FORMULATING DYNAMIC PORTFOLIO BETWEEN STOCKS AND FIXED-INCOME INSTRUMENTS IN THE INDONESIAN CAPITAL MARKET

by Robiyanto Robiyanto

FORMULATING DYNAMIC PORTFOLIO BETWEEN STOCKS AND FIXED-INCOME INSTRUMENTS IN THE INDONESIAN CAPITAL MARKET

Robiyanto Robiyanto[1*]

[1] Faculty of Economics and Business, Satya Wacana Christian University,
Jl. Diponegoro No. 52-60, Salatiga 50711, Central Java, Indonesia,
email: robiyanto@staff.uksw.edu

* Corresponding Author

ABSTRACT

This research created a crossed asset portfolio formulation dynamically between stocks and fixed-income instruments. This dynamic portfolio formulation did not require data with were normally distributed and accommodate the correlation among class assets which change across time. This was based on the thought that assumptions exist within Modern Portfolio Theory tend to never be found in the real world like the assumption that stock return was normally distributed and that the correlation among securities was constant at all times. The data used in this research were LQ45 Index as stock market proxy and S&P Indonesia Corporate Bond Index (representing the corporate bond market) and S&P Indonesia Government Bond Index data (representing the government bond market) during June 4, 2007 until April 11, 2016 period of time. This research found that the dynamic portfolio of stock with either government bonds or corporate bonds was able to reduce the level of risk significantly despite producing a lower rate of return when compared to specifically invest in stock market alone. Investors who put forward the principles of prudent investment can use the dynamic approach in shaping the portfolio between stocks and fixed-income instruments.

Keywords: DCC-GARCH, LQ45 Index, S&P Indonesia Corporate Bond Index, S&P Indonesia Government Bond Index, Indonesia Stock Exchange, Dynamic Portfolio.

JEL classification : G11.

Robiyanto Robiyanto, earned his Ph.D. in Finance (2015) from the Faculty of Economics and Business Diponegoro University (FEB UNDIP), Semarang, Indonesia. He is a senior lecturer at the Faculty of Economics and Business, Satya Wacana Christian University, Salatiga, Indonesia. Active as an academic researcher.

1. Introduction

An article entitled *"Portfolio Selection"* written by Markowitz (1952) and refined by Markowitz (1959) has become a cornerstone for Modern Portfolio Theory known today (Fabozzi, Gupta, & Markowitz, 2002). Unfortunately, the assumptions used in Modern Portfolio Theory are likely never to be found in real-world example like the assumption that stock returns are normally distributed. Chion, Veliz, and Carlos (2008) and Canedo and Cruz (2013) openly criticized it and even this criticism was also supported with many studies which found that stock returns will likely not normally distributed in a variety of stock markets as researches from Aparicio and Estrada (1997); Canedo and Cruz (2013); Chion et al. (2008); Kamath, Chakornpipat, and Chatrath (1998); Rachev, Stoyanov, Biglova, and Fabozzi (2004); Richardson and Smith (1993). Another assumption which is often criticized is the assumption that the correlation among securities is constant at all times (Eimer, 2011; Ogata, 2012; Robiyanto, 2018a, 2018b; Robiyanto, Wahyudi, & Pangestuti, 2017). This assumption also underlies the calculation method of portfolio in a more simple approach to the Single Index Model introduced by Sharpe (1964). In fact, the correlation between assets will tend to change with time and market conditions that occur.

Although this Modern Portfolio Theory assumption is widely criticized and the assumption is almost never found in real world but there are still a lot of researches on the establishment of portfolio in Indonesia done by using the assumption foundation in this theory such as Abdilah and Rahayu (2015); Anggraini (2013); Astuti and Sugiharto (2005); Eko (2008); Hamdani, Murhadi, and Sutejo (2015); Kewal (2014); Mirah and Wijaya (2013); Natalia, Darminto, and N.P. (2014); Paramitasari and Mulyono (2015); Sartono and Zulaihati (1998); Sembiring (2012); Sembiring and Rahmah (2014); Septyanto and Kertopati (2014a, 2014b); Triharjono (2013); Wijayanti and Marjono (2013).

Researches from Abdilah and Rahayu (2015); Anggraini (2013); Kewal (2014); Mirah and Wijaya (2013); Sartono and Zulaihati (1998); Sembiring (2012); Triharjono (2013); Wijayanti and Marjono (2013) employed single index model in formulating their portfolio even though the researchers were using stocks that vary based on the type of sector and time period. Conversely, a research from Natalia et al. (2014) employed Markowitz model in their portfolio formulation while Septyanto and Kertopati (2014a, 2014b) employed both Markowitz and Single Index Model in their portfolio formulation. By using the Single Index Model and Markowitz Model, then all these researchers were still using static approach to portfolio formulation. Furthermore, all the researchers also still tended to use one asset class only which was stock in formulating portfolio, whereas, portfolio can be formed using cross-asset class instruments.

