positive	9,57%		1,421165%	Positive	Peak
Q1/2006	13,79%		0,80%	Low	1,321219%	Negative	Recession
Q2/2006	-0,96%	Negative	1,34%	Medium	1,276789%	Negative	Trough
Q3/2006	17,12%	Positive	3,00%	Very High	1,611895%	Positive	Expansion
Q4/2006	17,65%		3,20%		1,594384%	Negative	
Q1/2007	1,41%	Negative	2,82%	High	1,626360%	Positive	
Q2/2007	16,84%	Positive	1,61%	Medium	1,666702%		Peak

Quarterly Date	Jakarta Composite Index (%)		Indonesia Inflation (%)		Indonesia GDP (%)		Business Cycle
Q3/2007	10,28%	Negative	2,93%	High	1,576563%	Negative	Recession
Q4/2007	16,39%	Positive	4,33%	Very High	0,866016%	Negative	
Q1/2008	-10,87%	Negative	6,18%	Very High	2,074667%	Positive	
Q2/2008	-4,01%	Positive	4,45%	Very High	1,483493%	Negative	
Q3/2008	-21,99%	Negative	3,99%		1,526719%	Positive	
Q4/2008	-26,04%	Negative	1,69%	Medium	0,343023%	Negative	
Q1/2009	5,80%	Positive	-0,72%	Deflation	1,401183%	Positive	
Q2/2009	41,33%	Positive	1,54%	Medium	0,765688%	Negative	Trough
Q3/2009	21,75%	Negative	1,04%	Medium	1,712660%	Positive	Expansion
Q4/2009	2,71%	Negative	2,78%	High	1,596191%	Negative	
Q1/2010	9,59%	Positive	2,19%	High	1,653744%	Positive	
Q2/2010	4,91%	Negative	1,63%	Medium	1,565582%	Negative	
Q3/2010	20,17%	Positive	0,50%	Low	1,514722%	Negative	
Q4/2010	5,78%	Negative	2,06%	High	1,594368%	Positive	Peak
Q1/2011	-0,67%	Negative	2,91%	High	1,483304%	Negative	Recession
Q2/2011	5,71%	Positive	0,94%	Low	1,451684%	Negative	
Q3/2011	-8,73%	Negative	2,38%	High	1,491991%	Positive	
Q4/2011	7,69%	Positive	1,06%	Medium	1,483432%	Negative	
Q1/2012	7,84%	Positive	1,19%	Medium	1,538727%	Positive	
Q2/2012	-4,03%	Negative	0,90%	Low	1,467214%	Negative	
Q3/2012	7,76%	Positive	-0,89%	Deflation	1,394951%	Negative	
Q4/2012	1,27%	Negative	0,45%	Low	1,365970%	Negative	
Q1/2013	14,46%	Positive	1,97%	Medium	1,397780%	Positive	
Q2/2013	-2,47%	Negative	1,01%	Medium	1,349621%	Positive	
Q3/2013	-10,43%	Negative	2,36%	High	1,302850%	Negative	
Q4/2013	-0,97%	Positive	2,29%	High	1,270813%	Negative	
Q1/2014	11,56%	Positive	0,62%	Low	1,166115%	Negative	
Q2/2014	2,31%	Negative	1,06%	Medium	1,212047%	Positive	
Q3/2014	5,31%	Positive	1,02%	Medium	1,211799%	Negative	
Q4/2014	1,74%	Negative	1,03%	Medium	1,244334%	Positive	

Business Cycle Identification

Expansion Phase   Peak Phase   Recession Phase   Trough Phase

—— Indonesia GDP (%)

34
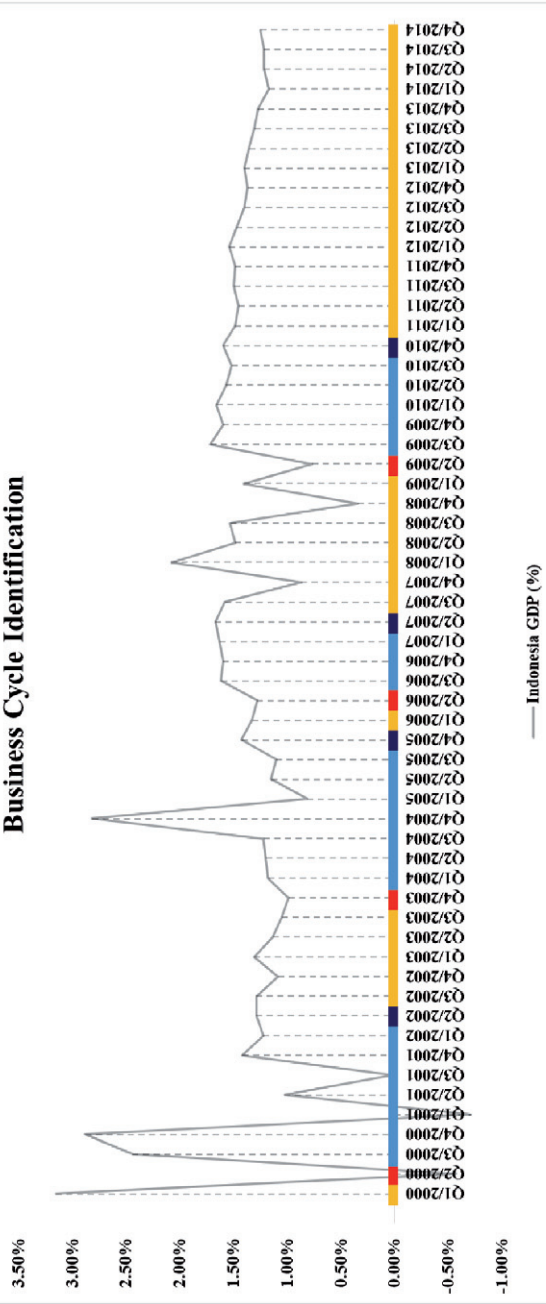
4.2. Sector Choice of Business Cycle

Previous studies proved that there are some sectors that perform better than the others in specified business cycle phase. In this section, the author summary the sectoral index performance analysis from Q1/2000 to Q4/2007 by comparing with Jakarta Composite Index. Then, the assessment analysis is conducted by scoring the rank position and chooses three best sectors to be picked out into portfolio.

4.2.1. Recession Phase

Quarterly Date	Sector Rank								
	#1	#2	#3	#4	#5	#6	#7	#8	#9
Q1/2000	-	-	-	-	-	-	-	-	-
Q3/2002	JKINFA	JKFINA	JKBIND	JKCONS	JKMISC	JKTRAD	JKMING	JKPROP	JKAGRI
Q4/2002	JKAGRI	JKMISC	JKMING	JKFINA	JKINFA	JKPROP	JKCONS	JKTRAD	JKBIND
Q1/2003	JKMING	JKBIND	JKMISC	JKCONS	JKPROP	JKINFA	JKFINA	JKTRAD	JKAGRI
Q2/2003	JKCONS	JKPROP	JKBIND	JKFINA	JKINFA	JKTRAD	JKMISC	JKAGRI	JKMING
Q3/2003	JKPROP	JKMING	JKBIND	JKINFA	JKFINA	JKAGRI	JKMISC	JKTRAD	JKCONS
Q1/2006	JKAGRI	JKPROP	JKMING	JKINFA	JKBIND	JKFINA	JKTRAD	JKMISC	JKCONS
Q3/2007	JKMING	JKPROP	JKMISC	JKINFA	JKFINA	JKAGRI	JKBIND	JKCONS	JKTRAD
Q4/2007	JKMING	JKAGRI	JKMISC	JKBIND	JKTRAD	JKFINA	JKPROP	JKCONS	JKINFA

	8	7	6	5	4	3	2	1	0	Total
JKAGRI	16	7	0	0	0	6	0	1	0	30
JKMING	24	7	12	0	0	0	2	0	0	*45*
JKBIND	0	7	18	5	4	0	2	0	0	*36*
JKMISC	0	7	18	0	4	0	4	1	0	34
JKCONS	8	0	0	10	0	0	2	2	0	22
JKPROP	8	21	0	0	4	3	2	1	0	*39*
JKINFA	8	0	0	15	8	3	0	0	0	34
JKFINA	0	7	0	10	8	6	2	0	0	33
JKTRAD	0	0	0	0	4	6	2	3	0	15

In the recession phase, three sectors which are better than the others are JKMING, JKPROP, and JKBIND. The investment portfolios that will be offered by this analysis are from Mining sector, Property sector, as well as Basic Industry and Chemicals sector.

4.2.2. Trough Phase

Quarterly Date	Sector Rank								
	#1	#2	#3	#4	#5	#6	#7	#8	#9
Q2/2000	JKMING	JKCONS	JKBIND	JKTRAD	JKMISC	JKPROP	JKFINA	JKINFA	JKAGRI
Q4/2003	JKMING	JKINFA	JKAGRI	JKFINA	JKCONS	JKBIND	JKTRAD	JKMISC	JKPROP
Q2/2006	JKINFA	JKAGRI	JKCONS	JKTRAD	JKFINA	JKMING	JKPROP	JKBIND	JKMISC

	8	7	6	5	4	3	2	1	0	Total
JKAGRI	0	7	6	0	0	0	0	0	0	13
JKMING	16	0	0	0	0	3	0	0	0	_**19**_
JKBIND	0	0	6	0	0	3	0	1	0	10
JKMISC	0	0	0	0	4	0	0	1	0	5
JKCONS	0	7	6	0	4	0	0	0	0	_**17**_
JKPROP	0	0	0	0	0	3	2	0	0	5
JKINFA	8	7	0	0	0	0	0	1	0	_**16**_
JKFINA	0	0	0	5	4	0	2	0	0	11
JKTRAD	0	0	0	10	0	0	2	0	0	12

Based on selected trough phase, the author can conclude that top 3 sectors are JKMING, JKCONS, and JKINFA. As a result, the investment portfolio will be created from Mining sector, Consumer Goods Industry sector, and Infrastructure, Utilities & Transportation sector.

4.2.3. Expansion Phase

Quarterly Date	Sector Rank								
	#1	#2	#3	#4	#5	#6	#7	#8	#9
Q3/2000	JKCONS	JKINFA	JKMISC	JKMING	JKFINA	JKAGRI	JKPROP	JKTRAD	JKBIND
Q4/2000	JKCONS	JKTRAD	JKMISC	JKAGRI	JKMING	JKFINA	JKPROP	JKBIND	JKINFA
Q1/2001	JKINFA	JKCONS	JKMING	JKPROP	JKFINA	JKTRAD	JKMISC	JKBIND	JKAGRI
Q2/2001	JKINFA	JKAGRI	JKTRAD	JKMING	JKBIND	JKCONS	JKFINA	JKMISC	JKPROP
Q3/2001	JKFINA	JKPROP	JKAGRI	JKBIND	JKMISC	JKMING	JKCONS	JKTRAD	JKINFA
Q4/2001	JKINFA	JKTRAD	JKPROP	JKFINA	JKMING	JKCONS	JKMISC	JKBIND	JKAGRI
Q1/2002	JKFINA	JKAGRI	JKCONS	JKPROP	JKINFA	JKMISC	JKTRAD	JKBIND	JKMING
Q1/2004	JKFINA	JKAGRI	JKMING	JKINFA	JKTRAD	JKBIND	JKMISC	JKPROP	JKCONS
Q2/2004	JKINFA	JKCONS	JKAGRI	JKPROP	JKMISC	JKFINA	JKTRAD	JKMING	JKBIND
Q3/2004	JKPROP	JKBIND	JKMING	JKFINA	JKMISC	JKAGRI	JKINFA	JKTRAD	JKCONS
Q4/2004	JKBIND	JKFINA	JKMISC	JKAGRI	JKINFA	JKMING	JKTRAD	JKPROP	JKCONS
Q1/2005	JKCONS	JKAGRI	JKPROP	JKMISC	JKMING	JKTRAD	JKBIND	JKFINA	JKINFA
Q2/2005	JKMISC	JKMING	JKINFA	JKBIND	JKAGRI	JKTRAD	JKFINA	JKCONS	JKPROP
Q3/2005	JKAGRI	JKINFA	JKMING	JKTRAD	JKFINA	JKCONS	JKBIND	JKMISC	JKPROP
Q3/2006	JKAGRI	JKFINA	JKMISC	JKTRAD	JKCONS	JKINFA	JKBIND	JKPROP	JKMING
Q4/2006	JKPROP	JKAGRI	JKMING	JKMISC	JKBIND	JKINFA	JKFINA	JKCONS	JKTRAD
Q1/2007	JKMING	JKPROP	JKTRAD	JKAGRI	JKBIND	JKCONS	JKFINA	JKINFA	JKMISC

	8	7	6	5	4	3	2	1	0	Total
JKAGRI	16	35	12	15	4	6	0	0	0	*88*
JKMING	8	7	30	10	12	6	0	1	0	*74*
JKBIND	8	7	0	10	12	3	6	4	0	50
JKMISC	8	0	24	10	12	3	6	2	0	65
JKCONS	24	14	6	0	4	12	2	2	0	64
JKPROP	16	14	12	15	0	0	4	3	0	64
JKINFA	32	14	6	5	8	6	2	1	0	*74*
JKFINA	24	14	0	10	12	6	8	1	0	*75*
JKTRAD	0	14	12	10	4	9	6	3	0	58

The first-three ranked sectors in expansion phase are achieved by JKAGRI, JKFINA, JKMING, and JKINFA. The portfolio in this phase consists of Agriculture sector, Finance sector, Mining sector, and Infrastructure, Utilities & Transportation sector.

4.2.4. Peak Phase

Quarterly Date	Sector Rank								
	#1	#2	#3	#4	#5	#6	#7	#8	#9
Q2/2002	JKMISC	JKTRAD	JKAGRI	JKBIND	JKFINA	JKCONS	JKPROP	JKINFA	JKMING
Q4/2005	JKINFA	JKCONS	JKBIND	JKTRAD	JKFINA	JKAGRI	JKPROP	JKMISC	JKMING
Q2/2007	JKPROP	JKAGRI	JKBIND	JKTRAD	JKMISC	JKMING	JKCONS	JKFINA	JKINFA

	8	7	6	5	4	3	2	1	0	Total
JKAGRI	0	7	6	0	0	3	0	0	0	*16*
JKMING	0	0	0	0	0	3	0	0	0	3
JKBIND	0	0	12	5	0	0	0	0	0	*17*
JKMISC	8	0	0	0	4	0	0	1	0	13
JKCONS	0	7	0	0	0	3	2	0	0	12
JKPROP	8	0	0	0	0	0	4	0	0	12
JKINFA	8	0	0	0	0	0	0	1	0	9
JKFINA	0	0	0	0	8	0	0	1	0	9
JKTRAD	0	7	0	10	0	0	0	0	0	*17*

In the peak phase, three sectors that have higher growth than the others are JKBIND, JKTRAD, and JKAGRI. So, the portfolio will be made of Basic Industry and Chemicals sector, Trade, Services & Investment sector and Agriculture sector.

