

## SINGLE INDEX MODEL IN DETERMINING OPTIMAL PORTFOLIO COMPOSITION OF JAKARTA ISLAMIC INDEX (JII)

Irni Yunita,

Telkom University, Padjadjaran University  
Faculty of Economy and Business, Bandung, Indonesia  
E-mail: [irniyunita81@yahoo.com](mailto:irniyunita81@yahoo.com)

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### Abstract

*The aim of this study is to select the securities from Jakarta Islamic Index (JII Index) into Optimal Portfolio using Single Index Model. This research is using descriptive analysis with quantitative approach. The sample of this study is 29 companies in Jakarta Islamic Index year 2018. The results shows that the optimal portfolio selection is consist of 12 securities that are PWON (11.8%), UNVR (24.4%), TPIA (16.3%), BPRT (7.6%), AKRA (8.8%), ICBP (2.9%), ADRO (7.6%), INCO (2.3%), UNTR(11.3%), MYRX (3.1%), WSKT(3.2%) and PTBA (0.6%). The monthly return of Portfolio is 1.86 % and the risk of portfolio is 0.08%. The risk of portfolio is smaller than individual securities.*

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**Key Words:** *Optimal Portfolio Selection, Single Index Model, Jakarta Islamic Index*

**JEL Classification:** *C22, G11*

### 1. INTRODUCTION

Investment is a delay of current consumption for use in efficient production over a certain period (Jogiyanto, 2016). There are two forms of financial assets, direct investment and indirect investment. Direct investments are made by purchasing the financial assets of a company directly either through intermediaries or by other means. Indirect investment is made by purchasing shares from an investment company with a portfolio of financial assets from another company. Direct investment can be made by purchasing financial assets that can be traded in the money market, capital market, or in the derivative market (Jogiyanto, 2016). In making investment decisions, investors are always faced with returns and risks from each financial assets where the returns and risks of each asset vary, starting from the lowest return that is savings, bonds and stocks.

Return is the result obtained from the investment while the risk is a deviation from the expected average results. In maximizing the return on investment, investors can diversify their assets to reduce their investment risk by forming a portfolio. A portfolio is a collection or combination of financial assets or securities such as stocks, bonds, and cash equivalents in a unit held or created by an investor, investment company or financial institution (Jogiyanto, 2014). In the capital market, the formation of a portfolio can consist of stocks from different types of industries. The problem arises when conducting the selection of stocks that will be included in the portfolio, considering a lot of stocks that can be selected. There are two kinds of Portfolio that are efficient portfolio and optimal portfolio. The optimal portfolio can be determined using single index model (Jogiyanto, 2016). According to Husnan and Pudjiastuti (2004), The use of single index model in optimal portfolio formation is based on two reasons. First, input portfolio analysis using single index model. Second, the use of single index model can be used for estimation purposes by using beta.

The portfolio selection can be started by selecting company that belong to a specific index such as the Jakarta Islamic Index (JII). JII Index is the average stock price index for the type of stocks that meet the criteria of sharia. According to Gumanti (2011), JII is a 30 sharia liquid stocks traded on the Indonesia Stock Exchange so that securities in JII are eligible to be used as a reference in the formation of a portfolio of the many shares in the Indonesia Stock Exchange.