About the cross-asset class portfolio, Greer (1997) suggested that asset allocation is strongly associated with the decision in determining the asset portion within portfolio. Further stated that in order to correspond to the real conditions, the asset allocation should also be done among asset classes (Putra, Atahau, & Robiyanto, 2018). It has been also supported by Boido and Fasano (2009) who stated that the portfolio managers need to determine the weight of asset classes in their portfolio. Unfortunately, studies which have been done in the field of portfolio formulation among asset classes in Indonesia are still relatively rare. Therefore, this research seeks to establish portfolio formulation among asset classes which are stocks and fixed-income instruments (government bonds and corporate bonds) by utilizing dynamic approach in Indonesia. This research employs LQ45 Index as a proxy of stock market, while the S&P Indonesia Corporate Bond Index and S&P Indonesia Government Bond Index are used as a proxy of corporate bond market and state bond market in Indonesia. LQ45 Index is used as stock market proxy in Indonesia because the Index is deemed capable of becoming a better market proxy than JCI (Sembiring & Rahmah, 2014) for it only involves 45 actively traded stocks that can avoid bias because the thin trading and also stocks counted into the LQ45 Index calculation capable to represent above 75% of market capitalization in Indonesia Stock Exchange.

2. Literature Review

2.1. Asset Class and Portfolio

Asset class is defined as a collection of assets with the same characteristic of economic fundamental weight that makes it different to the other assets (Greer, 1997). In general, there are three asset classes in the financial world, they are stocks, fixed income instruments (bonds), and cash (Baur, 2013). Stocks asset class is different to the asset class of bonds for the stocks contain element of ownership and possess mutual result in the form of dividend which may change over time, while bonds contain element of debt and are characterized with interest regularly paid.

Asset allocation method is often carried out based on Modern Portfolio Theory developed by Markowitz (1952). Shortly after introducing the Modern Portfolio Theory, Markowitz (1959) stated that a good portfolio more than just a long list which contains stocks and bonds. Further explained that investors need to develop an integrated portfolio that is tailored to their needs. Both investors and portfolio managers need to create decisions about asset allocation.

Portfolio can eliminate risks if the returns securities (both equity and fixed income) have no correlation. If the correlation between the effect returns is perfect then the returns of all effects will move in tandem as a perfect unity and the establishment of portfolio cannot eliminate the risks. Thus, to reduce the risks, the creation of portfolio which consists of securities with high correlation between one and another must be avoided.

2.2. The Establishment of Dynamic Portfolio with *Dynamic Conditional Correlation* (DCC)

Correlation is a very important input in the financial management (Engle, 2002). Asset allocation and risk estimation depend on the correlation, but often a large number of correlation coefficients required. Efforts to find estimated correlation among financial variables have motivated various studies done by the academicians and practitioners in the capital market. A simple method 1 such as using historical correlations and exponential smoothing has been widely applied. Several more complex methods such as various types of GARCH or stochastic volatility have been studied in the econometric literature and used by practitioners with expertise. 10 Engle (2002) proposed a Dynamic Conditional Correlation (DCC) estimator which owns flexibility within GARCH univariate.

This model which provides direct conditional correlation parameter is naturally calculated in two phases which are through a series of GARCH univariate estimation and correlation estimation. This method has advantage in calculation compared to GARCH multivariate in terms of the parameter number 1 to be estimated during the correlation process is independent of the to-be-correlated series number. Thus, a massive potential of correlation matrix can be estimated. This method produces a model with a good prediction in estimating various correlation processes with time variation. The comparison between DCC and 1 GARCH and other methods shows that the DCC often becomes the most accurate method. This DCC method can be expanded to carry out portfolio diversification and the effectiveness of hedging (Robiyanto et al., 2017).

Dynamic portfolio is based on the assumption that correlation will tend to be dynamic rather than static. Therefore, in the calculation of the dynamic portfolio, the conditional correlation is used as a substitute for static correlation. Engle (2002) stated that conditional correlation between two random variables r_1 and r_2 which has an average of zero can be formulated as follows:

$$\rho_{12,t} = \frac{E_{t-1}(r_{1,t} r_{2,t})}{\sqrt{E_{t-1}(r_{1,t}^2) E_{t-1}(r_{2,t}^2)}} \quad \text{.. (1)}$$

In this formula, conditional correlation is based on information known to the prior period, the multiperiode correlation forecasting can be explained in the same way. By applying the law of probabilities, all correlations described in similar ways should be located in the interval (-1 to 1). Conditional Correlation meets this limit for each realization of the past information and for any linier combination of variables.

To explain the relationship between the conditional correlation with conditional variances, it will be easier to write the returns as conditional standard deviation multiplied by standardized disturbances (Engle, 2002) :

$$h_{i,t} = E_{t-1}(r_{i,t}^2), \quad r_{i,t} = \sqrt{h_{i,t}}\varepsilon_{i,t}, \quad i = 1, 2$$

ε is the standardized disturbances which has an average of zero and variance equal to 1 for each series. Substituting the equation into the following equation (3).

$$\rho_{12,t} = \frac{E_{t-1}(\varepsilon_{1,t} \varepsilon_{2,t})}{\sqrt{E_{t-1}(\varepsilon_{1,t}^2) E_{t-1}(\varepsilon_{2,t}^2)}} = E_{t-1}(\varepsilon_{1,t} \varepsilon_{2,t}) \quad \text{.. (2)}$$

Hence, the conditional correlation is also as the conditional variance between the standardized disturbance.