4.2.5. Sector Choice of Business Cycle Summary

The sector choice of business cycle from Q1/2000 to Q4/2007 is summarized below.

	Sector Choice of Business Cycle			
	Recession	Trough	Expansion	Peak
JKAGRI			√	√
JKMING	√	√	√	
JKBIND	√			√
JKMISC				
JKCONS		√		
JKPROP	√			
JKINFA		√	√	
JKFINA			√	
JKTRAD				√

4.3. Stock Selection in Sectoral Indices

This section describes stock selection based on LQ45 Index in period of August 2007 until January 2008, which captures the liquidity performance of TOP 45 listed companies. This index also covers at least 70% of the stock market capitalization and transaction values in the Indonesia Stock Market. Then, the author will choose some stocks based on sufficient historical stock price, largest market capitalization, and positive annual growth in simulation period to construct investment portfolio as listed below.

Sector	Stocks from LQ45, August 2007 – January 2008	Stock Selection
JKAGRI	AALI, CPRO, LSIP, UNSP	AALI, LSIP
JKMING	ANTM, BUMI, ENRG, INCO, MEDC, PTBA, TINS	PTBA
JKBIND	BRPT, INKP, SMCB, SULI	SMCB, INKP
JKMISC	ASII	ASII
JKCONS	INDF, KLBF, TSPC	INDF, KLBF
JKPROP	ADHI, CTRA, CTRS, ELTY, KIJA, TOTL	CTRA, KIJA, ADHI
JKINFA	BLTA, BTEL, CMNP, ISAT, PGAS, TLKM, TRUB	TLKM, PGAS
JKFINA	BBCA, BBKP, BBRI, BDMN, BNBR, BNGA, BNII, BMRI, PNBN, PNLF	BBRI, BBCA, BMRI
JKTRAD	BHIT, BMTR, UNTR	UNTR, BHIT

In Agriculture sector, the best two stocks are preferred by largest market capitalization and positive annual growth such as Astra Agro Lestari Tbk (AALI) and PP London Sumatera Tbk (LSIP). AALI involves in the agricultural business, specifically in the management of oil palm plantations and the production of palm oil. LSIP is an Indonesian plantation company focused on the production of palm oil, rubber, tea and cocoa.

In Mining sector, Tambang Batubara Bukit Asam Tbk (PTBA) is still chosen because of its positive annual growth even though it only has small market capitalization. PTBA engages in coal mining activities include general surveying, exploration, exploitation, processing, refining, transportation, and trading in Indonesia.

		Number of Shares Outstanding	Stock Price		Market Capitalization		Adjusted Close at Year Ended 2007		2014		Annual Growth	Stock Selection
JKAGRI	AALI	1,574,745,000	Rp	28,000	Rp	44,092,860,000,000	59%	Rp	23,157	Rp	23,760	0.37%	AALI, LSIP
	CPRO	18,346,072,084	Rp	430	Rp	7,888,810,996,120	10%	Rp	430	Rp	103	-18.47%	
	LSIP	1,364,572,793	Rp	10,650	Rp	14,532,700,245,450	19%	Rp	1,632	Rp	1,829	1.64%	
	UNSP	3,787,875,000	Rp	2,275	Rp	8,617,415,625,000	11%	Rp	2,163	Rp	50	-41.62%	
JKMING	ANTM	9,538,459,750	Rp	4,475	Rp	42,684,607,381,250	13%	Rp	3,788	Rp	1,065	-16.58%	PTBA
	BUMI	19,404,000,000	Rp	6,000	Rp	116,424,000,000,000	35%	Rp	5,648	Rp	80	-45.56%	
	ENRG	14,400,813,372	Rp	1,490	Rp	21,457,211,924,280	6%	Rp	1,470	Rp	100	-31.89%	
	INCO	993,633,872	Rp	96,250	Rp	95,637,260,180,000	29%	Rp	8,759	Rp	3,625	-11.84%	
	MEDC	3,332,451,450	Rp	5,150	Rp	17,162,124,967,500	5%	Rp	4,792	Rp	3,800	-3.26%	
	PTBA	2,304,131,850	Rp	12,000	Rp	27,649,582,200,000	8%	Rp	9,613	Rp	12,134	3.38%	
	TINS	503,302,000	Rp	28,700	Rp	14,444,767,400,000	4%	Rp	1,483	Rp	1,197	-3.02%	
JKBIND	BRPT	2,617,459,794	Rp	2,800	Rp	7,328,887,423,200	25%	Rp	2,800	Rp	303	-27.22%	SMCB, INKP
	INKP	5,470,982,941	Rp	840	Rp	4,595,625,670,440	16%	Rp	820	Rp	1,045	3.52%	
	SMCB	7,662,900,000	Rp	1,750	Rp	13,410,075,000,000	46%	Rp	1,569	Rp	2,185	4.85%	
	SULI	1,228,465,988	Rp	3,225	Rp	3,961,802,811,300	14%	Rp	2,221	Rp	62	-40.02%	
JKMISC	ASII	4,048,355,314	Rp	27,300	Rp	110,520,100,072,200	100%	Rp	1,054	Rp	7,271	31.77%	ASII
JKCONS	INDF	9,444,189,000	Rp	2,575	Rp	24,318,786,675,000	60%	Rp	2,214	Rp	6,539	16.73%	INDF, KLBF
	KLBF	10,156,014,422	Rp	1,260	Rp	12,796,578,171,720	32%	Rp	179	Rp	1,811	39.20%	
	TSPC	4,500,000,000	Rp	750	Rp	3,375,000,000,000	8%	Rp	643	Rp	2,865	23.80%	
JKPROP	ADHI	1,801,320,000	Rp	1,360	Rp	2,449,795,200,000	9%	Rp	1,166	Rp	3,438	16.70%	CTRA, KIJA, ADHI
	CTRA	6,540,596,675	Rp	890	Rp	5,821,131,040,750	21%	Rp	416	Rp	1,250	17.04%	
	CTRS	1,978,864,834	Rp	980	Rp	1,939,287,537,320	7%	Rp	931	Rp	2,960	17.97%	
	ELTY	19,621,889,800	Rp	620	Rp	12,165,571,676,000	45%	Rp	616	Rp	50	-30.15%	
	KIJA	13,780,872,551	Rp	230	Rp	3,169,600,686,730	12%	Rp	225	Rp	295	3.93%	
	TOTL	2,750,000,000	Rp	590	Rp	1,622,500,000,000	6%	Rp	384	Rp	1,120	16.53%	
JKINFA	BLTA	4,159,010,436	Rp	2,650	Rp	11,021,377,655,400	3%	Rp	2,166	Rp	196	-29.05%	TLKM, PGAS
	BTEL	18,953,676,867	Rp	420	Rp	7,960,544,284,140	2%	Rp	420	Rp	50	-26.22%	
	CMNP	2,000,000,000	Rp	2,200	Rp	4,400,000,000,000	1%	Rp	1,698	Rp	2,368	4.86%	
	ISAT	5,433,933,500	Rp	8,650	Rp	47,003,524,775,000	13%	Rp	8,217	Rp	4,050	-9.61%	
	PGAS	4,539,885,805	Rp	15,350	Rp	69,687,247,106,750	19%	Rp	2,477	Rp	5,818	12.97%	
	TLKM	20,159,999,280	Rp	10,150	Rp	204,623,992,692,000	56%	Rp	836	Rp	2,791	18.80%	
	TRUB	13,978,021,380	Rp	1,420	Rp	19,848,790,359,600	5%	Rp	1,420	Rp	50	-38.00%	
JKFINA	BBCA	12,209,745,560	Rp	7,300	Rp	89,131,142,588,000	26%	Rp	3,386	Rp	13,039	21.24%	BBRI, BBCA, BMRI
	BBKP	5,656,086,993	Rp	560	Rp	3,167,408,716,080	1%	Rp	428	Rp	750	8.34%	
	BBRI	12,199,082,450	Rp	7,400	Rp	90,273,210,130,000	26%	Rp	3,186	Rp	11,388	19.96%	
	BDMN	4,982,478,180	Rp	8,000	Rp	39,859,825,440,000	12%	Rp	7,162	Rp	4,525	-6.35%	
	BNBR	26,970,278,400	Rp	290	Rp	7,821,380,736,000	2%	Rp	580	Rp	50	-29.54%	
	BNGA	12,241,252,704	Rp	900	Rp	11,017,127,433,600	3%	Rp	850	Rp	835	-0.25%	
	BNII	48,161,976,731	Rp	285	Rp	13,726,163,368,335	4%	Rp	271	Rp	208	-3.72%	
	BMRI	20,602,715,174	Rp	3,500	Rp	72,109,503,109,000	21%	Rp	3,075	Rp	10,587	19.32%	
	PNBN	19,954,626,884	Rp	680	Rp	13,569,146,281,120	4%	Rp	680	Rp	1,165	7.99%	
	PNLF	24,031,011,185	Rp	195	Rp	4,686,047,181,075	1%	Rp	195	Rp	299	6.30%	
JKTRAD	BHIT	7,236,259,371	Rp	1,050	Rp	7,598,072,339,550	14%	Rp	63	Rp	289	24.25%	UNTR, BHIT
	BMTR	13,745,734,550	Rp	1,050	Rp	14,433,021,277,500	27%	Rp	1,117	Rp	1,425	3.54%	
	UNTR	2,851,609,100	Rp	10,900	Rp	31,082,539,190,000	59%	Rp	8,979	Rp	16,920	9.47%	

In Basic Industry and Chemicals sector, Holcim Indonesia Tbk (SMCB) and Indah Kiat Pulp & Paper Tbk (INKP) are selected from LQ45 since market capitalization and annual growth is adequate. SMCB is a leading producer of cement, ready mixed concrete and aggregates with retail franchise offering end-to-end solution to home building, from building materials supply to design and speedy, safe construction. INKP is a paper packaging companies which provides solution for all paper and board packaging needs.

In Miscellaneous Industry sector, ASII is the only one company that listed on LQ45 Index. In addition, ASII also has large market capitalization and positive annual growth. Astra International Tbk is an Indonesian conglomerate industry that focuses on automotive, agroindustry, financial services, heavy equipment, information technology, infrastructure & logistic, and electronic.

In Consumer Goods Industry, Indofood Sukses Makmur Tbk (INDF) and Kalbe Farma Tbk (KLBF) are selected by market capitalization and annual growth. INDF is an Indonesian food industry that engages in the manufacture of noodle, flour milling, packaging, management services and research development. KLBF is a pharmaceutical company that offers medical needs comprising of prescription pharmaceuticals, consumer health, nutritional products, and healthcare services.

In Property sector, Ciputra Development Tbk (CTRA), Kawasan Industri Jababeka Tbk (KIJA), and Adhi Karya (Persero) Tbk (ADHI) are picked up into portfolio by considering market capitalization and annual growth. CTRA is leading property company in Indonesia covering residential, apartments, office buildings, shopping malls, hotels, Golf Courses, and hospitals. KIJA is the first publicly listed industrial estate developer in Indonesia offering a full range of real estate, infrastructure, logistics and leisure products and facilities. ADHI is Indonesia-based company primarily engaged in provisioning construction services such as construction; engineering, procurement and construction (EPC); property; real estate and investment.

In Infrastructure, Utilities & Transportation sector, Telekomunikasi Indonesia Tbk (TLKM) and Perusahaan Gas Negara (Persero) Tbk (PGAS) are chosen based on largest market capitalization and significant positive annual growth. TLKM is the largest telecommunications services company in Indonesia, mainly engaged in fixed line telephony, internet and data communications. PGAS, a government controlled enterprise, is the largest natural gas transportation and distribution company in Indonesia.

In Finance sector, Bank Rakyat Indonesia (Persero) Tbk (BBRI), Bank Central Asia Tbk (BBCA), Bank Mandiri (Persero) Tbk (BMRI) are picked up into portfolio since banking industry still dominating the finance sector compared with other finance activities. BBRI's business focus is on banking services in micro, small, and medium enterprises (MSME's). BBCA provides both commercial and personal banking services through its 1000-plus branches across the country. BMRI offers a broad range of banking products and services to its customers ranging from individuals and small and medium-sized enterprises (SMEs) to large corporations and Government entities.

In Trade, Services & Investment sector, United Tractors Tbk (UNTR) and Bhakti Investama Tbk (BHIT) are selected from LQ45 based on sufficient historical price, market capitalization, and annual growth. UNTR, exclusive distributor of Komatsu Limited heavy equipment in Indonesia, has three major business units such as Construction Machinery, Mining Contracting and Mining. BHIT (currently known as MNC Investama Tbk) is engaged in media, financial services, energy and natural resources, and investment portfolio businesses in Indonesia.

4.4.   Investment Portfolio Construction

The goal of this part is to achieve Sharpe ratio optimization by using three methods such as optimal portfolio by Solver, modified optimal portfolio by Solver, and balance weight.

4.4.1. Optimal Portfolio by Solver Method

For determining optimal portfolio, the investment portfolio construction is guided by evaluating the past performance of stock selection. The author will use available data of historical stock price (September 2004 to December 2007) to define portfolio's monthly return for each business cycle phase. Then, the desired weight of every stock will be created by Solver for investment portfolio on backdated simulation in order to maximize Sharpe ratio.

		Sector Choice of Business Cycle			
		Recession	Trough	Expansion	Peak
JKAGRI	AALI			40,33%	0,00%
	LSIP			0,00%	55,17%
JKMING	PTBA	0,00%	38,72%	2,40%	
JKBIND	SMCB	83,25%			34,62%
	INKP	0,00%			10,21%
JKMISC	ASII				
JKCONS	INDF		0,00%		
	KLBF		0,00%		
JKPROP	CTRA	0,00%			
	KIJA	16,75%			
	ADHI	0,00%			
JKINFA	TLKM		61,28%	23,84%	
	PGAS		0,00%	24,19%	
JKFINA	BBRI			4,22%	
	BBCA			5,03%	
	BMRI			0,00%	
JKTRAD	UNTR				0,00%
	BHIT				0,00%
		100%	*100%*	*100%*	*100%*

4.4.2. Modified Optimal Portfolio by Solver Method

The modified optimal portfolio by Solver method is quite similar with previous method, but the author will create additional modification in order to construct investment portfolio such as the minimum proportion with the amount of stock selection for each business cycle phase is 90%. Because the number of stock selection in recession phase and peak phase is six, so the author create minimum weight of each stock is 15%. Furthermore, the minimum weight of each stock for trough phase is 18% (90% divided by five stocks), while minimum weight of each stock for expansion phase is 11.25% (90% divided by eight stocks).