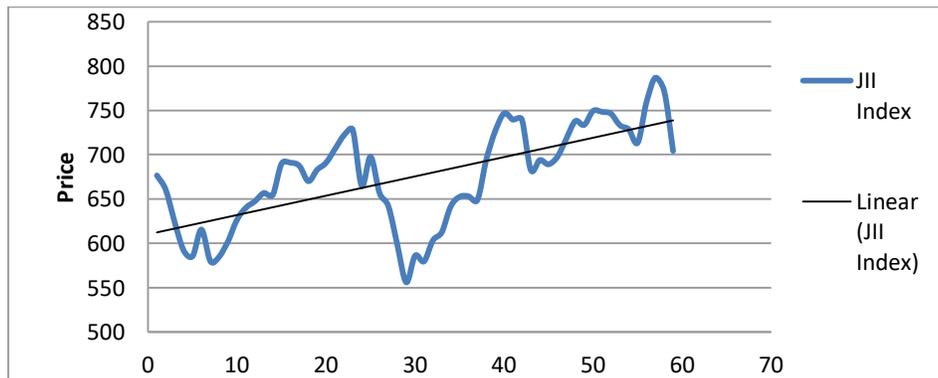


Figure 1.1 The Performance of Jakarta Islamic Index Year 2013-2018

Source : Data Processed from [www.yahoofinance.com](http://www.yahoofinance.com) (2018)

From Figure 1.1, it can be seen that the movement of JII Index is very volatile but the long term trend line of JII is increasing from 2013 to 2018. Thus, the JII Index could be a reference to investor to performing optimal portfolio. Jayati et al (2017) and Zulfiana (2017) use single index model to form the optimal portfolio from the stocks listed in Index IDX 30 and LQ45. The result shows that the risk of optimal portfolio is smaller than individual stocks. Thus, the Single Index Model can be used to perform the optimal portfolio. The objective of this research is to select the securities to forming an optimal portfolio by using single index model and to calculate the return and risk of portfolio.

## 2. LITERATURE REVIEW

### 2.1 INVESTMENT

Investment is investment is a commitment to a number of current funds at the moment to gaining some profit in the future (Tandelilin, 2017). The fundamental thing in the investment decision process is understanding the relationship between expected return and investment risk. Risk is the return variability of an asset (Ahmad, 2004). Expected Return is an expected profit by an investor in the future from the amount of funds it has placed (Fahmi, 2012). Risk is the possibility of difference between actual return and expected return (Fahmi, 2012). In making investments, investors can reduce the risk to a minimum by establishing a portfolio to diversifying the risk (Fahmi, 2012). Investor can reduce the risk by using Single Index Model to forming an optimal portfolio (Jogiyanto, 2016).

### 2.2 SINGLE INDEX MODEL

A single index model was introduced by William Sharpe (1963). Single index model is based on the observation that the prices of securities fluctuate in the direction of the market price index (Jogiyanto, 2016). The calculation of security return involves two main components that are : (1) Component return associated with the uniqueness of the company, denoted by  $\alpha_i$ , (2) Component return associated with the market, denoted by  $\beta_i$  (Tandelilin, 2017). The calculation to determine the optimal portfolio is based on excess return to beta ratio. This ratio is (Jogiyanto (2016) and Elton et al (2007)):

$$ERB_i = \frac{E(R_i) - R_{BR}}{\beta_i}$$

### 2.3 SYARIAH INDEX

Syariah Index was first introduced in 1st January 1995. Sharia index was first launched by Indonesia Stock Exchange in cooperation with Sharia Supervisory Board of PT. Danareksa Investment Management. Sharia index criteria are based on Islamic sharia. The sharia index consists of 30 stocks. (Umam, 2013).

### 3. METHODOLOGY

The objective of this paper is to select the securities in Jakarta Islamic Index (JII) in forming the optimal portfolio and also to calculate the return and risk of portfolio.

In this paper, we use Single Index Model to find out the optimal portfolio. Single index model is a technique to calculate the return and risk of portfolio. The model assumes that the stock return movement is only correlated with the market movement (Zubir, 2011). The calculation to determine the optimal portfolio is based on excess return to beta ratio.

This study uses secondary data in the form of time series for the period 2013- 2018 which consists of companies in Jakarta Islamic Index 2018 that has complete data in monthly closing, IHS index Closing Price as Market Index and BI rate as Risk free rate. Data is obtained from Indonesia Stock Exchange ([www.idx.co.id](http://www.idx.co.id)), Bank Indonesia ([www.bi.go.id](http://www.bi.go.id)). The population is companies in Jakarta Islamic Index period 2018. This research is using purposive sampling technique. The criteria that used in sample selection is companies which has a complete data from May 2013- March 2018.