Many estimators have been filed for conditional correlation. The rolling correlation estimator is the most popular one which explains returns with an average of zero as

$$\hat{\rho}_{12,t} = \frac{\sum_{s=t-n-1}^{t-1} r_{1,s} r_{2,s}}{\sqrt{(\sum_{s=t-n-1}^{t-1} r_{1,s}^2)(\sum_{s=t-n-1}^{t-1} r_{2,s}^2)}} \quad \text{.. (3)}$$

By substituting the equation (3), it is clear that the rolling correlation becomes an interesting estimator only in special circumstances. In particular, the rolling correlation gives equal weight to each observation minus a certain n period in the past and a zero weight on a longer observation. This estimator will always lie between -1 until 1, however, there is a lack of clarity concerning the assumptions which consistently estimate the conditional correlation.

The exponential balancer used by RiskMetrics employs the decreasing weight according to parameter λ. In the context of multivariate, the same λ must be used for all assets to ensure a positive definite correlation matrix. By depicting the conditional correlation matrix of returns as:

$$E_{t-1}(r_t \acute{r}_t) \equiv H_t, \quad \text{..} (4)$$

Hence, these estimators can be expressed into the following matrix notation:

$$H_t = \frac{1}{n} \sum_{j=1}^{n} (r_{t-j} \acute{r}_{t-j}) \text{ dan } H_t = \lambda(r_{t-1} \acute{r}_{t-1}) + (1 + \lambda) H_{t-1} \quad \text{..................} (5)$$

2.3. Portfolio Performance Measurement with Sharpe Ratio

Sharpe Ratio which is introduced by Sharpe (1966) is often used to measure portfolio performance. Sharpe Ratio has been accepted and implemented widely by academicians and practitioners in finance to measure the performance of a portfolio (Kidd, 2011; Low & Chin, 2013; Pangestuti, Wahyudi, & Robiyanto, 2017). Sharpe Ratio is also referred as Reward to Variability (Horowitz, 1966; Robiyanto, 2017; Sharpe, 1966). Formulation for Sharpe Ratio / Reward to Variability is as follows:

$$\textit{Reward to Variability Ratio} \text{ (RVAR)} = \frac{\textit{Average of Return} \text{ Portofolio}}{\text{Portfolio Standard Deviation}} \quad \text{.................} (6)$$

3. Research Method

3.1. Research Data

The data used in this research were the daily closing of LQ45 Index data, S&P Indonesia Corporate Bond Index data, and S&P Indonesia Government Bond Index data during the period of 4 June 2007 to 11 April 2016. During that period, there were about 2,158 days of valid observations. The daily closing LQ45 index data were obtained from www.idx.co.id, while the S&P Indonesia Corporate Bond Index data and S&P Indonesia Government Bond Index data were acquired from http://us.spindices.com/indices/fixed-income/. S&P Indonesia Corporate Bond Index is an index designed to measure the performance of corporate bonds from Indonesia which are denominated Indonesian Rupiah, while S&P Indonesia Government Bond Index is an index designed to measure the performance of Indonesia government bonds which are denominated Indonesian Rupiah.

3.2. Definition of Operational Variable

Here is elaborated the definition of operational variable used in this study.

1. Stock market returns, calculated from LQ45 Index returns by using the following formula

$$R_{LQ45,t} = \left[\frac{LQ45_t - LQ45_{t-1}}{LQ45_{t-1}}\right] \quad \text{................................(7)}$$

Where:

$LQ45_t$ = Closing of LQ45 Index in Indonesia Stock Exchange at day t

$LQ45_{t-1}$ = Closing of LQ45 Index in Indonesia Stock Exchange at day t – 1

2. Indonesia Government Bond Market returns, calculated from S&P Indonesia Government Bond Index by applying the following formula

$$R_{S\&P\ IGBI,t} = \left[\frac{S\&PIGBI_t - S\&P\ IGBI_{t-1}}{S\&P\ IGBI_{t-1}}\right] \quad \text{................................(8)}$$

Where :

$S\&P\ IGBI_t$ = Closing of S&P Indonesia Government Bond Index at day t

$S\&P\ IGBI_{t-1}$ = Closing of S&P Indonesia Government Bond Index at day t – 1

3. Indonesia Corporate Bond Market returns, calculated from S&P Indonesia Corporate Bond Index by using the following formula

$$R_{S\&P\ ICBI,t} = \left[\frac{S\&PICBI_t - S\&P\ ICBI_{t-1}}{S\&P\ ICBI_{t-1}}\right] \quad \text{.................................(9)}$$

Where :

S&P $ICBI_t$ = Closing of S&P Indonesia Corporate Bond Index at day t

S&P $ICBI_{t-1}$ = Closing of S&P Indonesia Corporate Bond Index at day t – 1

3.3. Technique of Analysis

This study employed a model of Dynamic Conditional Correlation – Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) introduced by Engle (2002). DCC-GARCH was the development of GARCH model which was originally introduced by Bollerslev (1986). The DCC-GARCH model assumes that the conditional correlation matrix changes over time. The DCC-GARCH calculation was carried out by employing Eviews Program.