		Sector Choice of Business Cycle			
		Recession	Trough	Expansion	Peak
JKAGRI	AALI			21.25%	15.00%
	LSIP			11.25%	15.00%
JKMING	PTBA	15.00%	28.00%	11.25%	
JKBIND	SMCB	25.00%			25.00%
	INKP	15.00%			15.00%
JKMISC	ASII				
JKCONS	INDF		18.00%		
	KLBF		18.00%		
JKPROP	CTRA	15.00%			
	KIJA	15.00%			
	ADHI	15.00%			
JKINFA	TLKM		18.00%	11.25%	
	PGAS		18.00%	11.25%	
JKFINA	BBRI			11.25%	
	BBCA			11.25%	
	BMRI			11.25%	
JKTRAD	UNTR				15.00%
	BHIT				15.00%
		100%	*100%*	*100%*	*100%*

4.4.3. Balance Weight Method

For balance weight method, the investment portfolio is constructed by allocating the proportion with the amount of stock selection for each business cycle phase. The weight of each stock in recession phase and peak phase are 16.67% (100% divided by six stocks). In addition, the weight of each stock in trough phase is 20% (100% divided by five stocks), while the weight of each stock in expansion phase is 12.5% (100% divided by eight stocks).

		Sector Choice of Business Cycle			
		Recession	Trough	Expansion	Peak
JKAGRI	AALI			12.50%	16.67%
	LSIP			12.50%	16.67%
JKMING	PTBA	16.67%	20.00%	12.50%	
JKBIND	SMCB	16.67%			16.67%
	INKP	16.67%			16.67%
JKMISC	ASII				
JKCONS	INDF		20.00%		
	KLBF		20.00%		
JKPROP	CTRA	16.67%			
	KIJA	16.67%			
	ADHI	16.67%			
JKINFA	TLKM		20.00%	12.50%	
	PGAS		20.00%	12.50%	
JKFINA	BBRI			12.50%	
	BBCA			12.50%	
	BMRI			12.50%	
JKTRAD	UNTR				16.67%
	BHIT				16.67%
		100%	*100%*	*100%*	*100%*

4.5. Portfolio Backdated Simulation

The author will start portfolio simulation with the amount of Rp 100,000,000 as investment capital from Q1/2008 to Q4/2014 in order to generate higher ending investment value by using several method based on sector rotation strategy as guideline such as optimal portfolio by Solver, modified optimal portfolio by Solver, and balance weight. With the same initial fund of Rp 100,000,000, the author also simulates passive strategy by investing in Jakarta Composite Index.

4.5.1. Optimal Portfolio by Solver Method

The following table shows the simulation with initial investment of Rp 100,000,000 that invested in specific portfolio from each business cycle phase from Q1/2008 to Q4/2014.

Sector	Stock	Weight	Beginning Price	Initial Investment		# of Share	Ending Price	Ending Investment	
Portfolio Backdated Simulation Based On Sector Rotation Strategy									
Recession Phase from Q1/2008 to Q1/2009									
JKMING	PTBA	0.00%	Rp 8,050.70	Rp	-	-	Rp 5,407.18	Rp	-
JKBIND	SMCB	83.25%	Rp 1,075.74	Rp	83,245,335.92	77,384.25	Rp 493.05	Rp	38,154,305.76
	INKP	0.00%	Rp 907.96	Rp	-	-	Rp 868.91	Rp	-
JKPROP	CTRA	0.00%	Rp 256.81	Rp	-	-	Rp 168.09	Rp	-
	KIJA	16.75%	Rp 133.15	Rp	16,754,667.25	125,837.47	Rp 48.95	Rp	6,159,819.49
	ADHI	0.00%	Rp 668.96	Rp	-	-	Rp 235.85	Rp	-
Investment Portfolio		*100.00%*	*Total Fund*	*Rp 100,000,003.17*		*Decrease -55.69%*		*Rp 44,314,125.25*	
Trough Phase in Q2/2009									
JKMING	PTBA	38.72%	Rp 5,407.18	Rp	17,158,116.05	3,173.21	Rp 9,292.35	Rp	29,486,575.20
JKCONS	INDF	0.00%	Rp 808.31	Rp	-	-	Rp 1,625.21	Rp	-
	KLBF	0.00%	Rp 89.43	Rp	-	-	Rp 145.68	Rp	-
JKINFA	TLKM	61.28%	Rp 631.04	Rp	27,156,008.52	43,033.74	Rp 626.86	Rp	26,976,127.50
	PGAS	0.00%	Rp 1,734.85	Rp	-	-	Rp 2,541.76	Rp	-
Investment Portfolio		*100.00%*	*Total Fund*	*Rp 44,314,124.57*		*Increase 27.41%*		*Rp 56,462,702.71*	
Expansion Phase from Q3/2009 to Q3/2010									
JKAGRI	AALI	40.33%	Rp 13,935.63	Rp	22,770,181.21	1,633.95	Rp17,448.13	Rp	28,509,445.35
	LSIP	0.00%	Rp 919.30	Rp	-	-	Rp 1,683.02	Rp	-
JKMING	PTBA	2.4%	Rp 9,292.35	Rp	1,354,649.65	145.78	Rp15,955.18	Rp	2,325,964.80
JKINFA	TLKM	23.8%	Rp 626.86	Rp	13,459,137.40	21,470.72	Rp 894.79	Rp	19,211,788.21
	PGAS	24.2%	Rp 2,541.76	Rp	13,658,734.22	5,373.73	Rp 3,209.84	Rp	17,248,816.35
JKFINA	BBRI	4.22%	Rp 2,712.00	Rp	2,381,978.81	878.31	Rp 4,464.15	Rp	3,920,911.02
	BBCA	5.03%	Rp 3,269.57	Rp	2,838,021.54	868.01	Rp 6,281.84	Rp	5,452,703.94
	BMRI	0.00%	Rp 2,789.26	Rp	-	-	Rp 6,427.36	Rp	-
Investment Portfolio		*100.00%*	*Total Fund*	*Rp 56,462,702.83*		*Increase 35.79%*		*Rp 76,669,629.68*	
Peak Phase in Q4/2010									
JKAGRI	AALI	0.00%	Rp 17,448.13	Rp	-	-	Rp22,222.15	Rp	-
	LSIP	55.17%	Rp 1,683.02	Rp	42,302,466.29	25,134.86	Rp 2,195.61	Rp	55,186,342.42
JKBIND	SMCB	34.62%	Rp 2,173.90	Rp	26,539,433.66	12,208.21	Rp 2,017.02	Rp	24,624,209.25
	INKP	10.21%	Rp 2,269.91	Rp	7,827,730.14	3,448.48	Rp 1,601.14	Rp	5,521,492.85
JKTRAD	UNTR	0.00%	Rp 17,111.46	Rp	-	-	Rp20,047.72	Rp	-
	BHIT	0.00%	Rp 111.74	Rp	-	-	Rp 157.02	Rp	-
Investment Portfolio		*100.00%*	*Total Fund*	*Rp 76,669,630.09*		*Increase 11.30%*		*Rp 85,332,044.52*	
Recession Phase from Q1/2011 to Q4/2014									
JKMING	PTBA	0.00%	Rp 18,885.47	Rp	-	-	Rp12,133.67	Rp	-
JKBIND	SMCB	83.25%	Rp 2,017.02	Rp	71,034,947.10	35,217.77	Rp 2,185.00	Rp	76,950,828.16
	INKP	0.00%	Rp 1,601.14	Rp	-	-	Rp 1,045.00	Rp	-
JKPROP	CTRA	0.00%	Rp 326.85	Rp	-	-	Rp 1,250.00	Rp	-
	KIJA	16.75%	Rp 117.48	Rp	14,297,100.11	121,696.40	Rp 295.00	Rp	35,900,438.40
	ADHI	0.00%	Rp 811.91	Rp	-	-	Rp 3,438.47	Rp	-
Investment Portfolio		*100.00%*	*Total Fund*	*Rp 85,332,047.22*		*Increase 32.25%*		*Rp 112,851,266.56*	

The portfolio backdated simulation started on recession phase from Q1/2008 to Q1/2009 by using initial fund of Rp 100,000,000 invested in optimal weight of two stocks such as SMCB (83.25%) and KIJA (16.75%). The ending value of portfolio was decreased by 55.69% for Rp 44,314,125.25. This ending value of investment would be the beginning value of investment in the next trough phase.

For trough phase in Q2/2009, the fund of Rp 44,314,125.25 invested in portfolio which consists of PTBA (38.72%) and TLKM (61.28%). The ending value of portfolio was increased by 27.41% for Rp 56,462,702.71. In addition, this ending value of investment would be the beginning value of investment in the next expansion phase.

In expansion phase (Q3/2009-Q3/2010), the fund of Rp 56,462,702.71 invested in six stocks such as AALI (40.33%), PTBA (2.4%), TLKM (23.8%), PGAS (24.2%), BBRI (4.22%), and BBCA (5.03%). The ending value of portfolio was increased by 35.79% for Rp 76,669,629.68. This ending value of investment also would be the beginning value of investment in the next peak phase.

The fund of Rp 76,669,629.68 in peak phase Q4/2010 invested in three stocks such as LSIP (55.17%), SMCB (34.62%), and INKP (10.21%). The ending value of portfolio was increased by 11.30% for Rp 85,332,044.52. Furthermore, this ending value of investment would be the beginning value of the investment in the next recession phase.

For recession phase from Q1/2011 to Q4/2014, the fund of Rp 85,332,044.52 invested like prior recession phase in Q1/2008-Q1/2009. By doing this strategy, the ending value of portfolio was increased by 32.25% for Rp 112,851,266.56.

4.5.2. Modified Optimal Portfolio by Solver Method

The following table shows the simulation with initial investment of Rp 100,000,000 that invested in specific portfolio from each business cycle phase from Q1/2008 to Q4/2014.

Portfolio Backdated Simulation Based On Sector Rotation Strategy							
Sector	Stock	Weight	Beginning Price	Initial Investment	# of Share	Ending Price	Ending Investment
Recession Phase from Q1/2008 to Q1/2009							
JKMING	PTBA	15.00%	Rp 8,050.70	Rp 15,000,000.00	1,863.19	Rp 5,407.18	Rp 10,074,614.63
JKBIND	SMCB	25.00%	Rp 1,075.74	Rp 25,000,000.26	23,239.82	Rp 493.05	Rp 11,458,391.55
	INKP	15.00%	Rp 907.96	Rp 15,000,000.00	16,520.55	Rp 868.91	Rp 14,354,872.46
JKPROP	CTRA	15.00%	Rp 256.81	Rp 15,000,000.00	58,408.94	Rp 168.09	Rp 9,817,958.80
	KIJA	15.00%	Rp 133.15	Rp 15,000,000.00	112,658.88	Rp 48.95	Rp 5,514,719.63
	ADHI	15.00%	Rp 668.96	Rp 15,000,000.00	22,422.87	Rp 235.85	Rp 5,288,432.79
Investment Portfolio		100.00%	Total Fund	Rp 100,000,000.26	Decrease -43.49%		Rp 56,508,989.87
Trough Phase in Q2/2009							
JKMING	PTBA	28.00%	Rp 5,407.18	Rp 15,822,515.91	2,926.20	Rp 9,292.35	Rp 27,191,318.90
JKCONS	INDF	18.00%	Rp 808.31	Rp 10,171,618.18	12,583.81	Rp 1,625.21	Rp 20,451,331.27
	KLBF	18.00%	Rp 89.43	Rp 10,171,618.18	113,738.32	Rp 145.68	Rp 16,569,398.81
JKINFA	TLKM	18.00%	Rp 631.04	Rp 10,171,618.18	16,118.82	Rp 626.86	Rp 10,104,241.52
	PGAS	18.00%	Rp 1,734.85	Rp 10,171,618.18	5,863.11	Rp 2,541.76	Rp 14,902,621.10
Investment Portfolio		100.00%	Total Fund	Rp 56,508,988.62	Increase 57.88%		Rp 89,218,911.61
Expansion Phase from Q3/2009 to Q3/2010							
JKAGRI	AALI	21.25%	Rp 13,935.63	Rp 18,959,019.31	1,360.47	Rp17,448.13	Rp 23,737,673.40
	LSIP	11.25%	Rp 919.30	Rp 10,037,127.56	10,918.23	Rp 1,683.02	Rp 18,375,597.11
JKMING	PTBA	11.3%	Rp 9,292.35	Rp 10,037,127.56	1,080.15	Rp15,955.18	Rp 17,233,980.30
JKINFA	TLKM	11.3%	Rp 626.86	Rp 10,037,127.56	16,011.75	Rp 894.79	Rp 14,327,156.57
	PGAS	11.3%	Rp 2,541.76	Rp 10,037,127.56	3,948.89	Rp 3,209.84	Rp 12,675,301.17
JKFINA	BBRI	11.25%	Rp 2,712.00	Rp 10,037,127.56	3,701.01	Rp 4,464.15	Rp 16,521,844.76
	BBCA	11.25%	Rp 3,269.57	Rp 10,037,127.56	3,069.86	Rp 6,281.84	Rp 19,284,379.71
	BMRI	11.25%	Rp 2,789.26	Rp 10,037,127.56	3,598.49	Rp 6,427.36	Rp 23,128,814.96
Investment Portfolio		100.00%	Total Fund	Rp 89,218,912.20	Increase 62.84%		Rp 145,284,747.98
Peak Phase in Q4/2010							
JKAGRI	AALI	15.00%	Rp 17,448.13	Rp 21,792,712.20	1,249.00	Rp22,222.15	Rp 27,755,462.58
	LSIP	15.00%	Rp 1,683.02	Rp 21,792,712.20	12,948.58	Rp 2,195.61	Rp 28,430,022.71
JKBIND	SMCB	25.00%	Rp 2,173.90	Rp 36,321,187.16	16,707.85	Rp 2,017.02	Rp 33,700,060.23
	INKP	15.00%	Rp 2,269.91	Rp 21,792,712.20	9,600.69	Rp 1,601.14	Rp 15,372,055.81
JKTRAD	UNTR	15.00%	Rp 17,111.46	Rp 21,792,712.20	1,273.57	Rp20,047.72	Rp 25,532,250.90
	BHIT	15.00%	Rp 111.74	Rp 21,792,712.20	195,024.43	Rp 157.02	Rp 30,622,521.19
Investment Portfolio		100.00%	Total Fund	Rp 145,284,748.15	Increase 11.10%		Rp 161,412,373.43
Recession Phase from Q1/2011 to Q4/2014							
JKMING	PTBA	15.00%	Rp 18,885.47	Rp 24,211,856.01	1,282.04	Rp12,133.67	Rp 15,555,804.06
JKBIND	SMCB	25.00%	Rp 2,017.02	Rp 40,353,093.77	20,006.29	Rp 2,185.00	Rp 43,713,750.92
	INKP	15.00%	Rp 1,601.14	Rp 24,211,856.01	15,121.64	Rp 1,045.00	Rp 15,802,109.46
JKPROP	CTRA	15.00%	Rp 326.85	Rp 24,211,856.01	74,076.35	Rp 1,250.00	Rp 92,595,441.39
	KIJA	15.00%	Rp 117.48	Rp 24,211,856.01	206,090.45	Rp 295.00	Rp 60,796,681.73
	ADHI	15.00%	Rp 811.91	Rp 24,211,856.01	29,820.86	Rp 3,438.47	Rp 102,538,139.14
Investment Portfolio		100.00%	Total Fund	Rp 161,412,373.84	Increase 105.07%		Rp 331,001,926.71

The portfolio backdated simulation started on recession phase from Q1/2008 to Q1/2009 by using initial fund of Rp 100,000,000 invested in modified weight of six stocks such as PTBA (15%), SMCB (25%), INKP (15%), CTRA (15%), KIJA (15%), and ADHI (15%). The ending value of portfolio was decreased by 43.49% for Rp 56,508,989.87. This ending value of investment would be the beginning value of investment in the next trough phase.

