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Economic Sector Portfolio Optimization in the Commercial and Retail Segments

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Abstract. Credit disbursement is an investment decision in the banking business. Therefore, the concept of "high risk high return" becomes the focus of banks in managing credit. One of the effort of these banks to manage risk and enhancing/ increasing returns is forming their portfolio. This research was conducted in one of the state banks in Indonesia, which has the goal of increasing lending in the retail and commercial segments. Single Index Model is used to find the optimal composition of the economic sector. This model recommends economic sectors into the portfolio on the basis of Excess Return to Beta, which represents the difference between the rates of return in the form of interest income with a risk-free asset returns, divided by beta sectors of the economy itself. The results showed that the return portfolio can be improved and the risks derived using that approach. Banking business purpose is the return and growth so that the portfolio optimization needs to be supported with other parameters when the economic sectors that are not recommended put in a portfolio. Analysis of the performance of RAROC is a performance metric that of performance that computes net profit after adjusting for potential losses than capital allocation, can be used to help the formation of portfolios that received the return and risk are still in line with expectations.

Keywords: credit, portfolio, risk and return, single index model

Abstrak. *Penyaluran kredit merupakan investment decision dalam bisnis perbankan. Oleh sebab itu konsep " high risk high return" menjadi fokus perbankan dalam mengelola kredit. Salah satu upaya perbankan mengelola risiko dan meningkatkan return adalah membentuk portofolio. Penelitian ini dilakukan di salah satu bank pemerintah di Indonesia yang mempunyai target meningkatkan penyaluran kredit di segmen retail dan commercial. Single Index Model digunakan untuk mencari komposisi optimal dari sektor ekonomi. Model ini merekomendasi sektor ekonomi yang masuk ke dalam portofolio atas dasar Excess Return to Beta yang merupakan selisih antara tingkat return berupa pendapatan bunga dengan return aset bebas risiko (SBI) dibagi dengan beta sektor ekonomi itu sendiri. Hasil penelitian menunjukkan bahwa return porofolio dapat ditingkatkan dan risiko diturunkan dengan menggunakan pendekatan tersebut. Tujuan bisnis perbankan adalah return dan growth sehingga optimalisasi portofolio perlu didukung dengan parameter lain ketika sektor ekonomi yang tidak direkomendasikan dimasukkan ke dalam portofolio. Analisis RAROC yaitu suatu metrik kinerja yang menghitung keuntungan bersih setelah disesuaikan dengan potensi kerugian dibanding alokasi modalnya digunakan untuk membantu pembentukan portofolio sehingga return dan risiko yang diterima masih sesuai dengan harapan.*

Kata kunci*: kredit, portofolio, risiko dan imbal hasil,* single index model

INTRODUCTION

According to the 2013 data from the Indonesian In Credit disbursement is one of the businesses that are vulnerable to the risks. Banks are thus required to manage the credit risk so that their asset qualities remain good. Credits disbursed as banks investment to earn income can be identified as economic sector-based credit disbursement. Customers grouping in certain economic sectors are done based on the type of business they manage, for example, trade, agriculture and others. This condition causes each bank's credit disbursement will have a composition consisted of different basis of economic sectors. The composition is then form investment portfolio. Portfolio in Umanto (2008) is defined as a collection of assets owned for a certain economic purpose. Thus the portfolio of economic sectors can be defined as a set of investments owned by banks in disbursing credit on the basis of economic sectors in order to obtain the yield or return in the form of income interest.

Markowitz (1952) pioneered investment approach in financial management by developing a model of the portfolio formation in one period to yield the desired increase in certain risk level. Increasing the number of types of assets in the portfolio can reduce risk and the yield rate can go up if there is a difference in the price movement of the combined assets. In banking practice, credits are managed on the basis of the balance of risk and return so that any risks are acceptable, credit remains disbursed as long as the yield accepted was as expected.

Risk according to Zubir (2011) is the difference between the expected results (expected return) and realization (actual return). Actual returns are returns that have occurred and is calculated based on historical data. Yields that have been received allow investors to compare the actual profit or expected benefits of various investments at the desired rate of return. Solechan (2009) argued that the actual return can be used as one of measurement tools of company performance and can also be used as a basic determinant of return and risk

in the future. Therefore, this study used an evaluation of the returns and the risks to measure the extent of the achievement of the economic sector portfolio performance against the set targets.