Meanwhile, hedging effectiveness (HE) was estimated by using a formula developed by Ku, Chen, and Chen (2007) as follows :

$$HE = \frac{Variance_{unhedged} - Variance_{hedged}}{Variance_{unhedged}} \quad \text{.................................(10)}$$

Where, $Variance_{hedged}$ is stock-bond portfolio returns and $Variance_{unhedged}$ is stocks (stock market) portfolio returns variance. The higher HE portfolio indicates the bigger reduction of portfolio risk formed and implies that the investment strategy formed is a better strategy. For instance, the HE portfolio value of 70% indicates that the portfolio involving other asset class instruments can reduce the risk level by up to 70%.

Returns value risk (risk adjusted return) of the formed portfolio performance is calculated by using the following Sharpe Index:

$$\textit{Reward to Variability Ratio}\ (RVAR) = \frac{Average\ of\ Portfolio\ Return}{Portfolio\ Standard\ Deviation} \quad \text{.................................(11)}$$

4. Discussions

4.1. Dynamic Conditional Correlation (DCC) of LQ45 Index Return with S&P Indonesia Corporate Bond Index Return

Based on the analysis performed using the DCC-GARCH, the results obtained that the DCC value between LQ45 index return with S&P Indonesia Corporate Bond Index return during the research period was at around -0.05 to 0.15 of range. It showed that the correlation between LQ45 index return with S&P Indonesia Corporate Bond Index return during the research period was weak that it is suitable for the establishment of a portfolio among stocks represented by LQ45 index with corporate bond as represented by S&P Indonesia Corporate Bond Index.

[Figure 1. About Here]

4.2. Dynamic Conditional Correlation (DCC) of LQ45 Index Return with S&P Indonesia Government Bond Index Return

Based on the analysis done using the DCC-GARCH, the results showed that the DCC between LQ45 Index return with S&P Indonesia Government Bond Index return during the research period was at around -0.2 to 0.1 of range. It indicated that the correlation between LQ45 Index return with S&P Indonesia Government Bond Index return during the research period was weak that it is suitable for the establishment of portfolio among stocks represented by LQ45 Index with corporate bond as represented by S&P Indonesia Government Bond Index.

[Figure 2. About Here]

4.3. The Formulation of Dynamic Portfolio between LQ45 Index with S&P Indonesia Corporate Bond Index

Based on the establishment of dynamic portfolio carried out between LQ45 Index with S&P Indonesia Corporate Bond Index during the research period, it can be seen that the largest weight of portfolio for S&P Indonesia Corporate Bond Index was at 64.4% which occurred on 30 November 2007, the average portfolio weight of S&P Indonesia Corporate Bond Index during the research period was at 49.99% and the stocks represented by the LQ45 Index was amounted to 50.01%.

[Figure 3. About Here]

The portfolio formulation between LQ45 Index with S&P Indonesia Corporate Bond Index was able to reduce risk by 17.32% as can be seen from the hedging effectiveness value at 17.32%. The portfolio generated using LQ45 Index with S&P Indonesia Corporate Bond Index was able to produce an average portfolio return to 0.0349% with a deviation standard of 0.002. Although the average return of this portfolio was smaller when compared to the average return of LQ45 which was at 0.04%, but the average return of portfolio formed was bigger than the average return of S&P Indonesia Corporate Index at 0.028%. Meanwhile, when it was seen from the deviation standard indicating the risk, the risk of portfolio formed by LQ45 Index with S&P Indonesia Corporate Bond Index was at 0.002 smaller when compared to the risk contained within the stocks represented by LQ45 Index which was at 0.003, however, the risk was relatively stock to the risk contained in S&P Indonesia Corporate Index which has 0.002 of deviation standard.

[Table 1. About Here]

When looked upon Sharpe Ratio value which was at -3.559%, it can be concluded that the portfolio performance generated by using LQ45 Index with S&P Indonesia Corporate Bond Index was better when compared to the S&P Indonesia Corporate Bond Index performance which had Sharpe Ratio at -7,384%, however, it was not better when compared to the LQ45 Index performance which had 0.105% of Sharpe Ratio.

4.4. The Formulation of Dynamic Portfolio between LQ45 Index with S&P Indonesia Government Bond Index

Based on the formulation of dynamic portfolio conducted between LQ45 Index with S&P Indonesia Government Bond Index during the research period, it can be seen that the largest portfolio weight for S&P Indonesia Government Bond Index was at 81.59% which occurred on 18 December 2014, the average portfolio weight of S&P Indonesia Government Bond Index during the research period was 49.98% and the stocks represented by LQ45 Index was amounted to 50.02%.

The portfolio formulation between LQ45 Index with S&P Indonesia Government Bond Index was able to reduce the risk by 16.96% as can be seen from the hedging effectiveness value at 16.69%. The portfolio generated using LQ45 Index with S&P Indonesia Government Bond Index was able to produce average of portfolio return at 0.035% with 0.002 of deviation standard. Although this average of portfolio return was smaller when compared to the return average of LQ45 which was at 0.042%, the portfolio return average formed was bigger than the return average of S&P Indonesia Government Index at 0.028%. Meanwhile, when it is seen from the deviation standard indicating risk, the risk of portfolio formed by LQ45 Index with S&P Indonesia Government Bond Index was at 0.002 which was smaller compared to the risks contained in the stocks represented by LQ45 Index at 0.003, however, this risk was relatively stock with the risks contained in the S&P Indonesia Government Index which has 0.002 of Deviation Standard.