For trough phase in Q2/2009, the fund of Rp 56,508,989.87 invested in portfolio which consists of PTBA (28%), INDF (18%), KLBF (18%), TLKM (18%), and PGAS (18%). The ending value of portfolio was increased by 57.88% for Rp 89,218,911.61. In addition, this ending value of investment would be the beginning value of investment in the next expansion phase.

In expansion phase (Q3/2009-Q3/2010), the fund of Rp 89,218,911.61 invested in eight stocks such as AALI (21.25%), LSIP (11.25%), PTBA (11.3%), TLKM (11.3%), PGAS (11.3%), BBRI (11.25%), BBCA (11.25%), and BMRI (11.25%). The ending value of portfolio was increased by 62.84% for Rp 145,284,747.98. This ending value of investment also would be the beginning value of investment in the next peak phase.

The fund of Rp 145,284,747.98 in peak phase Q4/2010 invested in six stocks such as AALI (15%), LSIP (15%), SMCB (25%), INKP (15%), UNTR (15%), and BHIT (15%). The ending value of portfolio was increased by 11.10% for Rp 161,412,373.43. Furthermore, this ending value of investment would be the beginning value of the investment in the next recession phase.

For recession phase from Q1/2011 to Q4/2014, the fund of Rp 161,412,373.43 invested like prior recession phase in Q1/2008-Q1/2009. By doing this strategy, the ending value of portfolio was increased by 105.07% for Rp 331,001,926.71.

4.5.3. Balance Weight Method

The following table shows the simulation with initial investment of Rp 100,000,000 that invested in specific portfolio from each business cycle phase from Q1/2008 to Q4/2014.

Sector	Stock	Weight	Beginning Price	Initial Investment	# of Share	Ending Price	Ending Investment
Portfolio Backdated Simulation Based On Sector Rotation Strategy							
Recession Phase from Q1/2008 to Q1/2009							
JKMING	PTBA	16.67%	Rp 8,050.70	Rp 16,666,666.67	2,070.21	Rp 5,407.18	Rp 11,194,016.26
JKBIND	SMCB	16.67%	Rp 1,075.74	Rp 16,666,666.67	15,493.21	Rp 493.05	Rp 7,638,927.62
	INKP	16.67%	Rp 907.96	Rp 16,666,666.67	18,356.17	Rp 868.91	Rp 15,949,858.29
JKPROP	CTRA	16.67%	Rp 256.81	Rp 16,666,666.67	64,898.82	Rp 168.09	Rp 10,908,843.11
	KIJA	16.67%	Rp 133.15	Rp 16,666,666.67	125,176.53	Rp 48.95	Rp 6,127,466.26
	ADHI	16.67%	Rp 668.96	Rp 16,666,666.67	24,914.29	Rp 235.85	Rp 5,876,036.43
Investment Portfolio		**100.00%**	**Total Fund**	**Rp 100,000,000.00**	**Decrease -42.30%**		**Rp 57,695,147.98**
Trough Phase in Q2/2009							
JKMING	PTBA	20.00%	Rp 5,407.18	Rp 11,539,029.60	2,134.02	Rp 9,292.35	Rp 19,830,059.60
JKCONS	INDF	20.00%	Rp 808.31	Rp 11,539,029.60	14,275.50	Rp 1,625.21	Rp 23,200,685.74
	KLBF	20.00%	Rp 89.43	Rp 11,539,029.60	129,028.62	Rp 145.68	Rp 18,796,889.54
JKINFA	TLKM	20.00%	Rp 631.04	Rp 11,539,029.60	18,285.73	Rp 626.86	Rp 11,462,595.23
	PGAS	20.00%	Rp 1,734.85	Rp 11,539,029.60	6,651.31	Rp 2,541.76	Rp 16,906,040.21
Investment Portfolio		**100.00%**	**Total Fund**	**Rp 57,695,147.98**	**Increase 56.33%**		**Rp 90,196,270.31**
Expansion Phase from Q3/2009 to Q3/2010							
JKAGRI	AALI	12.50%	Rp 13,935.63	Rp 11,274,533.79	809.04	Rp17,448.13	Rp 14,116,299.82
	LSIP	12.50%	Rp 919.30	Rp 11,274,533.79	12,264.26	Rp 1,683.02	Rp 20,640,994.08
JKMING	PTBA	12.50%	Rp 9,292.35	Rp 11,274,533.79	1,213.31	Rp15,955.18	Rp 19,358,635.44
JKINFA	TLKM	12.5%	Rp 626.86	Rp 11,274,533.79	17,985.73	Rp 894.79	Rp 16,093,450.04
	PGAS	12.5%	Rp 2,541.76	Rp 11,274,533.79	4,435.72	Rp 3,209.84	Rp 14,237,949.11
JKFINA	BBRI	12.50%	Rp 2,712.00	Rp 11,274,533.79	4,157.28	Rp 4,464.15	Rp 18,558,705.76
	BBCA	12.50%	Rp 3,269.57	Rp 11,274,533.79	3,448.32	Rp 6,281.84	Rp 21,661,814.04
	BMRI	12.50%	Rp 2,789.26	Rp 11,274,533.79	4,042.13	Rp 6,427.36	Rp 25,980,202.44
Investment Portfolio		**100.00%**	**Total Fund**	**Rp 90,196,270.31**	**Increase 67.02%**		**Rp 150,648,050.73**
Peak Phase in Q4/2010							
JKAGRI	AALI	16.67%	Rp 17,448.13	Rp 25,108,008.45	1,439.01	Rp22,222.15	Rp 31,977,864.11
	LSIP	16.67%	Rp 1,683.02	Rp 25,108,008.45	14,918.43	Rp 2,195.61	Rp 32,755,044.17
JKBIND	SMCB	16.67%	Rp 2,173.90	Rp 25,108,008.45	11,549.75	Rp 2,017.02	Rp 23,296,083.17
	INKP	16.67%	Rp 2,269.91	Rp 25,108,008.45	11,061.24	Rp 1,601.14	Rp 17,710,586.17
JKTRAD	UNTR	16.67%	Rp 17,111.46	Rp 25,108,008.45	1,467.32	Rp20,047.72	Rp 29,416,438.20
	BHIT	16.67%	Rp 111.74	Rp 25,108,008.45	224,693.23	Rp 157.02	Rp 35,281,084.53
Investment Portfolio		**100.00%**	**Total Fund**	**Rp 150,648,050.73**	**Increase 13.14%**		**Rp 170,437,100.35**
Recession Phase from Q1/2011 to Q4/2014							
JKMING	PTBA	16.67%	Rp 18,885.47	Rp 28,406,183.39	1,504.13	Rp12,133.67	Rp 18,250,605.11
JKBIND	SMCB	16.67%	Rp 2,017.02	Rp 28,406,183.39	14,083.24	Rp 2,185.00	Rp 30,771,886.60
	INKP	16.67%	Rp 1,601.14	Rp 28,406,183.39	17,741.22	Rp 1,045.00	Rp 18,539,579.08
JKPROP	CTRA	16.67%	Rp 326.85	Rp 28,406,183.39	86,908.93	Rp 1,250.00	Rp 108,636,161.05
	KIJA	16.67%	Rp 117.48	Rp 28,406,183.39	241,792.41	Rp 295.00	Rp 71,328,760.99
	ADHI	16.67%	Rp 811.91	Rp 28,406,183.39	34,986.86	Rp 3,438.47	Rp 120,301,276.50
Investment Portfolio		**100.00%**	**Total Fund**	**Rp 170,437,100.35**	**Increase 115.81%**		**Rp 367,828,269.33**

The portfolio backdated simulation started on recession phase from Q1/2008 to Q1/2009 by using initial fund of Rp 100,000,000 invested in proportional weight of six stocks such as PTBA (16.67%), SMCB (16.67%), INKP (16.67%), CTRA (16.67%), KIJA (16.67%), and ADHI (16.67%). The ending value of portfolio was decreased by 42.3% for Rp 57,695,147.98. This ending value of investment would be the beginning value of investment in the next trough phase.

For trough phase in Q2/2009, the fund of Rp 57,695,147.98 invested in portfolio which consists of PTBA (20%), INDF (20%), KLBF (20%), TLKM (20%), and PGAS (20%). The ending value of portfolio was increased by 56.33% for Rp 90,196,270.31. In addition, this ending value of investment would be the beginning value of investment in the next expansion phase.

In expansion phase (Q3/2009-Q3/2010), the fund of Rp 90,196,270.31 invested in eight stocks such as AALI (12.5%), LSIP (12.5%), PTBA (12.5%), TLKM (12.5%), PGAS (12.5%), BBRI (12.5%), BBCA (12.5%), and BMRI (12.5%). The ending value of portfolio was increased by 67.02% for Rp 150,648,050.73. This ending value of investment also would be the beginning value of investment in the next peak phase.

The fund of Rp 150,648,050.73 in peak phase Q4/2010 invested in six stocks such as AALI (16.67%), LSIP (16.67%), SMCB (16.67%), INKP (16.67%), UNTR (16.67%), and BHIT (16.67%). The ending value of portfolio was increased by 13.14% for Rp 170,437,100.35. Furthermore, this ending value of investment would be the beginning value of the investment in the next recession phase.

For recession phase from Q1/2011 to Q4/2014, the fund of Rp 170,437,100.35 invested like prior recession phase in Q1/2008-Q1/2009. By doing this strategy, the ending value of portfolio was increased by 115.81% for Rp 367,828,269.33.

4.5.4. Passive Strategy

Portfolio Backdated Simulation Based On Passive Strategy					
Jakarta Composite Index	Beginning Investment	Initial Investment	# of Share	Ending Price	Ending Investment
Recession Phase from Q1/2008 to Q1/2009					
Decrease -41.40%	Rp 2,447.30	Rp 100,000,000.00	40,861.36	Rp 1,434.07	Rp 58,598,046.83
Trough Phase in Q2/2009					
Increase 41.33%	Rp 1,434.07	Rp 58,598,046.83	40,861.36	Rp 2,026.78	Rp 82,816,981.98
Expansion Phase from Q3/2009 to Q3/2010					
Increase 72.75%	Rp 2,026.78	Rp 82,816,981.98	40,861.36	Rp 3,501.30	Rp 143,067,870.71
Peak Phase in Q4/2010					
Increase 5.78%	Rp 3,501.30	Rp 143,067,870.71	40,861.36	Rp 3,703.51	Rp 151,330,445.80
Recession Phase from Q1/2011 to Q4/2014					
Increase 41.14%	Rp 3,703.51	Rp 151,330,445.80	40,861.36	Rp 5,226.95	Rp 213,580,272.14

With the same initial fund of Rp 100,000,000, the ending value of investing in Jakarta Composite Index was Rp 213,580,272.14. This following table shows all methods based on sector rotation strategy in comparison with passive strategy.

	Sector Rotation Strategy			Passive Strategy
	Optimal Portfolio by Solver	Modified Portfolio by Solver	Balance Weight	Jakarta Composite Index
	Initial Fund Rp 100,000,000.00			
Recession	Rp 44,314,125.25	Rp 56,508,989.87	Rp 57,695,147.98	Rp 58,598,046.83
	Decrease -55.69%	Decrease -43.49%	Decrease -42.30%	Decrease -41.40%
Trough	Rp 56,462,702.71	Rp 89,218,911.61	Rp 90,196,270.31	Rp 82,816,981.98
	Increase 27.41%	Increase 57.88%	Increase 56.33%	Increase 41.33%
Expansion	Rp 76,669,629.68	Rp 145,284,747.98	Rp 150,648,050.73	Rp 143,067,870.71
	Increase 35.79%	Increase 62.84%	Increase 67.02%	Increase 72.75%
Peak	Rp 85,332,044.52	Rp 161,412,373.43	Rp 170,437,100.35	Rp 151,330,445.80
	Increase 11.30%	Increase 11.10%	Increase 13.14%	Increase 5.78%
Recession	Rp 112,851,266.56	Rp 331,001,926.71	Rp 367,828,269.33	Rp 213,580,272.14
	Increase 32.25%	Increase 105.07%	Increase 115.81%	Increase 41.14%

The ending value of portfolio backdated simulation with optimal portfolio by Solver was Rp 100,729,005.58 less than passive strategy. Nevertheless, the ending value of modified portfolio by Solver was Rp 117,421,654.57 more than passive strategy and the ending value of portfolio backdated simulation with balance weight was Rp 154,247,997.19 more than passive strategy.

4.6. Optimal Investment Portfolio Based On Sector Rotation Strategy

A strict model of optimal portfolio selection which is expressing diversification principles has been published by Harry Markowitz in his 1990 Nobel Prize in Economics. His pattern is specifically step one of portfolio management: the recognition of the *efficient frontier of risky assets* (Bodie, Kane, & Marcus, 2011, Pg 239). The essential concept of his theory explains the two equivalent methods of defining the best risk-return combinations: highest expected return for any risk level or lowest standard deviation for any target expected return. For that reason, optimal portfolio can be generated by investment mockup to achieve certain optimizations, whether to maximize return, to minimize risk, or else to maximize Sharpe ratio (Dharma & Soekarno, 2014).

Strategy	Holding Period Return	Geometric Average Return	Sharpe Ratio
Optimal Portfolio by Solver	*12.85%*	*1.74%*	*0.0509*
Modified Portfolio by Solver	*231.00%*	*18.65%*	*0.4758*
Balance Weight	*267.83%*	*20.45%*	*0.5126*
Jakarta Composite Index	*113.58%*	*11.45%*	*0.3600*

The table above shows that sector rotation strategy with balance weight method has the highest holding period return (267.83%), geometric average return (20.45%), and Sharpe ratio (0.5126) in comparison with other strategies. The second rank is achieved by sector rotation strategy based on modified portfolio by Solver with holding period return 231%, geometric average return 18.65%, and Sharpe ratio 0.4758. In addition, the third rank is accomplished by passive strategy by investing in Jakarta Composite Index with holding period return 113.58%, geometric average return 11.45%, and Sharpe ratio 0.36. Nevertheless, optimal portfolio by Solver gives the lowest holding period return (12.85%), geometric average return (1.74%), and Sharpe ratio (0.0509). In these scenario, the author learned that insufficient historical data (September 2004 to December 2007) cannot forecast the future Sharpe ratio (Q1/2008 to Q4/2014) accurately although the result is still positive and not too bad for being considered. It would be better for dividing the portfolio weight equally in attempt to beat the passive strategy. In summarized, it was proved that sector rotation strategy based on modified portfolio by Solver and balance weight are effective for maximizing investors' wealth and give superior return in comparison with passive strategy.