Historical portfolio performance evaluation is used as a basis to establish an optimal portfolio of economic sectors in the commercial and retail segments. Optimal portfolio is portfolio selected by an investor out of many alternatives that exist on the set of efficient portfolio, that is a portfolio that gives the greatest expected return for a given level of risk or portfolio with the lowest risk level for any particular rate of return. Selection of a portfolio then tailored according to the preferences of investors concerned about returns and the risks inherent in the portfolio selected.

Optimal portfolio formation model used in the study is the Single Index Model. According to Bodie et al. (2011), Markowitz model as basic theory has its limitations: firstly, it requires a lot of estimates in calculating the covariance matrix. If n is the number of securities or investment instruments that are analyzed then the estimated amount required by Markowitz model is equal to (n2 - n)/2. Secondly, the possibility of an error in correlation coefficient estimation caused by inconsistency in correlation coefficient of investment instruments. While the Single Index Models use empirical approach in the form of stock market indexes as a proxy for the general factors that affect the movement of securities. This model simplifies the estimated amount required as input for analysis. If n is the number of securities to be analyzed, then the amount of estimation required is (3n + 2).

Tandelilin (2010) in Wibowo (2014) showed a comparison model of Markowitz and Single Index Model. Single Index Model approach is simpler and the implementation of the investment instruments also considering risk-free assets, so that it is closer to actual conditions (Table 1). The establishment of optimal portfolio in this study is using Single Index Model approach, which is a simpler approach than the Markowitz model.

Single Index Model is based on the observation that the price of an investment instrument will fluctuate in line with market price index. The analysis was performed by comparing the value of excess return to beta (ERB) with the cut-off rate, or cut-off point of each investment instrument. Excess return is defined as the difference between the yields expected with the yield of risk-free assets, while the excess return to beta (ERB) measure the excess returns relative to a single unit of risk that cannot be diversified as measured by beta, that is a risk that cannot be eliminated by diversification.

In banking practice, portfolio preparation may not eliminate one of the economic sectors in the portfolio. If the economic sectors that are not recommended by the calculation of the model are eliminated, then all customers who have facilities in that sector should pay the credit. Therefore, this study used Risk Adjusted Return on Capital (RAROC) parameter to assist the formation of the portfolio. RAROC is the approach of Risk-Adjusted Performance Measures (RAPM), which is the quotient between net income return with the risks that are designed to obtain the order (ranking) of risky opportunities that are acceptable to most investors (Basyaib, 2007). RAROC was popularized by Bankers Trust since 1979 and is used by many banks as a system in the allocation of economic capital and assess the performance of the capital allocated to the various units in the bank's business. In credit performance measurement using RAROC approach, the risk variable is the Expected Loss, which is the average (means) of statistical forecast of the level of harm caused by negligence on the part of the receiving loans or Non-Performing Loans (NPL) (Milne and Onorato, 2007). NPL is a delay in the payment of the obligations of more than 90 days. The NPL is an early warning for banks that accepted yield potential is not in accordance with the expected returns. While the allocation of capital is the variable of NPL's worst loss at the confidence level that have been determined. On the basis of the evaluation of the performance of risk and yield, as well as the establishment of a portfolio by using a Single Index Model assisted with the establishment of a portfolio RAROC parameter, economic sector is expected to yield, and with better risk than before.

The study was conducted in Bank Negara Indonesia (BNI) as a state-owned bank, owned by the

Table 1. Differences Between Markowitz Model and Single Index Model

Comparison	Markowitz (Theoretical Approach)	Single Index Model (Empirical Approach)
Assumption	Markowitz is based on three assumptions: - Single investment period e.g., one year - No transactional cost - Investor preferences based only on the expected returns and risk	Assumption used in this model is that the investment instruments are to be correlated only if such investment instruments have the same response to market changes.
Investment	Not taking into account the possibility of investors to invest in risk-free assets	This model uses the calculation of return of each asset in the market and taking into account the index return investment in risk-free assets
Calculation	Complex and complicated calculation	This model can simplify the complex calculation in Markowitz model.