[Figure 4. About Here]

[Table 2. About Here]

When looked upon the Sharpe Ratio, the value was -3.45%, it can be concluded that the portfolio performance generated by using LQ45 Index with S&P Indonesia Government Bond Index was better when it was compared to S&P Indonesia Government Bond Index performance which has -7.384 of Sharpe Ratio, however, it was not better when it was compared to the LQ45 Index performance which has Sharpe Ratio at 0.105%.

5. Conclusions

This research found that the dynamic portfolio carried out between LQ45 Index with S&P Indonesia Corporate Bond Index is able to reduce risk by 17.323% compared to the risk of investing in LQ45 stocks alone, furthermore, it is also found that the dynamic portfolio conducted between LQ45 Index with S&P Indonesia Government Bond Index is able to reduce the risk by 16.691% compared to the risk of only investing in LQ45 stocks. It indicates that the inclusion of corporate bonds into LQ45 stocks portfolio will be able to reduce greater risk level than that involving the government bonds. Unfortunately, it is not offset by an increase in the portfolio performance for the Sharpe Ratio value of formed dynamic portfolio both by involving corporate bonds and government bonds are not capable of exceeding the Sharpe Ratio value of LQ45 stocks portfolio alone. However, the dynamic portfolio which is formulated both by involving corporate bonds and government bonds is able to own better performances than investments on corporate bonds or government bonds only.

6. Managerial Implications

The results of this study indicate that the portfolio between stocks with bonds (both the government and corporate bonds) dynamically formulated can significantly reduce the risks though producing a lower rate of returns when compared to specifically invest in stock market alone. Based on this, investors, especially those institutional investors that tend to promote prudent investment principles can use the dynamic approach in establishing portfolio between stocks with fixed-income instruments. Investors are also advised to undertake the establishment of a dynamic portfolio which consists of stock market instrument and fixed income instruments in the form of government bond for it produces a better returns than the dynamic portfolio established by using stock market instruments and corporate bonds.

7. Future Research Agenda

This study still focuses on the stock market instruments and fixed income instruments in the general view. This study has not specifically conducted the formulation of dynamic portfolio based on the individual stocks or government bonds or particular corporate bonds that there is still potential for future researches to utilize the instruments individually. Future researches may also specifically use indexes in measuring other fixed income instruments such as Indonesia Government Bond Index (IGBX) which is issued by Indonesia Bond Pricing Agency (IBPA) with different methods used for S&P Indonesia Government Bond Index done in this study.

References

Abdilah, S. B., & Rahayu, S. (2015). Analisis Pembentukan Portofolio Optimal Saham Dengan Menggunakan Model Indeks Tunggal Untuk Pengambilan Keputusan Investasi (Studi Kasus Saham Index LQ-45 di BEI Periode Agustus 2008-Juli 2013) *Working Paper*

Anggraini, R. (2013). Analisis Pembentukan Portofolio Optimal Menggunakan Model Indeks Tunggal Untuk Pengambilan Keputusan Investasi. *Jurnal Ilmu & Riset Akuntansi, 2*(6), 1-24.

Aparicio, F., & Estrada, J. (1997). Empirical Distributions of Stock Returns: Scandinavian Securities Markets 1990-1995. *Working Paper*.

Astuti, D., & Sugiharto, T. (2005). *Analisis Pembentukan Portofolio Optimal Pada Perusahaan Industri Plastics and Packaging yang Terdaftar di Bursa Efek Jakarta Studi Kasus (1999-2003)*. Paper presented at the Seminar Nasional PESAT 2005, Jakarta.

Baur, D. G. (2013). Gold - Fundamental Drivers and Asset Allocation (Working Paper). from Electronic copy available at: http://ssrn.com/abstract=2240831

Boido, C., & Fasano, A. (2009). Alternative Assets: A Comparison Between Commodities and Traditional Asset Classes. *ICFAI Journal of Derivatives Markets, 6*(2), 74-105.

Bollerslev, T. (1986). Generalized autoregressive conditional heteroscedasticity. *Journal of Econometrics, 31*, 307-327. doi: https://doi.org/10.1016/0304-4076(86)90063-1

Canedo, M. A., & Cruz, E. D. (2013). *The Philippine Stock Returns and The Levy Distribution.* Paper presented at the 12th National Convention on Statistics (NCS), EDSA Shangri-La Hotel, Madaluyong City.

Chion, S. J., Veliz, C., & Carlos, N. (2008). On the Normality of Stock Return Distributions: Latin American Markets 2000-2007. *Journal of CENTRUM Cathedra, 1*(2), 90-108. doi: http://dx.doi.org/10.7835/jcc-berj-2008-0015

Eimer, S. (2011). *Adaptive Portfolio Theory: Hedging Against Correlations.* Paper presented at the The 2011 Industrial Engineering Research Conference.

Eko, U. (2008). Analisis dan Penilaian Kinerja Portofolio Optimal Saham-Saham LQ-45. *Bisnis & Birokrasi, Jurnal Ilmu Administrasi dan Organisasi, 15*(3), 178-187.