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1. Conclusion

Equity fund performance in Indonesia which achieves long-term growth through capital gains and dividends is vary based on four basic business cycle phases such as peak, recession, trough, and expansion. Due not all sectors of the economy perform well at the same time, investors apply sector rotation strategy by investing more funds in some industries or sectors that are going up and avoiding them that are falling down. This study captures the pattern relationship between business cycle and particular stocks in Indonesia Stock Exchange as well as formulates investment portfolio optimization by maximizing Sharpe ratio.

Based on careful analysis, recession phase generated the largest negative return (Q1/2008-Q1/2009) among other phases by using all methods. Expansion phase produced relatively higher return (Q3/2009-Q3/2010) than other phases by using optimal portfolio by Solver method and passive strategy method, while recession phase produced relatively higher return (Q1/2011-Q4/2014) than other phases by using modified portfolio by Solver method and balance weight method.
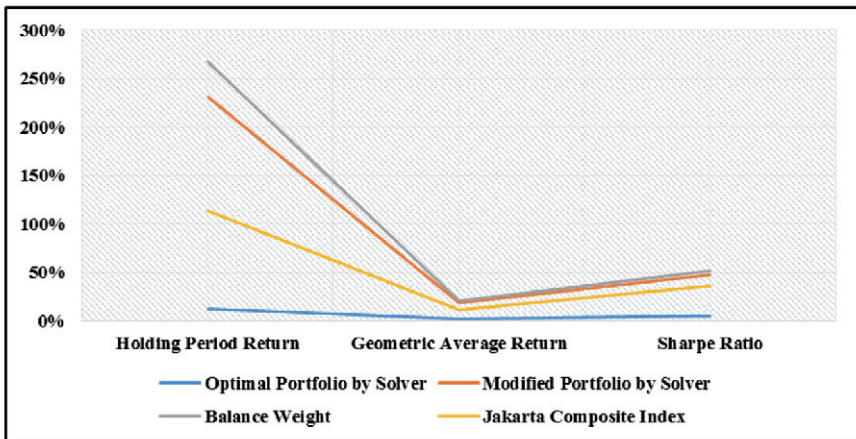
For measuring the effectiveness of strategy implementation to investment portfolio, the author use Sharpe ratio and additional indicators such as holding period return and geometric average return. By assuming some research limitations, sector rotation strategy with balance weight method has the best result in comparison with other strategies. Nevertheless, optimal portfolio by Solver which gives the lowest result than the others indicates insufficient historical data cannot forecast the future performance precisely although the result is still positive and not too bad for being counted.

In summarized, it was proved that sector rotation strategy based on modified portfolio by Solver and balance weight are effective for maximizing investors' wealth as well as give superior return in comparison with passive strategy. The author also conclude that sector rotation strategy is possible to be implemented into the real investment world.

5.2. Recommendation

The author recommended for the investors to consider using sector rotation investment strategy in optimizing their investment portfolio. Balance weight method is preferred than modified portfolio by Solver method because it generates higher ending investment and risk adjusted return. Nonetheless, investors should rethink about all assumptions in this research to be implemented in the real investment world such as sufficient historical market price, positive annual growth expectation, transaction fee, lot size, and so forth. The investors should also make careful decision in analyzing business cycle phase, sector choice, stock selection, and investment portfolio construction by keep updating the information regularly. For further research, the author recommended to keep using sector rotation investment strategy in future period and assess its performance whether the strategy will be still effective and feasible to apply or not.

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APPENDICES

Appendix A Jakarta Composite Index and Sectoral Indices

1. Quarterly Adjusted Close Price in Period of Q1/2000-Q4/2007

Quarterly Date	JKSE Adj Close	JKAGRI Adj Close	JKMING Adj Close	JKBIND Adj Close	JKMISC Adj Close	JKCONS Adj Close	JKPROP Adj Close	JKINFA Adj Close	JKFINA Adj Close	JKTRAD Adj Close
Q1/2000	Rp 583.28	Rp 280.13	Rp 149.35	Rp 111.89	Rp 127.72	Rp 150.43	Rp 48.58	Rp 137.11	Rp 56.46	Rp 192.22
Q2/2000	Rp 515.11	Rp 220.63	Rp 156.52	Rp 100.13	Rp 108.83	Rp 144.49	Rp 40.46	Rp 113.22	Rp 46.71	Rp 165.79
Q3/2000	Rp 421.34	Rp 177.30	Rp 132.71	Rp 68.19	Rp 92.55	Rp 127.00	Rp 31.00	Rp 96.82	Rp 38.29	Rp 125.19
Q4/2000	Rp 416.32	Rp 176.18	Rp 129.67	Rp 60.08	Rp 95.23	Rp 141.12	Rp 27.86	Rp 82.12	Rp 36.69	Rp 130.62
Q1/2001	Rp 381.05	Rp 127.07	Rp 115.89	Rp 44.74	Rp 78.88	Rp 138.76	Rp 24.26	Rp 87.97	Rp 31.75	Rp 109.42
Q2/2001	Rp 437.62	Rp 148.04	Rp 132.88	Rp 50.82	Rp 84.33	Rp 153.94	Rp 25.15	Rp 114.90	Rp 35.11	Rp 127.06
Q3/2001	Rp 392.48	Rp 154.91	Rp 121.77	Rp 47.88	Rp 78.92	Rp 133.14	Rp 26.60	Rp 97.31	Rp 37.55	Rp 109.53
Q4/2001	Rp 392.04	Rp 119.04	Rp 118.84	Rp 40.53	Rp 73.48	Rp 129.10	Rp 26.97	Rp 112.84	Rp 36.69	Rp 111.28
Q1/2002	Rp 481.77	Rp 167.41	Rp 121.26	Rp 43.56	Rp 83.85	Rp 165.99	Rp 34.17	Rp 138.66	Rp 54.33	Rp 121.73
Q2/2002	Rp 505.01	Rp 187.19	Rp 113.79	Rp 47.09	Rp 100.87	Rp 172.39	Rp 33.54	Rp 133.55	Rp 56.94	Rp 142.19
Q3/2002	Rp 419.31	Rp 125.44	Rp 87.22	Rp 38.64	Rp 80.24	Rp 138.84	Rp 24.63	Rp 125.59	Rp 47.92	Rp 111.85
Q4/2002	Rp 424.95	Rp 144.35	Rp 94.87	Rp 36.92	Rp 88.13	Rp 135.47	Rp 24.33	Rp 129.41	Rp 51.03	Rp 107.61
Q1/2003	Rp 398.00	Rp 120.17	Rp 105.48	Rp 36.91	Rp 87.10	Rp 125.25	Rp 22.47	Rp 119.27	Rp 46.38	Rp 95.09
Q2/2003	Rp 505.50	Rp 137.20	Rp 108.89	Rp 48.30	Rp 102.74	Rp 170.96	Rp 30.26	Rp 148.35	Rp 59.04	Rp 116.84
Q3/2003	Rp 597.65	Rp 161.53	Rp 162.55	Rp 59.71	Rp 119.91	Rp 189.76	Rp 46.30	Rp 177.31	Rp 70.45	Rp 133.82
Q4/2003	Rp 691.90	Rp 182.83	Rp 332.63	Rp 63.87	Rp 124.59	Rp 209.38	Rp 42.11	Rp 221.29	Rp 78.84	Rp 142.10
Q1/2004	Rp 735.68	Rp 211.00	Rp 359.02	Rp 65.93	Rp 128.12	Rp 206.36	Rp 43.19	Rp 235.63	Rp 94.04	Rp 149.16
Q2/2004	Rp 732.40	Rp 223.48	Rp 329.52	Rp 54.23	Rp 129.30	Rp 218.67	Rp 45.31	Rp 250.07	Rp 89.62	Rp 137.99
Q3/2004	Rp 820.13	Rp 249.28	Rp 414.96	Rp 68.78	Rp 150.14	Rp 216.88	Rp 59.46	Rp 272.50	Rp 104.44	Rp 148.72
Q4/2004	Rp 1,000.23	Rp 304.66	Rp 491.16	Rp 98.33	Rp 192.01	Rp 233.32	Rp 68.21	Rp 332.54	Rp 133.72	Rp 171.14
Q1/2005	Rp 1,080.17	Rp 387.88	Rp 549.70	Rp 102.61	Rp 217.20	Rp 297.14	Rp 84.89	Rp 312.86	Rp 138.24	Rp 188.45
Q2/2005	Rp 1,122.38	Rp 403.24	Rp 622.15	Rp 111.12	Rp 249.91	Rp 279.70	Rp 78.53	Rp 350.19	Rp 137.64	Rp 194.48
Q3/2005	Rp 1,079.28	Rp 483.40	Rp 647.02	Rp 96.46	Rp 204.52	Rp 259.29	Rp 62.86	Rp 381.91	Rp 128.21	Rp 191.18
Q4/2005	Rp 1,162.64	Rp 493.45	Rp 604.57	Rp 104.24	Rp 204.67	Rp 280.83	Rp 64.12	Rp 472.87	Rp 131.48	Rp 196.18
Q1/2006	Rp 1,322.97	Rp 645.81	Rp 746.75	Rp 122.47	Rp 220.67	Rp 293.90	Rp 79.33	Rp 561.50	Rp 145.34	Rp 213.18
Q2/2006	Rp 1,310.26	Rp 661.25	Rp 729.65	Rp 111.45	Rp 192.43	Rp 299.32	Rp 77.43	Rp 585.96	Rp 142.39	Rp 212.68
Q3/2006	Rp 1,534.61	Rp 857.53	Rp 760.04	Rp 122.56	Rp 234.47	Rp 343.54	Rp 83.78	Rp 666.51	Rp 180.30	Rp 247.55
Q4/2006	Rp 1,805.52	Rp 1,218.45	Rp 933.21	Rp 147.10	Rp 284.12	Rp 392.46	Rp 122.92	Rp 771.62	Rp 206.57	Rp 275.08
Q1/2007	Rp 1,830.92	Rp 1,221.73	Rp 1,346.42	Rp 145.59	Rp 257.50	Rp 385.83	Rp 143.24	Rp 729.74	Rp 197.42	Rp 304.26
Q2/2007	Rp 2,139.28	Rp 1,680.12	Rp 1,647.04	Rp 196.10	Rp 324.96	Rp 437.01	Rp 211.72	Rp 750.43	Rp 223.14	Rp 387.38
Q3/2007	Rp 2,359.21	Rp 1,843.72	Rp 2,023.91	Rp 205.86	Rp 372.70	Rp 421.42	Rp 242.83	Rp 853.05	Rp 246.49	Rp 368.91
Q4/2007	Rp 2,745.83	Rp 2,754.76	Rp 3,270.09	Rp 238.05	Rp 477.35	Rp 436.04	Rp 251.82	Rp 874.07	Rp 260.57	Rp 392.24

2. Percentage Change of Quarterly Adjusted Price in Period of Q1/2000-Q4/2007

Quarterly Date	JKSE Adj Close	JKAGRI Adj Close	JKMING Adj Close	JKBIND Adj Close	JKMISC Adj Close	JKCONS Adj Close	JKPROP Adj Close	JKINFA Adj Close	JKFINA Adj Close	JKTRAD Adj Close
Q1/2000	-	-	-	-	-	-	-	-	-	-
Q2/2000	-11.69%	-21.24%	4.80%	-10.51%	-14.79%	-3.95%	-16.71%	-17.42%	-17.27%	-13.75%
Q3/2000	-18.20%	-19.64%	-15.21%	-31.90%	-14.96%	-12.10%	-23.38%	-14.49%	-18.03%	-24.49%
Q4/2000	-1.19%	-0.63%	-2.29%	-11.89%	2.90%	11.12%	-10.13%	-15.18%	-4.18%	4.34%
Q1/2001	-8.47%	-27.87%	-10.63%	-25.53%	-17.17%	-1.67%	-12.92%	7.12%	-13.46%	-16.23%
Q2/2001	14.85%	16.50%	14.66%	13.59%	6.91%	10.94%	3.67%	30.61%	10.58%	16.12%
Q3/2001	-10.31%	4.64%	-8.36%	-5.79%	-6.42%	-13.51%	5.77%	-15.31%	6.95%	-13.80%
Q4/2001	-0.11%	-23.16%	-2.41%	-15.35%	-6.89%	-3.03%	1.39%	15.96%	-2.29%	1.60%
Q1/2002	22.89%	40.63%	2.04%	7.48%	14.11%	28.57%	26.70%	22.88%	48.08%	9.39%
Q2/2002	4.82%	11.82%	-6.16%	8.10%	20.30%	3.86%	-1.84%	-3.69%	4.80%	16.81%
Q3/2002	-16.97%	-32.99%	-23.35%	-17.94%	-20.45%	-19.46%	-26.57%	-5.96%	-15.84%	-21.34%
Q4/2002	1.35%	15.07%	8.77%	-4.45%	9.83%	-2.43%	-1.22%	3.04%	6.49%	-3.79%
Q1/2003	-6.34%	-16.75%	11.18%	-0.03%	-1.17%	-7.54%	-7.64%	-7.84%	-9.11%	-11.63%
Q2/2003	27.01%	14.17%	3.23%	30.86%	17.96%	36.50%	34.67%	24.38%	27.30%	22.87%
Q3/2003	18.23%	17.73%	49.28%	23.62%	16.71%	11.00%	53.01%	19.52%	19.33%	14.53%
Q4/2003	15.77%	13.19%	104.63%	6.97%	3.90%	10.34%	-9.05%	24.80%	11.91%	6.19%
Q1/2004	6.33%	15.41%	7.93%	3.23%	2.83%	-1.44%	2.56%	6.48%	19.28%	4.97%
Q2/2004	-0.45%	5.91%	-8.22%	-17.75%	0.92%	5.97%	4.91%	6.13%	-4.70%	-7.49%
Q3/2004	11.98%	11.54%	25.93%	26.83%	16.12%	-0.82%	31.23%	8.97%	16.54%	7.78%
Q4/2004	21.96%	22.22%	18.36%	42.96%	27.89%	7.58%	14.72%	22.03%	28.04%	15.08%
Q1/2005	7.99%	27.32%	11.92%	4.35%	13.12%	27.35%	24.45%	-5.92%	3.38%	10.11%
Q2/2005	3.91%	3.96%	13.18%	8.29%	15.06%	-5.87%	-7.49%	11.93%	-0.43%	3.20%
Q3/2005	-3.84%	19.88%	4.00%	-13.19%	-18.16%	-7.30%	-19.95%	9.06%	-6.85%	-1.70%
Q4/2005	7.72%	2.08%	-6.56%	8.07%	0.07%	8.31%	2.00%	23.82%	2.55%	2.62%
Q1/2006	13.79%	30.88%	23.52%	17.49%	7.82%	4.65%	23.72%	18.74%	10.54%	8.67%
Q2/2006	-0.96%	2.39%	-2.29%	-9.00%	-12.80%	1.84%	-2.40%	4.36%	-2.03%	-0.23%
Q3/2006	17.12%	29.68%	4.17%	9.97%	21.85%	14.77%	8.20%	13.75%	26.62%	16.40%
Q4/2006	17.65%	42.09%	22.78%	20.02%	21.18%	14.24%	46.72%	15.77%	14.57%	11.12%
Q1/2007	1.41%	0.27%	44.28%	-1.03%	-9.37%	-1.69%	16.53%	-5.43%	-4.43%	10.61%
Q2/2007	16.84%	37.52%	22.33%	34.69%	26.20%	13.26%	47.81%	2.84%	13.03%	27.32%
Q3/2007	10.28%	9.74%	22.88%	4.98%	14.69%	-3.57%	14.69%	13.67%	10.46%	-4.77%
Q4/2007	16.39%	49.41%	61.57%	15.64%	28.08%	3.47%	3.70%	2.46%	5.71%	6.32%