Source: Tandelilin (2010) in Wibowo (2014)

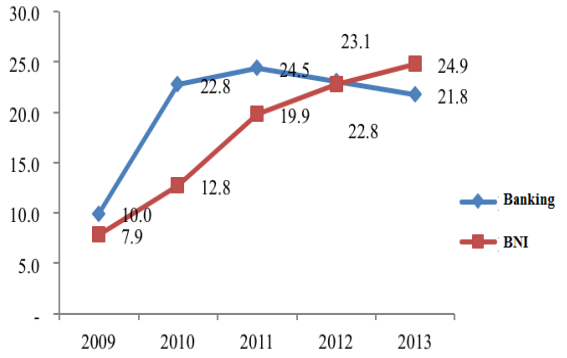

Figure 1. Growth of BNI credit compared to the average banking (in percent (%))

Government that during the period of 2012 to 2013 has a loan portfolio that continues to grow. In 2013 the average growth of bank lending amounted to 21.8%, BNI is still able to grow by 24.9% or above the average growth of the industry as presented in Figure 1.

Loans granted is the largest component of assets, in 2013 loans increased 24.9% from Rp. 200,7 trillion in 2012 to Rp. 250,6 trillion. Credit assets are dominated by the business banking amounted to 72.4% and are distributed by Consumer Banking, International Division and its subsidiaries. Business banking consists of the corporate segment, the commercial segment, and the retail segment. However, over the last 5 years, the corporate segment dominates credit growth. Until 2013, the corporate share reached 61.9%, while commercial reached 16.9%, and retail 21.2% of total lending in business banking, with the total amount of Rp. 181,3 trillion. Thus, the direction of the company is to increase the share of the commercial segment and the retail segment, and is expected to become balanced in proportions and continue to grow above the industry average. Business banking unit that consists of corporate, commercial and retail lending has a different character. Retail segment accommodate lending to small businesses with asset-based and nominal patterns that are smaller than commercial segment. With almost the same amount of portfolio, the number of customers in retail is greater. In 2009, the numbers of credit customers in the retail segment were as many as 44.389 and reached 134.846 in 2013, while in the commercial segment were 1.606 customers in 2009 and in 2013 reached 3.538 customers. Basic commercial segment credit disbursement is based more on financial performance analysis. While corporate segment is the same with the commercial segment, but with greater managed credit amount compared to the commercial segment.

The problem faced is the share of the burden of the smaller loan portfolio during 2009-2013 in the commercial and retail segments of the total loan portfolio in the Business Banking Unit. The corporate segment in 2009 had a share of 46,1% of the total loan portfolio, in 2013 its share increased to 61,9%. This is different from the commercial segment, which originally has a share of 24,7% at the beginning of the study period, declined to 16,9% at the end of the study period. Likewise with the original retail segment amounted to 29,2% of burden share was increased to 21,2% in 2013. NPL in commercial and retail segment was also higher than the corporate segment, which had an average of 2,08%. Commercial NPL had an average of 6,33% during the study period despite its improving trend. The retail segment had an average NPL of 4.45% with the tendency of increasing during the 2009-2013 period (Figure 2).