**Table 3.1 Research Sample: Jakarta Islamic Index (JII) 2018**

Code	Company	Code	Company
ADRO	Adaro Energy Tbk	AKRA	AKR Corporindo Tbk
ANTM	Aneka Tambang (Persero) Tbk	ASII	Astra International Tbk
BRPT	Barito Pacific Tbk	BSDE	Bumi Serpong Damai Tbk
CTRA	Ciputra Development Tbk	EXCL	XL Axiata Tbk
ICBP	Indofood CBP Sukses Makmur Tbk	INCO	Vale Indonesia Tbk
INDF	Indofood Sukses Makmur Tbk	KLBF	Kalbe Farma Tbk
LPKR	Lippo Karawaci Tbk	LPPF	Matahari Department Store Tbk
LSIP	PP London Sumatra Indonesia Tbk	MYRX	Hanson International Tbk
PGAS	Perusahaan Gas Negara (Persero) Tbk	PTBA	Tambang Batubara Bukit Asam (Persero) Tbk
PTPP	PP (Persero) Tbk	PWON	Pakuwon Jati Tbk

SCMA	Surya Citra Media Tbk	SMGR	Semen Indonesia (Persero) Tbk
SMRA	Summarecon Agung Tbk	TLKM	Telekomunikasi Indonesia (Persero) Tbk
TPIA	Chandra Asri Petrochemical Tbk	UNTR	United Tractors Tbk
UNVR	Unilever Indonesia Tbk	WIKA	Wijaya Karya (Persero) Tbk
WSKT	Waskita Karya (Persero) Tbk		

Source : www.idx.co.id (2018), Yunita (2018)

### 3.1 RESEARCH STEPS

The calculation to determine the optimal portfolio is based on excess return to beta ratio. This ratio is (Jogiyanto, 2016 and Elton et al (2007):

$$ERB_i = \frac{E(R_i) - R_{BR}}{\beta_i}$$

ERBi = excess return to beta securities-i

E(Ri) = Expected return

RBR = Risk Free Return

$\beta_i$  = Beta Security-i

The optimal portfolio will contain assets with high ERB ratios. Assets with low ERB ratios will not be incorporated into the optimal portfolio. Thus, it takes a limiting point (Cut-Off Point) that determines what ERB value limit is said to be high. The magnitude of the limiting point can be determined by the following steps:

1. Sort securities based on the largest ERB value to the smallest. Securities with the largest ERB are candidates to be incorporated into the optimal portfolio.
2. Calculate the values of Ai and Bi for each of the securities as follows:

$$A_i = \frac{\{E(R_i) - R_{BR}\} \beta_i}{\sigma_{ei}^2}$$

$$B_i = \frac{\beta_i^2}{\sigma_{ei}^2}$$

$\sigma_{ei}^2$  = Variant of residual I-securities error that is a unique risk or risk is not systematic.

Calculate the value of  $C_i$

$$C_i = \frac{\sigma_m^2 \sum \frac{\{E(R_i) - R_{BR}\} \beta_i}{\sigma_{ei}^2}}{1 + \sigma_m^2 \sum \frac{\beta_i^2}{\sigma_{ei}^2}}$$

4. The amount of Cut off Point ( $C^*$ ) is the  $C_i$  value where the last ERB value is still greater than  $C_i$  value.
5. Securities that form the optimal portfolio are securities that have ERB values greater than or equal to the value of ERB at point  $C^*$ . Securities that have smaller ERBs with ERB point  $C^*$  are not included in optimal portfolio formation.
6. Calculate the proportion of each securities in the optimal portfolio. The amount of proportion for the  $i$ -th security is as follows:

$$w_i = \frac{x_i}{\sum x_i}$$

$$x_i = \frac{\beta_i}{\sigma_{ei}^2} (ERB_i - C^*)$$

7. Calculate return of portfolio

Return of portfolio is weighted average return of securities in portfolio. The formula is (Jogiyanto, 2016):

$$E(Rp) = \alpha p + \beta p \cdot E(Rm)$$

8. Calculate risk of portfolio

Risk of portfolio is varians return of security in portfolio. The formula is (Jogiyanto, 2016):

$$\alpha p^2 = \beta p^2 \cdot \sigma M^2 + (\sum_{i=1}^n w_i \cdot \sigma_{ei}^2)^2$$