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Appendix B LQ45 Index in Period of August 2007 – January 2008

No	Stock Code	Emitted Name	Information	Sector
		LQ 45, August 2007 – January 2008		
1	AALI	Astra Agro Lestari Tbk	Fixed	JKAGRI
2	ADHI	Adhi Karya (Persero) Tbk	Fixed	JKPROP
3	ANTM	Aneka Tambang (Persero) Tbk	Fixed	JKMING
4	ASII	Astra International Tbk	Fixed	JKMISC
5	BBCA	Bank Central Asia Tbk	Fixed	JKFINA
6	**BBKP**	**Bank Bukopin Tbk**	**New**	**JKFINA**
7	BBRI	Bank Rakyat Indonesia (Persero) Tbk	Fixed	JKFINA
8	BDMN	Bank Danamon Indonesia Tbk	Fixed	JKFINA
9	**BHIT**	**Bhakti Investama Tbk**	**New**	**JKTRAD**
10	BLTA	Berlian Laju Tanker Tbk	Fixed	JKINFA
11	BMRI	Bank Mandiri (Persero) Tbk	Fixed	JKFINA
12	**BMTR**	**Global Mediacom Tbk**	**New**	**JKTRAD**
13	BNBR	Bakrie & Brothers Tbk	Fixed	JKFINA
14	BNGA	Bank Niaga Tbk	Fixed	JKFINA
15	BNII	Bank International Indonesia Tbk	Fixed	JKFINA
16	**BRPT**	**Barito Pacific Timber Tbk**	**New**	**JKBIND**
17	BTEL	Bakrie Telecom Tbk	Fixed	JKINFA
18	BUMI	Bumi Resources Tbk	Fixed	JKMING
19	CMNP	Citra Marga Nusaphala Persada Tbk	Fixed	JKINFA
20	**CPRO**	**Central Proteinaprima Tbk**	**New**	**JKAGRI**
21	CTRA	Ciputra Development Tbk	Fixed	JKPROP
22	CTRS	Ciputra Surya Tbk	Fixed	JKPROP
23	**ELTY**	**Bakrieland Development Tbk**	**New**	**JKPROP**
24	ENRG	Energi Mega Persada Tbk	Fixed	JKMING
25	INCO	International Nickel Indonesia Tbk	Fixed	JKMING
26	INDF	Indofood Sukses Makmur Tbk	Fixed	JKCONS
27	INKP	Indah Kiat Pulp & Paper Tbk	Fixed	JKBIND
28	ISAT	Indosat Tbk	Fixed	JKINFA
29	KIJA	Kawasan Industri Jababeka Tbk	Fixed	JKPROP
30	KLBF	Kalbe Farma Tbk	Fixed	JKCONS
31	LSIP	PP London Sumatera Tbk	Fixed	JKAGRI
32	MEDC	Medco Energi International Tbk	Fixed	JKMING
33	PGAS	Perusahaan Gas Negara (Persero) Tbk	Fixed	JKINFA
34	PNBN	Bank Pan Indonesia Tbk	Fixed	JKFINA
35	PNLF	Panin Life Tbk	Fixed	JKFINA
36	PTBA	Tambang Batubara Bukit Asam Tbk	Fixed	JKMING
37	SMCB	Holcim Indonesia Tbk	Fixed	JKBIND
38	SULI	Sumalindo Lestari Jaya Tbk	Fixed	JKBIND
39	**TINS**	**Timah Tbk**	**New**	**JKMING**
40	TLKM	Telekomunikasi Indonesia Tbk	Fixed	JKINFA
41	TOTL	Total Bangun Persada Tbk	Fixed	JKPROP
42	**TRUB**	**Truba Alam Manunggal Engineering Tbk**	**New**	**JKINFA**
43	TSPC	Tempo Scan Pacific Tbk	Fixed	JKCONS
44	UNSP	Bakrie Sumatra Plantations Tbk	Fixed	JKAGRI
45	UNTR	United Tractors Tbk	Fixed	JKTRAD

Appendix C Monthly Adjusted Close Price of Selected Stock in Period of 2004-2007

		JKAGRI		JKMING	JKBIND		JKMISC	JKCONS		JKPROP			JKINFRA		JKFINA			JKTRAD	
Year	Mo	AALI	LSIP	PTBA	SMCB	INKP	ASII	INDF	KLBF	CTRA	KIJA	ADHI	TLKM	PGAS	BBRI	BBCA	BMRI	UNTR	BHIT
2004	8	Rp2,088.28	Rp164.71	Rp620.82	Rp273.42	Rp683.41	Rp245.25	Rp580.43	Rp59.14	Rp186.77	Rp112.59	Rp291.60	Rp346.86	Rp185.59	Rp742.57	Rp834.78	Rp1,273.83	Rp1,132.67	Rp16.26
	9	Rp2,129.63	Rp164.71	Rp680.90	Rp331.69	Rp829.86	Rp264.56	Rp580.43	Rp64.91	Rp193.77	Rp112.59	Rp373.07	Rp363.58	Rp185.59	Rp882.48	Rp927.54	Rp1,383.64	Rp1,194.45	Rp17.16
	10	Rp2,419.09	Rp187.69	Rp740.98	Rp372.03	Rp829.86	Rp303.18	Rp580.43	Rp79.33	Rp200.78	Rp112.59	Rp394.52	Rp417.91	Rp193.66	Rp839.43	Rp1,113.04	Rp1,603.28	Rp1,523.96	Rp17.46
	11	Rp2,729.23	Rp237.49	Rp1,141.52	Rp466.16	Rp878.67	Rp347.59	Rp644.92	Rp79.33	Rp219.45	Rp117.48	Rp493.14	Rp403.28	Rp225.93	Rp1,043.90	Rp1,275.36	Rp1,691.13	Rp1,647.53	Rp16.26
	12	Rp2,563.82	Rp218.33	Rp1,221.62	Rp515.46	Rp1,000.71	Rp370.77	Rp687.92	Rp83.66	Rp219.45	Rp112.59	Rp578.91	Rp401.19	Rp306.62	Rp1,237.62	Rp1,379.71	Rp1,704.30	Rp1,874.06	Rp15.65
2005	1	Rp2,481.12	Rp211.44	Rp1,321.76	Rp546.84	Rp1,220.38	Rp388.15	Rp748.11	Rp100.97	Rp198.44	Rp122.38	Rp806.18	Rp369.85	Rp411.52	Rp1,183.81	Rp1,333.33	Rp1,590.10	Rp2,347.72	Rp15.05
	2	Rp2,563.82	Rp220.63	Rp1,329.77	Rp519.94	Rp1,220.38	Rp417.11	Rp799.71	Rp98.08	Rp193.77	Rp127.27	Rp883.37	Rp374.03	Rp439.76	Rp1,409.81	Rp1,518.84	Rp1,502.25	Rp2,491.88	Rp15.35
	3	Rp3,308.16	Rp266.60	Rp1,217.62	Rp421.33	Rp1,288.72	Rp405.53	Rp997.48	Rp96.64	Rp303.50	Rp141.96	Rp754.72	Rp357.31	Rp367.14	Rp1,226.86	Rp1,576.81	Rp1,405.61	Rp2,368.31	Rp14.75
	4	Rp2,977.35	Rp314.09	Rp1,241.65	Rp389.96	Rp1,220.38	Rp407.46	Rp877.10	Rp103.85	Rp256.81	Rp112.59	Rp626.08	Rp388.65	Rp419.59	Rp1,151.52	Rp1,426.09	Rp1,458.32	Rp2,430.09	Rp13.55
	5	Rp3,018.70	Rp306.43	Rp1,249.66	Rp425.82	Rp1,318.01	Rp451.87	Rp1,031.88	Rp102.41	Rp256.81	Rp122.38	Rp694.69	Rp417.91	Rp447.83	Rp1,248.38	Rp1,611.59	Rp1,317.76	Rp2,697.82	Rp14.15
	6	Rp3,287.49	Rp333.25	Rp1,273.69	Rp510.98	Rp1,318.01	Rp490.49	Rp945.89	Rp100.97	Rp289.49	Rp122.38	Rp711.84	Rp463.88	Rp463.97	Rp1,248.38	Rp1,669.57	Rp1,414.40	Rp3,068.51	Rp13.85
	7	Rp3,411.54	Rp360.06	Rp1,257.67	Rp484.08	Rp1,249.67	Rp509.80	Rp937.29	Rp92.31	Rp280.15	Rp122.38	Rp660.38	Rp430.44	Rp520.46	Rp1,377.52	Rp1,692.75	Rp1,203.56	Rp3,665.73	Rp12.64
	8	Rp3,370.19	Rp317.93	Rp1,393.85	Rp367.55	Rp937.25	Rp392.01	Rp679.32	Rp89.43	Rp163.42	Rp88.11	Rp458.84	Rp447.16	Rp576.94	Rp1,108.48	Rp1,588.41	Rp1,273.83	Rp3,192.07	Rp11.74
	9	Rp4,238.58	Rp386.87	Rp1,305.73	Rp412.37	Rp898.20	Rp376.56	Rp627.73	Rp82.22	Rp149.42	Rp97.90	Rp471.70	Rp417.91	Rp673.77	Rp1,162.28	Rp1,600.00	Rp1,159.63	Rp3,192.07	Rp10.24
	10	Rp4,466.02	Rp440.50	Rp1,425.89	Rp407.89	Rp898.20	Rp359.18	Rp705.12	Rp83.66	Rp128.40	Rp88.11	Rp454.55	Rp459.70	Rp871.46	Rp1,054.67	Rp1,495.65	Rp1,133.27	Rp3,047.91	Rp10.54
	11	Rp4,548.72	Rp451.99	Rp1,353.80	Rp407.89	Rp839.62	Rp351.46	Rp730.91	Rp142.80	Rp130.74	Rp83.22	Rp454.55	Rp493.13	Rp1,153.88	Rp1,280.67	Rp1,530.44	Rp1,440.75	Rp2,965.54	Rp11.14
	12	Rp4,052.50	Rp451.99	Rp1,441.92	Rp425.82	Rp1,054.41	Rp393.94	Rp782.51	Rp187.51	Rp140.08	Rp88.11	Rp617.50	Rp526.56	Rp1,113.53	Rp1,302.19	Rp1,576.81	Rp1,563.74	Rp3,027.32	Rp11.44
2006	1	Rp4,176.55	Rp448.16	Rp1,570.09	Rp510.98	Rp1,054.41	Rp401.66	Rp756.71	Rp196.17	Rp207.78	Rp88.11	Rp694.69	Rp576.71	Rp1,339.47	Rp1,463.62	Rp1,681.16	Rp1,528.60	Rp3,150.89	Rp10.54
	2	Rp4,879.54	Rp566.90	Rp1,642.18	Rp555.80	Rp986.07	Rp378.49	Rp722.32	Rp196.17	Rp196.11	Rp107.69	Rp694.69	Rp631.04	Rp1,557.33	Rp1,399.05	Rp1,669.57	Rp1,686.73	Rp3,273.44	Rp10.24
	3	Rp5,086.30	Rp624.36	Rp1,662.21	Rp573.73	Rp1,015.36	Rp442.22	Rp765.31	Rp219.25	Rp205.45	Rp127.27	Rp729.00	Rp618.50	Rp1,613.82	Rp1,711.14	Rp1,936.23	Rp1,936.23	Rp3,624.55	Rp10.24
	4	Rp5,458.47	Rp597.55	Rp2,403.19	Rp609.59	Rp1,112.99	Rp461.53	Rp971.69	Rp193.28	Rp212.45	Rp151.75	Rp789.03	Rp589.25	Rp2,001.13	Rp1,990.59	Rp2,028.99	Rp1,546.17	Rp4,489.50	Rp9.93
	5	Rp5,375.76	Rp570.73	Rp2,683.57	Rp493.05	Rp956.78	Rp378.49	Rp808.31	Rp188.96	Rp217.12	Rp117.48	Rp634.65	Rp614.32	Rp1,976.92	Rp1,700.38	Rp1,901.45	Rp1,484.67	Rp4,448.31	Rp8.13
	6	Rp5,375.76	Rp532.43	Rp2,523.35	Rp502.01	Rp859.15	Rp376.56	Rp756.71	Rp180.30	Rp205.45	Rp127.27	Rp566.04	Rp622.68	Rp1,815.54	Rp1,764.95	Rp1,901.45	Rp1,511.03	Rp4,448.31	Rp9.93
	7	Rp6,905.79	Rp685.65	Rp2,623.49	Rp502.01	Rp868.91	Rp370.77	Rp902.89	Rp173.09	Rp214.78	Rp122.38	Rp514.59	Rp660.29	Rp1,904.30	Rp1,840.28	Rp1,936.23	Rp1,546.17	Rp4,613.06	Rp14.15
	8	Rp7,608.77	Rp735.44	Rp2,723.62	Rp475.12	Rp898.20	Rp428.70	Rp1,023.28	Rp161.55	Rp275.49	Rp122.38	Rp437.40	Rp706.26	Rp2,041.48	Rp1,872.57	Rp2,110.15	Rp1,844.87	Rp4,736.63	Rp17.16
	9	Rp7,526.07	Rp677.98	Rp2,703.59	Rp510.98	Rp878.67	Rp480.84	Rp1,074.87	Rp190.40	Rp284.82	Rp122.38	Rp523.16	Rp742.08	Rp1,944.65	Rp2,109.33	Rp2,237.68	Rp2,042.53	Rp4,983.76	Rp21.98
	10	Rp8,063.64	Rp708.63	Rp2,763.67	Rp510.98	Rp898.20	Rp517.53	Rp1,143.67	Rp196.17	Rp270.82	Rp117.48	Rp600.35	Rp827.46	Rp1,839.75	Rp2,109.33	Rp2,156.52	Rp2,393.93	Rp5,395.63	Rp27.39
	11	Rp8,807.98	Rp819.71	Rp2,603.46	Rp484.08	Rp917.73	Rp616.01	Rp1,203.86	Rp170.20	Rp303.50	Rp122.38	Rp694.69	Rp844.17	Rp1,759.06	Rp2,303.05	Rp2,457.97	Rp2,437.86	Rp5,313.26	Rp30.10
	12	Rp10,420.71	Rp1,020.71	Rp2,823.75	Rp600.62	Rp917.73	Rp606.36	Rp1,160.86	Rp171.65	Rp354.86	Rp151.75	Rp686.11	Rp844.17	Rp1,872.03	Rp2,216.95	Rp2,411.60	Rp2,547.67	Rp5,395.63	Rp28.90
2007	1	Rp10,916.93	Rp812.05	Rp2,503.33	Rp582.69	Rp849.38	Rp573.53	Rp1,453.23	Rp187.51	Rp373.54	Rp162.52	Rp604.69	Rp779.84	Rp1,516.99	Rp2,281.52	Rp2,365.22	Rp2,262.16	Rp5,560.39	Rp52.98
	2	Rp10,379.36	Rp919.30	Rp2,643.51	Rp591.66	Rp868.91	Rp542.63	Rp1,341.44	Rp175.97	Rp392.22	Rp175.24	Rp608.93	Rp743.87	Rp1,444.36	Rp2,044.76	Rp2,284.06	Rp2,042.53	Rp5,725.14	Rp62.61
	3	Rp10,420.71	Rp949.94	Rp2,763.67	Rp591.66	Rp849.38	Rp509.80	Rp1,307.05	Rp174.53	Rp429.57	Rp215.38	Rp643.23	Rp823.28	Rp1,508.92	Rp2,173.90	Rp2,365.22	Rp2,196.27	Rp6,095.83	Rp63.82
	4	Rp13,025.88	Rp1,003.57	Rp3,124.15	Rp645.45	Rp1,044.64	Rp556.15	Rp1,410.23	Rp181.74	Rp452.92	Rp190.91	Rp746.15	Rp798.20	Rp1,694.51	Rp2,260.00	Rp2,457.97	Rp2,701.41	Rp6,507.71	Rp76.46
	5	Rp12,488.31	Rp1,011.23	Rp4,205.59	Rp681.30	Rp1,112.99	Rp633.39	Rp1,487.63	Rp178.86	Rp448.25	Rp220.28	Rp866.22	Rp823.28	Rp1,654.16	Rp2,625.90	Rp2,434.78	Rp2,855.15	Rp6,219.40	Rp81.88
	6	Rp11,371.80	Rp955.91	Rp5,246.97	Rp851.63	Rp1,103.22	Rp652.70	Rp1,741.30	Rp200.50	Rp420.23	Rp210.49	Rp943.41	Rp906.86	Rp1,525.06	Rp2,475.24	Rp2,527.54	Rp2,745.33	Rp6,796.03	Rp81.28
	7	Rp12,695.07	Rp1,011.23	Rp5,327.08	Rp905.42	Rp1,103.22	Rp724.15	Rp1,719.80	Rp214.92	Rp429.57	Rp215.38	Rp1,303.62	Rp919.40	Rp1,492.78	Rp2,712.00	Rp2,921.74	Rp3,096.73	Rp7,084.35	Rp73.45
	8	Rp11,826.68	Rp995.91	Rp4,606.12	Rp923.35	Rp907.96	Rp689.39	Rp1,599.41	Rp196.17	Rp354.86	Rp215.38	Rp1,054.90	Rp888.50	Rp1,654.16	Rp2,690.47	Rp2,782.61	Rp2,855.15	Rp6,672.46	Rp54.79
	9	Rp13,894.28	Rp1,064.86	Rp5,246.97	Rp1,021.96	Rp917.73	Rp743.47	Rp1,659.61	Rp191.84	Rp434.24	Rp279.02	Rp1,072.05	Rp848.35	Rp1,944.65	Rp2,841.14	Rp2,852.18	Rp3,096.73	Rp6,754.84	Rp58.40
	10	Rp18,608.41	Rp1,478.54	Rp7,249.63	Rp1,255.00	Rp898.20	Rp988.71	Rp1,891.78	Rp196.17	Rp415.56	Rp189.93	Rp1,337.92	Rp848.35	Rp2,259.34	Rp3,336.19	Rp3,385.51	Rp3,316.36	Rp9,020.15	Rp68.64
	11	Rp21,048.18	Rp1,608.78	Rp9,692.88	Rp1,479.15	Rp820.09	Rp965.54	Rp2,171.25	Rp175.97	Rp303.50	Rp225.17	Rp1,174.97	Rp848.35	Rp2,727.35	Rp3,357.71	Rp3,292.76	Rp3,118.70	Rp9,267.34	Rp64.42
	12	Rp23,157.13	Rp1,631.76	Rp9,612.77	Rp1,568.79	Rp820.09	Rp1,054.37	Rp2,214.24	Rp181.74	Rp415.56	Rp225.17	Rp1,166.39	Rp848.35	Rp2,477.21	Rp3,185.52	Rp3,385.51	Rp3,074.77	Rp8,979.03	Rp63.22