Engle, R. F. (2002). Dynamic Conditional Correlation: A Simple Class of Multivariate Generalized Autoregressive Conditional Heteroskedasticity Models. *Journal of Business & Economic Statistics, 20*(3), 339-350. doi: http://dx.doi.org/10.1198/073500102288618487

Fabozzi, F. J., Gupta, F., & Markowitz, H. M. (2002). The Legacy of Modern Portfolio Theory. *Journal of Investing, 11*(3), 7-22. doi: http://dx.doi.org/10.3905/joi.2002.319510

Greer, R. J. (1997). What is an Asset Class, Anyway? *Journal of Portfolio Management, 23*(2), 86-91. doi: 10.3905/jpm.23.2.86

Hamdani, A. S., Murhadi, W. R., & Sutejo, B. S. (2015). Pembentukan Portofolio Optimal Pada Indeks KOMPAS100 Periode 2013-2014. *Calyptra: Jurnal Ilmiah Mahasiswa Universitas Surabaya, 4*(2), 1-13.

Horowitz, I. (1966). The "Reward-to-Variability" Ratio and Mutual Fund Performance. *Journal of Business, 39*(4), 485-488. doi: http://dx.doi.org/10.1086/294889

Kamath, R. R., Chakornpipat, R., & Chatrath, A. (1998). Return Distributions and The Day-of-the-Week Effects in the Stock Exchange of Thailand. *Journal of Economics and Finance, 22*(2-3), 97-106. doi: 10.1007/BF02771480

Kewal, S. S. (2014). Pembentukan Portofolio Optimal Saham-Saham Pada Periode *Bullish* di Bursa Efek Indonesia. *Jurnal Economica, 9*(1), 81-91.

Kidd, D. (2011). The Sharpe Ratio and the Information Ratio. *Investment Performance Measurement Feature Articles, 1*, 1-4.

Ku, Y.-H. H., Chen, H.-C., & Chen, K.-H. (2007). On the Application of the Dynamic Conditional Correlation Model in Estimating Optimal Time-varying Hedge Ratios. *Applied Economics Letters, 14*(7), 503-509. doi: 10.1080/13504850500447331

Low, S.-W., & Chin, Y.-B. (2013). Refinements to the Sharpe Ratio - Evidence from Malaysian Equity Funds. *Global Economic Review, 42*(1), 72-97. doi: http://dx.doi.org/10.1080/1226508X.2013.769818

Markowitz, H. M. (1952). Portfolio Selection. *Journal of Finance, 7*(1), 77-91. doi: http://dx.doi.org/10.1111/j.1540-6261.1952.tb01525.x

Markowitz, H. M. (1959). *Portfolio Selection: Efficient Diversification of Investments*. New York: John Wiley & Sons, Inc.

Mirah, & Wijaya, T. (2013). Analisis Model Indeks Tunggal Portofolio Saham di Bursa Efek Indonesia (BEI) Periode 2009-2011 *Working Paper*

Natalia, E., Darminto, & N.P., M. G. W. E. (2014). Penentuan Portofolio Saham Yang Optimal dengan Model Markowitz Sebagai Dasar Penetapan Investasi Saham (Studi Pada Perusahaan *Food and Beverage* yang Terdaftar di Bursa Efek Indonesia Tahun 2012) *Jurnal Administrasi Bisnis, 9*(1), 1-9.

Ogata, H. (2012). Optimal Portfolio Estimation for Dependent Financial Returns with Generalized Empirical Likelihood. *Advances in Decision Sciences, 2012*, 1-8. doi: http://dx.doi.org/10.1155/2012/973173

Pangestuti, I. R. D., Wahyudi, S., & Robiyanto, R. (2017). Performance Evaluation of Equity Mutual Funds in Indonesia Period of 2012-2014. *Jurnal Keuangan dan Perbankan 21*(4), 527-542.

Paramitasari, R., & Mulyono. (2015). Analisis Portofolio Untuk Menentukan *Expected Return* Optimal dan Risiko Minimal pada Saham Perusahaan Telekomunikasi yang Terdaftar di Bursa Efek Indonesia. *Jurnal Manajemen dan Organisasi, VI*(1), 19-33.

Putra, M. P. S., Atahau, A. D. R., & Robiyanto, R. (2018). Cross–asset class portfolio between gold and stocks in Indonesia. *Economic Journal of Emerging Markets, 10*(1), 69-81. doi: 10.20885/ejem.vol10.iss1.art8

Rachev, S. T., Stoyanov, S. V., Biglova, A., & Fabozzi, F. J. (2004). An Empirical Examination of Daily Stock Return Distributions for U.S. Stocks. *Working Paper*.

Richardson, M., & Smith, T. (1993). A Test for Multivariate Normality in Stock Returns. *Journal of Business, 66*(2), 295-321. doi: http://dx.doi.org/10.1086/296605

Robiyanto, R. (2017). Performance evaluation and risk aversion rate for several stock indices in Indonesia Stock Exchange. *Jurnal Manajemen dan Kewirausahaan, 19*(1), 60-64. doi: 10.9744/jmk.19.1.60-64

Robiyanto, R. (2018a). The dynamic correlation between ASEAN-5 stock markets and world oil prices. *Jurnal Keuangan dan Perbankan, 22*(2).