#### 4. RESULTS AND DISCUSSION

Excess return to beta measures the excess return premium to a single unit of non-diversifiable risk as measured by beta. The value of ERB is used as the basis for determining the stock that includes the optimal portfolio. A high value ERB is a candidate for optimal portfolio. The RBR is the average monthly BI Rate from 2013-2018, that is 0.52%.

**Table 4.1 The Result of ERBi,**

No	Code	Expected Return	Excess Return	Bi	$\sigma_{ei}^2$	ERBi
1	AKRA	0.0206	0.0205	0.7478	0.0131	0.0275
2	ADRO	0.0207	0.0207	0.9421	0.0137	0.0219
3	ASII	0.0028	0.0027	1.4131	0.0044	0.0019

4	BPRT	0.0604	0.0552	1.8335	0.0427	0.0301
5	BSDE	-0.0001	-0.0002	1.8602	0.0069	-0.0001
6	CTRA	0.0038	0.0038	2.3874	0.0165	0.0016
7	EXCL	-0.0067	-0.0068	0.7148	0.0100	-0.0095
8	ICBP	0.0153	0.0153	0.6231	0.0281	0.0245
9	INCO	0.0137	0.0136	0.7554	0.0258	0.0180
10	INDF	0.0019	0.0018	0.8769	0.0046	0.0021
11	KLBF	0.0013	0.0013	0.9696	0.0036	0.0013
12	LPKR	-0.0151	-0.0151	0.0672	0.0093	-0.2248
13	LPPF	0.0015	0.0015	0.8752	0.0092	0.0017
14	LSIP	0.0018	0.0018	0.3148	0.0176	0.0057
15	MYRX	0.0069	0.0068	0.3982	0.0093	0.0172
16	PGAS	-0.0081	-0.0082	1.4403	0.0149	-0.0057
17	PTBA	0.0122	0.0122	1.3017	0.0188	0.0094
18	PTPP	0.0141	0.0140	1.6393	0.0130	0.0086
19	PWON	0.0155	0.0154	0.0735	0.0101	0.2096
20	SMRA	0.0000	-0.0001	2.3582	0.0147	0.0000
21	SCMA	0.0019	0.0018	0.7874	0.0074	0.0023
22	SMGR	-0.0069	-0.0069	1.3720	0.0052	-0.0051
23	TPIA	0.0537	0.0536	0.6337	0.0240	0.0846
24	UNTR	0.0132	0.0131	0.7487	0.0050	0.0176
25	UNVR	0.0094	0.0094	0.1037	0.0028	0.0905
26	WIKA	-0.0013	-0.0014	1.6529	0.0131	-0.0008
27	WSBP	-0.0069	-0.0070	0.1195	0.0097	-0.0582
28	WSKT	0.0236	0.0236	2.0249	0.0173	0.0116
29	TLKM	-0.0013	-0.0014	0.7739	0.0036	-0.0018

Source : Data Processed (2018), Yunita (2018)

After ERB was sorted from the highest to lowest, then determine a cut off point. Cut off point (C \*) can be done by determining the value of  $A_i$ ,  $B_i$ , and  $C_i$ . Value C \* is the last  $C_i$  value that has ERB value  $> C_i$ . The candidate of portfolio optimal are securities that have ERB values greater than or equal to the value

of ERB at point C\*. Securities that have smaller ERBs with ERB point C \* are not included in optimal portfolio formation.