Appendix D Monthly Log Return of Selected Stock in Period of 2004-2007

		JKAGRI		JKMING	JKBIND		JKMISC	JKCONS		JKPROP			JKINFA		JKFINA			JKTRAD	
		AALI	LSIP	PTBA	SMCB	INKP	ASII	INDF	KLBF	CTRA	KIJA	ADHI	TLKM	PGAS	BBRI	BBCA	BMRI	UNTR	BHIT
2004	9	1.96%	0.00%	9.24%	19.32%	19.42%	7.58%	0.00%	9.31%	3.68%	0.00%	24.64%	4.71%	0.00%	17.26%	10.54%	8.27%	5.31%	5.41%
	10	12.74%	13.06%	8.46%	11.48%	0.00%	13.63%	0.00%	20.06%	3.55%	-9.10%	5.59%	13.93%	4.26%	-5.00%	18.23%	14.73%	24.36%	1.74%
	11	12.06%	23.53%	43.21%	22.56%	5.72%	13.67%	10.54%	0.00%	8.89%	13.35%	22.31%	-3.56%	15.41%	21.80%	13.61%	5.33%	7.80%	-7.15%
	12	-6.25%	-8.41%	6.78%	10.05%	13.01%	6.46%	6.45%	5.31%	0.00%	-4.26%	16.04%	-0.52%	30.54%	17.02%	7.86%	0.78%	12.88%	-3.77%
2005	1	-3.28%	-3.21%	7.88%	5.91%	19.85%	4.58%	8.39%	18.81%	-10.06%	8.34%	33.12%	-8.13%	29.42%	-4.45%	-3.42%	-6.94%	22.53%	-3.92%
	2	3.28%	4.25%	0.60%	-5.04%	0.00%	7.20%	6.67%	-2.90%	-2.38%	3.92%	9.14%	1.12%	6.64%	17.47%	13.03%	-5.68%	5.96%	1.98%
	3	25.49%	18.93%	-8.81%	-21.03%	5.45%	-2.82%	22.10%	-1.48%	44.87%	10.92%	-15.74%	-4.57%	-18.05%	-13.90%	3.75%	-6.65%	-5.09%	-4.00%
	4	-10.54%	16.39%	1.95%	-7.74%	-5.45%	0.47%	-12.86%	7.20%	-16.70%	-23.18%	-18.69%	8.41%	13.35%	-6.34%	-10.05%	3.68%	2.58%	-8.52%
	5	1.38%	-2.47%	0.64%	8.80%	7.70%	10.35%	16.25%	-1.40%	0.00%	8.34%	10.40%	7.26%	6.51%	8.08%	12.23%	-10.13%	10.45%	4.35%
	6	8.53%	8.39%	1.90%	18.23%	0.00%	8.20%	-8.70%	-1.42%	11.98%	0.00%	2.44%	10.44%	3.54%	0.00%	3.53%	7.08%	12.87%	-2.15%
	7	3.70%	7.74%	-1.27%	-5.41%	-5.32%	3.86%	-0.91%	-8.97%	-3.28%	0.00%	-7.50%	-7.48%	11.49%	9.84%	1.38%	-16.14%	17.78%	-9.10%
	8	-1.22%	-12.44%	10.28%	-27.54%	-28.77%	-26.27%	-32.19%	-3.17%	-53.90%	-32.85%	-36.41%	3.81%	10.30%	-21.73%	-6.36%	5.67%	-13.84%	-7.41%
	9	22.93%	19.63%	-6.53%	11.51%	-4.26%	-4.02%	-7.90%	-8.41%	-8.96%	10.54%	2.76%	-6.77%	15.52%	4.74%	0.73%	-9.39%	0.00%	-13.72%
	10	5.23%	12.98%	8.80%	-1.09%	0.00%	-4.73%	11.63%	7.20%	-15.16%	-10.54%	-3.70%	9.53%	25.73%	-9.72%	-6.74%	-2.30%	-4.62%	2.90%
	11	1.83%	2.57%	-5.19%	0.00%	-6.74%	-2.17%	3.59%	53.47%	1.81%	-5.72%	0.00%	7.02%	28.07%	19.42%	2.30%	24.01%	-2.74%	5.56%
	12	-11.55%	0.00%	6.31%	4.30%	22.78%	11.41%	6.82%	27.24%	6.90%	5.72%	-3.56%	6.56%	-3.56%	1.67%	2.98%	8.19%	2.06%	2.67%
2006	1	3.02%	-0.85%	8.52%	18.23%	0.00%	1.94%	-3.35%	4.51%	39.43%	0.00%	11.78%	-1.60%	18.47%	11.69%	6.41%	-9.42%	4.00%	-8.22%
	2	15.56%	23.50%	4.49%	8.41%	-6.70%	-5.94%	-4.65%	0.00%	-5.78%	20.07%	0.00%	10.70%	15.07%	-4.51%	-0.69%	7.15%	3.85%	-2.90%
	3	4.15%	9.65%	1.21%	3.18%	2.93%	15.56%	5.78%	11.12%	4.65%	16.71%	4.82%	9.00%	3.56%	20.14%	14.82%	9.84%	10.16%	0.00%
	4	7.06%	-4.39%	36.86%	6.06%	9.18%	4.27%	23.88%	-12.61%	3.35%	17.59%	7.91%	-2.01%	21.51%	15.15%	4.68%	-8.70%	21.40%	-2.98%
	5	-1.53%	-4.59%	11.04%	-21.22%	-15.12%	-19.84%	-18.41%	-2.26%	2.17%	-25.59%	-21.77%	-4.84%	-1.22%	-15.78%	-6.49%	-4.06%	-0.92%	-20.07%
	6	0.00%	-6.95%	-6.16%	1.80%	-10.76%	-0.51%	-6.60%	-4.69%	-5.52%	8.00%	-11.44%	4.17%	-8.52%	3.73%	0.00%	1.76%	0.00%	20.07%
	7	25.05%	25.29%	3.89%	0.00%	1.13%	-1.55%	17.66%	-4.08%	4.44%	0.00%	-9.53%	1.35%	4.77%	4.18%	1.81%	2.30%	3.64%	35.36%
	8	9.69%	7.01%	3.75%	-5.51%	3.32%	14.52%	12.52%	-6.90%	24.89%	-3.92%	-16.25%	5.86%	6.96%	1.74%	8.60%	17.66%	2.64%	19.29%
	9	-1.09%	-8.14%	-0.74%	7.28%	-2.20%	11.48%	4.92%	16.43%	3.33%	0.00%	17.90%	6.73%	-4.86%	11.91%	5.87%	10.18%	5.09%	24.74%
	10	6.90%	4.42%	-2.20%	1.74%	4.35%	7.35%	6.20%	2.99%	-5.04%	-4.08%	13.76%	-0.59%	-5.55%	0.00%	-3.69%	15.87%	7.94%	22.04%
	11	8.83%	14.56%	-5.97%	-7.15%	0.00%	17.42%	5.13%	-14.20%	11.39%	4.08%	14.60%	16.43%	-4.49%	8.79%	13.08%	1.82%	-1.54%	9.43%
	12	16.81%	21.00%	8.12%	21.57%	0.00%	-1.58%	-3.64%	0.85%	15.63%	21.51%	-1.24%	2.00%	6.22%	-3.81%	-1.90%	4.41%	1.54%	-4.08%
2007	1	4.65%	-21.94%	-12.04%	-3.03%	-7.74%	-5.57%	22.46%	8.84%	5.13%	6.86%	1.24%	-6.65%	-21.03%	2.87%	-1.94%	-11.89%	3.01%	60.61%
	2	-5.05%	12.41%	5.45%	1.53%	2.27%	-5.54%	-8.00%	-6.35%	4.88%	7.54%	-13.18%	-6.00%	-4.91%	-10.96%	-3.49%	-10.21%	2.92%	16.71%
	3	0.40%	3.28%	4.45%	0.00%	-2.27%	-6.24%	-2.60%	-0.82%	9.10%	20.62%	5.48%	10.14%	4.37%	6.12%	3.49%	7.26%	6.27%	1.90%
	4	22.31%	5.49%	12.26%	8.70%	20.69%	8.70%	7.60%	4.05%	5.29%	-12.06%	14.84%	6.39%	11.60%	3.88%	3.85%	20.70%	6.54%	18.07%
	5	-4.21%	0.76%	29.73%	5.41%	6.34%	13.00%	5.34%	-1.60%	-1.04%	14.31%	14.92%	-9.48%	-2.41%	15.01%	-0.95%	5.54%	-4.53%	6.85%
	6	-9.37%	-1.53%	22.12%	22.31%	-0.88%	3.00%	15.74%	11.42%	-6.45%	-4.55%	8.54%	3.09%	-8.13%	-5.91%	3.74%	-3.92%	8.87%	-0.74%
	7	11.01%	1.53%	1.52%	6.12%	0.00%	10.39%	-1.24%	6.95%	2.20%	20.91%	32.34%	12.84%	-2.14%	9.13%	14.49%	12.04%	4.15%	-10.13%
	8	-7.09%	-1.53%	-14.54%	1.96%	-19.48%	-4.92%	-7.26%	-9.13%	-19.11%	-18.61%	-21.17%	-3.17%	10.27%	-0.80%	-4.88%	-8.12%	-5.99%	-29.32%
	9	16.11%	6.69%	13.03%	10.15%	1.07%	7.55%	3.69%	-2.23%	20.19%	25.89%	1.61%	1.37%	16.18%	5.45%	2.47%	8.12%	1.23%	6.39%
	10	29.21%	32.82%	32.33%	20.54%	-2.15%	28.51%	13.09%	2.23%	-4.40%	-17.18%	22.15%	-2.30%	15.00%	16.06%	17.14%	6.85%	28.92%	16.15%
	11	12.32%	8.44%	29.04%	16.43%	-9.10%	-2.37%	13.78%	-10.87%	-31.42%	-21.28%	-12.99%	-5.74%	18.83%	0.64%	-2.78%	-6.15%	2.70%	-6.34%
	12	9.55%	1.42%	-0.83%	5.88%	0.00%	8.80%	1.96%	3.23%	31.42%	17.02%	-0.73%	0.00%	-9.62%	-5.26%	2.78%	-1.42%	-3.16%	-1.89%
		6.01%	5.73%	6.85%	4.37%	0.46%	3.65%	3.35%	2.81%	2.00%	1.73%	3.47%	2.24%	6.48%	3.64%	3.50%	2.20%	5.18%	3.40%