Robiyanto, R. (2018b). Indonesian Stock Market's Dynamic Integration with Asian Stock Markets and World Stock Markets. *Jurnal Pengurusan, 52.*

Robiyanto, R., Wahyudi, S., & Pangestuti, I. R. D. (2017). The volatility–variability hypotheses testing and hedging effectiveness of precious metals for the Indonesian and Malaysian capital markets. *Gadjah Mada International Journal of Business, 19*(2), 167-192. doi: 10.22146/gamaijb.26260

Sartono, R. A., & Zulaihati, S. (1998). Rasionalitas Investor Terhadap Pemilihan Saham Dan Penentuan Portofolio Optimal Dengan Model Indeks Tunggal Di BEJ. *Kelola, 17*.

Sembiring, F. M. (2012). Analisis Pembentukan Portofolio Optimal Berdasarkan *Single Index Model* Pada Saham-Saham Yang Dikelola Oleh Manajer Investasi PT. Panin Securities. *Portofolio, 9*(1), 1-17.

Sembiring, F. M., & Rahmah, N. A. (2014). *Analisis Bias Beta Saham-Saham Pembentuk Portofolio Optimal*. Paper presented at the Seminar Nasional Ekonomi & Bisnis 2014, Bandung.

Septyanto, D., & Kertopati, B. (2014a). Analisa Pembentukan Portofolio Dengan Menggunakan Model Markowitz dan Single Index Model Pada Saham LQ45 di Bursa Efek Indonesia Tahun 2009-2013. *Working Paper*.

Septyanto, D., & Kertopati, B. (2014b). Analisa Pembentukan Portofolio Dengan Menggunakan Model Markowitz dan Single Index Model Pada Saham Yang Masuk dalam Indeks LQ45 di Bursa Efek Indonesia Tahun 2009-2013. *Finance and Banking Journal, 16*(2), 140-156.

Sharpe, W. F. (1966). Mutual Fund Performance. *Journal of Business, 39*(1), 119-138.

Triharjono, S. (2013). *Single Index Model* Sebagai Alat Analisis Optimalisasi Portofolio Investasi Saham (Studi Kasus pada Kelompok Saham LQ-45 di BEI Tahun 2009-2011). *Jurnal Ilmu Manajemen & Bisnis, 4*(1), 1-12.

Wijayanti, P., & Marjono. (2013). Pemilihan Saham dan Pembentukan Portofolio Optimal Dengan Menggunakan *Data Envelopment Analysis (DEA)* dan Model Indeks Tunggal Pada Bursa Efek Indonesia *Working Paper Universitas Brawijaya*

Table 1.
Results of Dynamic Portfolio Formulation between LQ45 Index with S&P Indonesia Corporate Bond Index

Note	LQ45 Index	S&P Indonesia Corporate Bond Index	Portfolio of LQ45 Index with S&P Indonesia Corporate Bond Index
Average of Return	0.042%	0.028%	0.0349%
Deviation Standard	0.003	0.002	0.002
Hedging Effectiveness	-	-	17,323%
Sharpe Ratio	0.105%	-7.384%	-3.559%

Table 2.
Results of Dynamic Portfolio Formulation between LQ45 Index with S&P Indonesia Government Bond Index

Note	LQ45 Index	S&P Indonesia Government Bond Index	Portfolio of LQ45 Index with S&P Indonesia Government Bond Index
Return Average	0.042%	0.028%	0.0350%
Deviation Standard	0.003	0.002	0.002
Hedging Effectiveness	-	-	16.961%
Sharpe Ratio	0.105%	-7.384%	-3.457%

Figure 1.

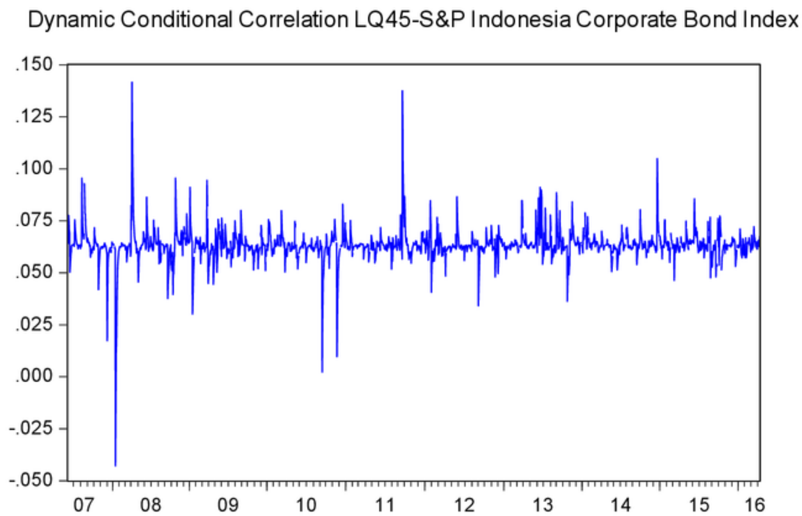


Figure 2.