**Table 4.2 The Result of Ci and C\***

No	Code	ERBi	Ai	Bi	$\Sigma Ai$	$\Sigma Bi$	Ci	
1	PWON	0.2096	0.1115	0.5322	0.1115	0.5322	0.00014	candidate
2	UNVR	0.0905	0.3449	3.8114	0.4564	4.3436	0.00055	candidate
3	TPIA	0.0846	1.4162	16.7430	1.8726	21.0866	0.00222	candidate
4	BPRT	0.0301	2.3723	78.7903	4.2449	99.8770	0.00461	candidate
5	AKRA	0.0275	1.1680	42.5385	5.4129	142.4154	0.00562	candidate
6	ICBP	0.0245	0.3384	13.8170	5.7513	156.2324	0.00589	candidate
7	ADRO	0.0219	1.4215	64.8488	7.1728	221.0812	0.00688	candidate
8	INCO	0.0180	0.3977	22.1003	7.5704	243.1814	0.00711	candidate
9	UNTR	0.0176	1.9783	112.6947	9.5487	355.8762	0.00811	candidate
10	MYRX	0.0172	0.2934	17.0968	9.8421	372.9730	0.00824	candidate
11	WSKT	0.0116	2.7584	236.9056	12.6004	609.8786	0.00881	candidate
12	PTBA	0.0094	0.8455	90.3319	13.4460	700.2105	0.00884	candidate*,C*
13	PTPP	0.0086	1.7737	207.0286	15.2196	907.2391	0.00881	
14	LSIP	0.0057	0.0319	5.6286	15.2515	912.8677	0.00880	
15	SCMA	0.0023	0.1937	83.6585	15.4453	996.5262	0.0085	
16	INDF	0.0021	0.3486	166.8962	15.7938	1163.4225	0.0080	
17	ASII	0.0019	0.8872	457.1192	16.6810	1620.5417	0.0068	
18	LPPF	0.0017	0.1382	83.1179	16.8192	1703.6596	0.0067	
19	CTRA	0.0016	0.5424	344.8008	17.3616	2048.4604	0.0061	
20	KLBF	0.0013	0.3480	263.5080	17.7096	2311.9684	0.0057	
21	SMRA	0.0000	-0.0164	378.9343	17.6932	2690.9027	0.0050	
22	BSDE	-0.0001	-0.0474	499.6290	17.6458	3190.5317	0.0044	
23	WIKA	-0.0008	-0.1731	208.7796	17.4727	3399.3113	0.0041	

24	TLKM	-0.0018	-0.2947	166.4319	17.1780	3565.7432	0.0039	
25	SMGR	-0.0051	-1.8371	362.9613	15.3409	3928.7046	0.0032	
26	PGAS	-0.0057	-0.7902	139.5289	14.5507	4068.2335	0.0030	
27	EXCL	-0.0095	-0.4859	51.1142	14.0647	4119.3477	0.0028	
28	WSBP	-0.0582	-0.0855	1.4701	13.9792	4120.8178	0.0028	
29	LPKR	-0.2248	-0.1093	0.4862	13.8699	4121.3040	0.0028	

Source : Data Processed (2018)

From the table above, the Cut of Rate ( $C^*$ ) is 0.00884, that is PTBA with ERB 0.0094. The stocks on optimal portfolio is the stock that has ERB more and same with  $C^*$ , that are PTBA, WSKT, MYRX, UNTR, INCO, ADRO, ICBP, AKRA, BPRT, TPIA, UNVR and PWON. The proportion of each stocks on portfolio is on the table below:

**Table 4.2 The Result of  $X_i$  and  $W_i$**

No	Code	$C_i$	$X_i$	$W_i$
1	PWON	0.00014	1.458704	11.8%
2	UNVR	0.00055	3.023027	24.4%
3	TPIA	0.00222	2.017032	16.3%
4	BPRT	0.00461	0.939626	7.6%
5	AKRA	0.00562	1.092992	8.8%
6	ICBP	0.00589	0.360235	2.9%
7	ADRO	0.00688	0.941337	7.6%
8	INCO	0.00711	0.285249	2.3%
9	UNTR	0.00811	1.401419	11.3%
10	MYRX	0.00824	0.382888	3.1%
11	WSKT	0.00881	0.397751	3.2%
12	PTBA	0.00884	0.077484	0.6%
		$\sum X_i$	12.37774	100%