Appendix E Optimal Portfolio by Solver Method

1. Recession Phase

		JKMING	JKBIND		JKPROP		
		PTBA	SMCB	INKP	CTRA	KIJA	ADHI
2006	1	8.52%	18.23%	0.00%	39.43%	0.00%	11.78%
	2	4.49%	8.41%	-6.70%	-5.78%	20.07%	0.00%
	3	1.21%	3.18%	2.93%	4.65%	16.71%	4.82%
2007	7	1.52%	6.12%	0.00%	2.20%	20.91%	32.34%
	8	-14.54%	1.96%	-19.48%	-19.11%	-18.61%	-21.17%
	9	13.03%	10.15%	1.07%	20.19%	25.89%	1.61%
	10	32.33%	20.54%	-2.15%	-4.40%	-17.18%	22.15%
	11	29.04%	16.43%	-9.10%	-31.42%	-21.28%	-12.99%
	12	-0.83%	5.88%	0.00%	31.42%	17.02%	-0.73%
		8.31%	10.10%	-3.71%	4.13%	4.84%	4.20%

MATRIX EXCESS RETURN						
	0.21%	8.13%	3.71%	35.30%	-4.84%	7.58%
	-3.82%	-1.69%	-2.99%	-9.91%	15.23%	-4.20%
	-7.09%	-6.93%	6.64%	0.52%	11.87%	0.62%
	-6.79%	-3.98%	3.71%	-1.93%	16.07%	28.14%
X	-22.85%	-8.14%	-15.76%	-23.24%	-23.45%	-25.37%
	4.72%	0.05%	4.78%	16.06%	21.05%	-2.59%
	24.02%	10.44%	1.56%	-8.53%	-22.02%	17.95%
	20.74%	6.33%	-5.38%	-35.56%	-26.11%	-17.19%
	-9.14%	-4.22%	3.71%	27.29%	12.19%	-4.93%

SIGMA					
2.18%	0.86%	0.27%	-0.66%	-1.00%	0.64%
0.86%	0.46%	0.09%	0.09%	-0.58%	0.32%
0.27%	0.09%	0.50%	1.10%	0.87%	0.80%
-0.66%	0.09%	1.10%	5.28%	2.48%	1.41%
-1.00%	-0.58%	0.87%	2.48%	3.70%	1.12%
0.64%	0.32%	0.80%	1.41%	1.12%	2.70%

		Average	Weight	μp	Sigma p	Sigma p'
33%	PTBA	8.31%	0.00%	9.22%	0.26%	5.08%
33%	SMCB	10.10%	**83.25%**			
	INKP	-3.71%	0.00%			
33%	CTRA	4.13%	0.00%			
	KIJA	4.84%	**16.75%**			
	ADHI	4.20%	0.00%			
			100.00%			

Target	9.22%
Sharpe	1.81338

2. Trough Phase

		JKMING	JKCONS		JKINFA	
		PTBA	INDF	KLBF	TLKM	PGAS
	4	36.86%	23.88%	-12.61%	-2.01%	21.51%
2006	5	11.04%	-18.41%	-2.26%	-4.84%	-1.22%
	6	-6.16%	-6.60%	-4.69%	4.17%	-8.52%
		13.91%	-0.38%	-6.52%	-0.90%	3.93%

	MATRIX EXCESS RETURN				
	22.95%	24.25%	-6.09%	-1.11%	17.58%
X	-2.88%	-18.03%	4.26%	-3.95%	-5.14%
	-20.07%	-6.22%	1.83%	5.06%	-12.44%

SIGMA				
4.69%	3.67%	-0.94%	-0.58%	3.34%
3.67%	4.76%	-1.18%	0.06%	2.98%
-0.94%	-1.18%	0.29%	0.00%	-0.76%
-0.58%	0.06%	0.00%	0.21%	-0.31%
3.34%	2.98%	-0.76%	-0.31%	2.45%

		Average	Weight	μp	Sigma p	Sigma p'
33%	PTBA	13.91%	38.72%	4.84%	0.51%	7.13%
33%	INDF	-0.38%	0.00%			
	KLBF	-6.52%	0.00%			
33%	TLKM	-0.90%	61.28%			
	PGAS	3.93%	0.00%			
			100.00%			

Target	4.84%
Sharpe	0.679

3. Expansion Phase

		JKAGRI		JKMING	JKINFA		JKFINA		
		AALI	LSIP	PTBA	TLKM	PGAS	BBRI	BBCA	BMRI
2004	9	1.96%	0.00%	9.24%	4.71%	0.00%	17.26%	10.54%	8.27%
	10	12.74%	13.06%	8.46%	13.93%	4.26%	-5.00%	18.23%	14.73%
	11	12.06%	23.53%	43.21%	-3.56%	15.41%	21.80%	13.61%	5.33%
	12	-6.25%	-8.41%	6.78%	-0.52%	30.54%	17.02%	7.86%	0.78%
2005	1	-3.28%	-3.21%	7.88%	-8.13%	29.42%	-4.45%	-3.42%	-6.94%
	2	3.28%	4.25%	0.60%	1.12%	6.64%	17.47%	13.03%	-5.68%
	3	25.49%	18.93%	-8.81%	-4.57%	-18.05%	-13.90%	3.75%	-6.65%
	4	-10.54%	16.39%	1.95%	8.41%	13.35%	-6.34%	-10.05%	3.68%
	5	1.38%	-2.47%	0.64%	7.26%	6.51%	8.08%	12.23%	-10.13%
	6	8.53%	8.39%	1.90%	10.44%	3.54%	0.00%	3.53%	7.08%
	7	3.70%	7.74%	-1.27%	-7.48%	11.49%	9.84%	1.38%	-16.14%
	8	-1.22%	-12.44%	10.28%	3.81%	10.30%	-21.73%	-6.36%	5.67%
2006	7	25.05%	25.29%	3.89%	1.35%	4.77%	4.18%	1.81%	2.30%
	8	9.69%	7.01%	3.75%	5.86%	6.96%	1.74%	8.60%	17.66%
	9	-1.09%	-8.14%	-0.74%	6.73%	-4.86%	11.91%	5.87%	10.18%
	10	6.90%	4.42%	2.20%	-0.59%	-5.55%	0.00%	-3.69%	15.87%
	11	8.83%	14.56%	-5.97%	16.43%	-4.49%	8.79%	13.08%	1.82%
	12	16.81%	21.00%	8.12%	2.00%	6.22%	-3.81%	-1.90%	4.41%
2007	1	4.65%	-21.94%	-12.04%	-6.65%	-21.03%	2.87%	-1.94%	-11.89%
	2	-5.05%	12.41%	5.45%	-6.00%	-4.91%	-10.96%	-3.49%	-10.21%
	3	0.40%	3.28%	4.45%	10.14%	4.37%	6.12%	3.49%	7.26%
		5.43%	5.89%	4.28%	2.60%	4.52%	2.90%	4.10%	1.78%

				MATRIX EXCESS RETURN					
	-3.47%	-5.89%	4.95%	2.10%	-4.52%	14.36%	6.43%	6.49%
	7.31%	7.17%	4.17%	11.32%	-0.26%	-7.90%	14.13%	12.95%
	6.63%	17.64%	38.93%	-6.17%	10.89%	18.90%	9.51%	3.55%
	-11.68%	-14.30%	2.50%	-3.12%	26.02%	14.12%	3.76%	-1.00%
	-8.71%	-9.10%	3.59%	-10.74%	24.90%	-7.35%	-7.52%	-8.72%
	-2.15%	-1.63%	-3.68%	-1.48%	2.12%	14.57%	8.92%	-7.46%
	20.06%	13.04%	-13.10%	-7.18%	-22.57%	-16.80%	-0.36%	-8.43%
	-15.97%	10.50%	-2.33%	5.80%	8.83%	-9.24%	-14.15%	1.90%
	-4.05%	-8.36%	-3.64%	4.65%	1.99%	5.18%	8.13%	-11.92%
	3.10%	2.50%	-2.38%	7.83%	-0.98%	-2.90%	-0.57%	5.30%
X	-1.73%	1.85%	-5.55%	-10.09%	6.97%	6.94%	-2.72%	-17.92%
	-6.65%	-18.33%	6.00%	1.21%	5.78%	-24.63%	-10.46%	3.89%
	19.61%	19.40%	-0.39%	-1.25%	0.25%	1.28%	-2.29%	0.52%
	4.26%	1.12%	-0.54%	3.26%	2.44%	-1.16%	4.50%	15.88%
	-6.52%	-14.02%	-5.02%	4.13%	-9.38%	9.01%	1.77%	8.40%
	1.47%	-1.47%	-2.09%	-3.20%	-10.07%	-2.90%	-7.80%	14.09%
	3.40%	8.67%	-10.26%	13.83%	-9.01%	5.89%	8.98%	0.04%
	11.38%	15.11%	3.84%	-0.60%	1.70%	-6.71%	-6.01%	2.63%
	-0.78%	-27.82%	-16.33%	-9.26%	-25.55%	-0.03%	-6.04%	-13.67%
	-10.48%	6.52%	1.16%	-8.60%	-9.43%	-13.86%	-7.59%	-11.99%
	-5.03%	-2.61%	0.16%	7.54%	-0.15%	3.22%	-0.61%	5.48%

SIGMA							
0.89%	0.67%	0.00%	0.00%	-0.46%	-0.08%	0.20%	0.13%
0.67%	1.54%	0.42%	0.12%	0.03%	-0.06%	0.13%	0.18%
0.00%	0.42%	1.14%	-0.07%	0.69%	0.32%	0.18%	0.31%
0.00%	0.12%	-0.07%	0.51%	-0.04%	0.04%	0.22%	0.40%
-0.46%	0.03%	0.69%	-0.04%	1.57%	0.29%	0.01%	0.05%
-0.08%	-0.06%	0.32%	0.04%	0.29%	1.26%	0.52%	0.00%
0.20%	0.13%	0.18%	0.22%	0.01%	0.52%	0.58%	0.13%
0.13%	0.18%	0.31%	0.40%	0.05%	0.00%	0.13%	0.91%

		Average	Weight	µp	Sigma p	Sigma p'
25%	AALI	5.43%	**40.33%**	4.34%	0.20%	4.51%
	LSIP	5.89%	0.00%			
25%	PTBA	4.28%	**2.40%**			
25%	TLKM	2.60%	**23.84%**			
	PGAS	4.52%	**24.19%**			
25%	BBRI	2.90%	**4.22%**			
	BBCA	4.10%	**5.03%**			
	BMRI	1.78%	0.00%			
			100.00%			

Target	4.34%
Sharpe	0.96148

4. Peak Phase

		JKAGRI		JKBIND		JKTRAD	
		AALI	LSIP	SMCB	INKP	UNTR	BHIT
2005	10	5.23%	12.98%	-1.09%	0.00%	-4.62%	2.90%
	11	1.83%	2.57%	0.00%	-6.74%	-2.74%	5.56%
	12	-11.55%	0.00%	4.30%	22.78%	2.06%	2.67%
2007	4	22.31%	5.49%	8.70%	20.69%	6.54%	18.07%
	5	-4.21%	0.76%	5.41%	6.34%	-4.53%	6.85%
	6	-9.37%	-1.53%	22.31%	-0.88%	8.87%	-0.74%
		0.71%	3.38%	6.61%	7.03%	0.93%	5.88%

	MATRIX EXCESS RETURN					
X	4.52%	9.60%	-7.70%	-7.03%	-5.55%	-2.99%
	1.13%	-0.81%	-6.61%	-13.77%	-3.67%	-0.33%
	-12.26%	-3.38%	-2.30%	15.75%	1.13%	-3.22%
	21.61%	2.11%	2.10%	13.66%	5.61%	12.19%
	-4.92%	-2.62%	-1.20%	-0.69%	-5.46%	0.96%
	-10.07%	-4.91%	15.71%	-7.91%	7.94%	-6.62%

SIGMA					
1.53%	0.38%	-0.24%	0.28%	0.05%	0.70%
0.38%	0.28%	-0.26%	-0.08%	-0.13%	0.08%
-0.24%	-0.26%	0.72%	0.03%	0.41%	-0.09%
0.28%	-0.08%	0.03%	1.47%	0.25%	0.39%
0.05%	-0.13%	0.41%	0.25%	0.34%	0.05%
0.70%	0.08%	-0.09%	0.39%	0.05%	0.43%

		Average	Weight	μp	Sigma p	Sigma p'
33%	AALI	0.71%	0.00%	4.87%	0.08%	2.83%
	LSIP	3.38%	**55.17%**			
33%	SMCB	6.61%	**34.62%**			
	INKP	7.03%	**10.21%**			
33%	UNTR	0.93%	0.00%			
	BHIT	-7.70%	0.00%			
			100.00%			

Target	4.869%
Sharpe	1.7190126

Appendix F Modified Portfolio by Solver Method

1. Recession Phase

		Average	Weight	µp	Sigma p	Sigma p'
33%	PTBA	8.31%	15.00%	5.19%	0.73%	8.52%
33%	SMCB	10.10%	**25.00%**			
	INKP	-3.71%	15.00%			
	CTRA	4.13%	15.00%			
33%	KIJA	4.84%	**15.00%**			
	ADHI	4.20%	15.00%			
			100.00%			

Target	5.19%
Sharpe	0.60905

2. Trough Phase

		Average	Weight	µp	Sigma p	Sigma p'
33%	PTBA	13.91%	**28.00%**	3.20%	1.22%	11.05%
33%	INDF	-0.38%	18.00%			
	KLBF	-6.52%	18.00%			
33%	TLKM	-0.90%	**18.00%**			
	PGAS	3.93%	18.00%			
			100.00%			

Target	3.20%
Sharpe	0.289

3. Expansion Phase

		Average	Weight	µp	Sigma p	Sigma p'
25%	AALI	5.43%	**21.25%**	4.09%	0.26%	5.05%
	LSIP	5.89%	11.25%			
25%	PTBA	4.28%	**11.25%**			
25%	TLKM	2.60%	**11.25%**			
	PGAS	4.52%	**11.25%**			
	BBRI	2.90%	**11.25%**			
25%	BBCA	4.10%	**11.25%**			
	BMRI	1.78%	11.25%			
			100.00%			

Target	4.09%
Sharpe	0.8095

4. Peak Phase

		Average	Weight	μp	Sigma p	Sigma p'
33%	AALI	0.71%	15.00%	2.30%	0.21%	4.61%
	LSIP	3.38%	**15.00%**			
33%	SMCB	6.61%	**25.00%**			
	INKP	7.03%	**15.00%**			
33%	UNTR	0.93%	15.00%			
	BHIT	-7.70%	15.00%			
			100.00%			

Target	2.304%
Sharpe	0.499442