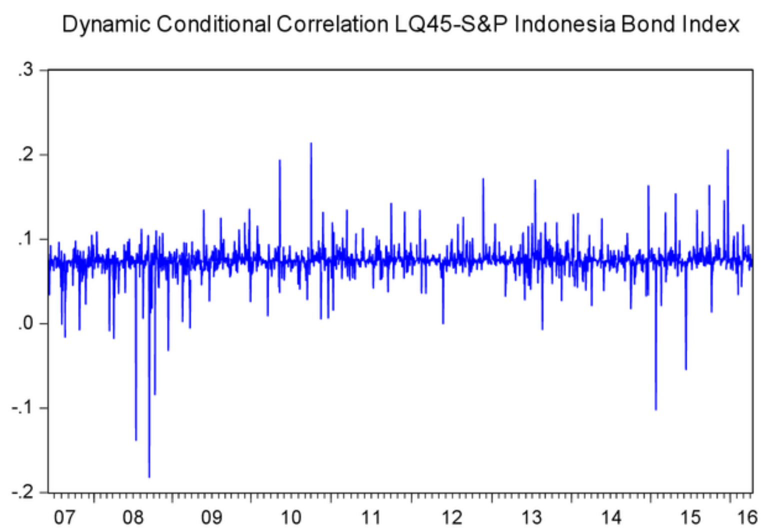


Figure 3.

Dynamic Portfolio Weight between LQ45 Index with S&P Indonesia Corporate Bond Index During the Research Period

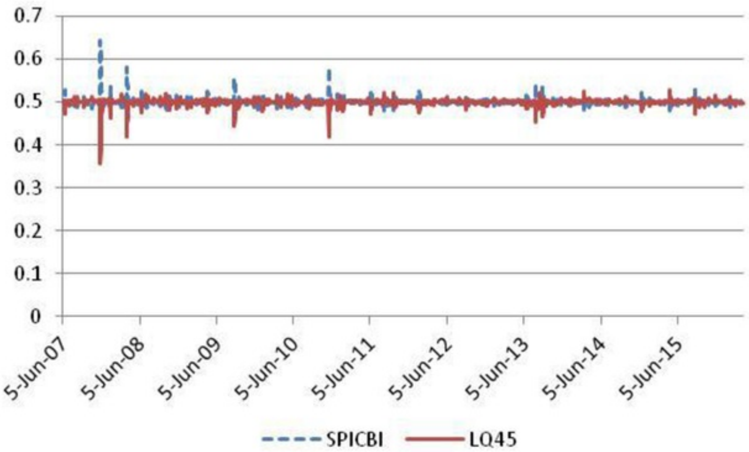
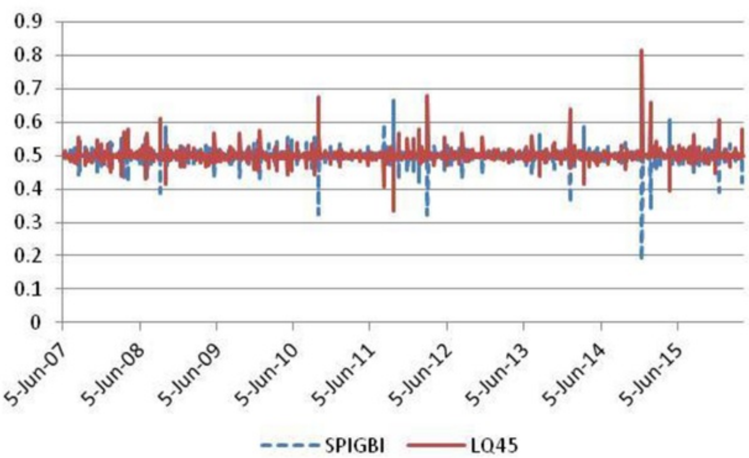


Figure 4.

Dynamic Portfolio Weight between LQ45 with S&P Indonesia Government Bond Index during the Research Period



FORMULATING DYNAMIC PORTFOLIO BETWEEN STOCKS AND FIXED-INCOME INSTRUMENTS IN THE INDONESIAN CAPITAL MARKET

ORIGINALITY REPORT

12%	8%	2%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	pages.stern.nyu.edu Internet Source	4%
2	Submitted to Universitas Kristen Satya Wacana Student Paper	3%
3	jurnal.ugm.ac.id Internet Source	1%
4	us.spindices.com Internet Source	1%
5	Submitted to University of Durham Student Paper	<1%
6	Sethapramote, Yuthana. "Synchronization of business cycles and economic policy linkages in ASEAN", Journal of Asian Economics, 2015. Publication	<1%
7	administrasibisnis.studentjournal.ub.ac.id Internet Source	<1%

www.emeraldinsight.com

8	Internet Source	<1%
9	swfa2015.uno.edu Internet Source	<1%
10	www.econ.canterbury.ac.nz Internet Source	<1%
11	Submitted to University of Glasgow Student Paper	<1%
12	www.slideshare.net Internet Source	<1%
13	eprints.utar.edu.my Internet Source	<1%
14	media.neliti.com Internet Source	<1%
15	"424B2: GOLDMAN SACHS GROUP INC.", EDGAR Online-Prospectus and Proxies, March 13 2018 Issue Publication	<1%

Exclude quotes	On	Exclude matches	< 5 words
Exclude bibliography	On		