Source : Data Processed (2018)

From Table 4.2, the proportion of each stock is : PWON (11.8%), UNVR (24.4%), TPIA (16.3%), BPRT (7.6%), AKRA(8.8%), ICBP (2.9%), ADRO (7.6%), INCO (2.3%), UNTR(11.3%), MYRX (3.1%), WSKT(3.2%) and PTBA (0.6%).

**Table 4.3 The Result of Return Portfolio**

No	Code	$W_i$	$\beta_i$	$\alpha_i$	$\beta_p$	$\alpha_p$
1	PWON	0.1178	0.0735	0.0152	0.0087	0.0018
2	UNVR	0.2442	0.1037	0.0090	0.0253	0.0022
3	TPIA	0.1630	0.6337	0.0236	0.1033	0.0038
4	BPRT	0.0759	1.8335	0.0419	0.1392	0.0032
5	AKRA	0.0883	0.7478	0.0129	0.0660	0.0011
6	ICBP	0.0291	0.6231	0.0276	0.0181	0.0008
7	ADRO	0.0761	0.9421	0.0135	0.0717	0.0010
8	INCO	0.0230	0.7554	0.0254	0.0174	0.0006
9	UNTR	0.1132	0.7487	0.0049	0.0848	0.0006
10	MYRX	0.0309	0.3982	0.0091	0.0123	0.0003
11	WSKT	0.0321	2.0249	0.0170	0.0651	0.0005
12	PTBA	0.0063	1.3017	0.0184	0.0081	0.0001
					0.61996	0.01606
E(Rm)					0.00407	
E(Rp)					0.01859	

Source: data Processed (2018)

**Table 4.4 The Result of Risk Portfolio**

No	Code	$w_i$	$\sigma_{ei}^2$	$(\sum W_i \cdot \sigma_{ei}^2)$	$\beta_p^2$	$\sigma_M^2$
1	PWON	0.121962	0.010138	0.0012	0.439368	0.001218
2	UNVR	0.176886	0.002821	0.0005		
3	TPIA	0.238433	0.023982	0.0057		
4	BPRT	0.092097	0.042668	0.0039		
5	AKRA	0.089833	0.013147	0.0012		

6	ICBP	0.028554	0.028099	0.0008	
7	ADRO	0.076155	0.013688	0.0010	
8	INCO	0.021336	0.025818	0.0006	
9	UNTR	0.10366	0.004974	0.0005	
10	MYRX	0.023426	0.009273	0.0002	
11	WSKT	0.027401	0.017308	0.0005	
12	PTBA	0.000259	0.018757	0.0000	
$(\sum W_i \cdot \sigma_{ei})^2$				0.0003	
$\alpha_p^2$					0.0008

Source: data Processed (2018)

From the table above, it can be seen that the monthly return of Portfolio is 1.86 % and the risk of portfolio is 0.08% that is below the risk of all individual stock in portfolio.

## 5. CONCLUSIONS AND RECOMMENDATIONS

In conducting an investment analysis, investors can use the single model index method when determining the stock to be selected into the portfolio and should not to invest in only one stock but to form an optimal portfolio that can provide a low risk without reducing the expected return

Based on this result research, the optimal portfolio selection by using single index model is consist of 12 companies in Jakarta Islamic Index such as PWON (11.8%), UNVR (24.4%), TPIA (16.3%), BPRT (7.6%), AKRA(8.8%), ICBP (2.9%), ADRO (7.6%), INCO (2.3%), UNTR(11.3%), MYRX (3.1%), WSKT(3.2%) and PTBA (0.6%). The monthly return of Portfolio is 1.86 % and the risk of portfolio is 0.08% that is below the risk of all individual stock in portfolio.

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