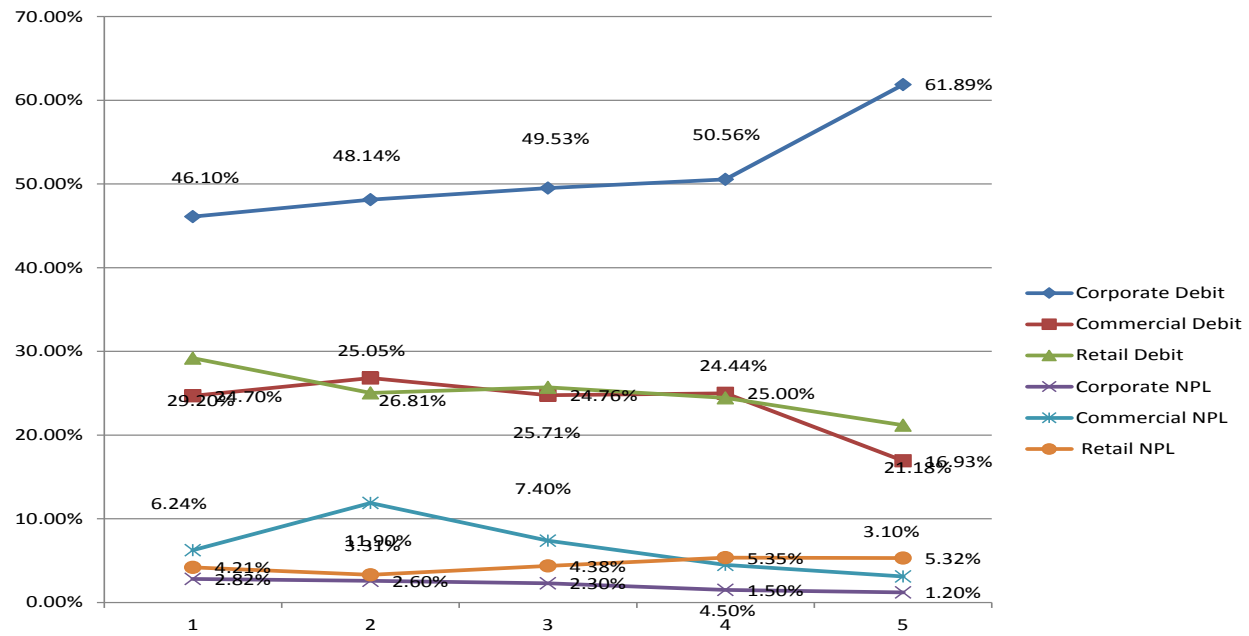

Figure 2. Proportion of Outstanding Credit and NPL Business Banking Unit
Source : BNI, 2014

Bank Indonesia Regulation (PBI) No. 14/22/PBI/2012 Bank Indonesia requires national banks to lend to Small Medium and Micro Enterprises (SMEs) at least 20%, conducted in phases from 2013-2018. This PBI serves as the underlying strategy utilized by BNI to improve distribution in commercial and retail segments in order to follow the growth in the corporate segment, so that the required composition of a minimum of 20% is met. It is also supported by the new competitive landscape that suggests there has only been 1 bank that is strong enough to maneuver in the commercial and retail segments, namely BRI which focuses on micro businesses (Table 2).

Increased lending in BNI is followed by credit risk management policies by establishing a policy of diversified lending using Lending Exposure Limit (LEL) in economic sectors so as to form a portfolio of economic sectors as the reference in credit expansion, in order to increase the share of commercial and retail segments. The growth of lending is important, by considering the economic sectors that optimally constitute the portfolio. Single Index Model approach is recommended because this approach can identify beta which is a risk that can not be eliminated by diversification.

Facing the constraints that lending portfolio yields has no comparison to market returns, this study used the yield expectations LEL. LEL is the maximum limit of the loan at the end of the year for each sector of the economy in each segment as lending guidelines. Credit limits are set for this economic sector in order to control risks and to minimize the concentration of credit on one economic sector or in sectors considered to have a higher risk (concentration risk) (Table 3). The purpose of LEL determination is to establish the direction of financing and loan concentration limits, as efforts to spread risk, and to optimize risk and return. Results of the calculation of yield expectations of LEL is obtained by multiplying the proportion of each sector of the economy with the historical average yields during the study period and was used as a surrogate variable of market returns (Rm). Recommended economic sectors will then be selected and their movements follow the direction of the beta yield expectations of LEL.

Table 2. Map of Competition of 5 Largest Banks in Indonesia

5 Largest Banks in Indonesia	Strategy	Competency		
		Corporation	Retail Commercial	Consumer
Bank Mandiri	Penetration in all segments	Solid	Medium	Medium
BCA	Best retail management	Poor	Medium	Solid
BNI	Penetration in all segments	Medium	Medium	Medium
BRI	Micro Business	Poor	Solid	Medium
Bank Niaga	Contender of the Big Four	Solid	Medium	Solid

Source: Batunanggar (2012)

Table 3. LEL in economic sector portfolio in 2014

Economic Sector	Retail (%)	Commercial (%)
Agriculture	6,8	5,1
Mining	0,6	3,4
Processing industry	8,7	27,1
Electricity, gas, and water	1,2	2,5
Construction	8,6	14,2
Trade, restaurant, and hotel	49,9	23,3
Transportation	5,5	12,1
Business services	16,5	9
Social services	2,1	3,2

Based on the identification of the problem above, the research objectives are: (1) To evaluate the performance of the loan portfolio at the BNI in commercial and retail segments and (2) To establish an optimal portfolio of Single Index Model on commercial and retail segments. To give you an idea as well as a clear mindset about the research that are about to be conducted, conceptual framework is needed in order for this research to remain focused and in accordance with the original purpose. In diagram, the conceptual framework of this research can be described as figure 3.

Researches on the formation of the economic sector lending portfolio in Indonesia have been carried out using various approaches. Wirananto (2002) formulate

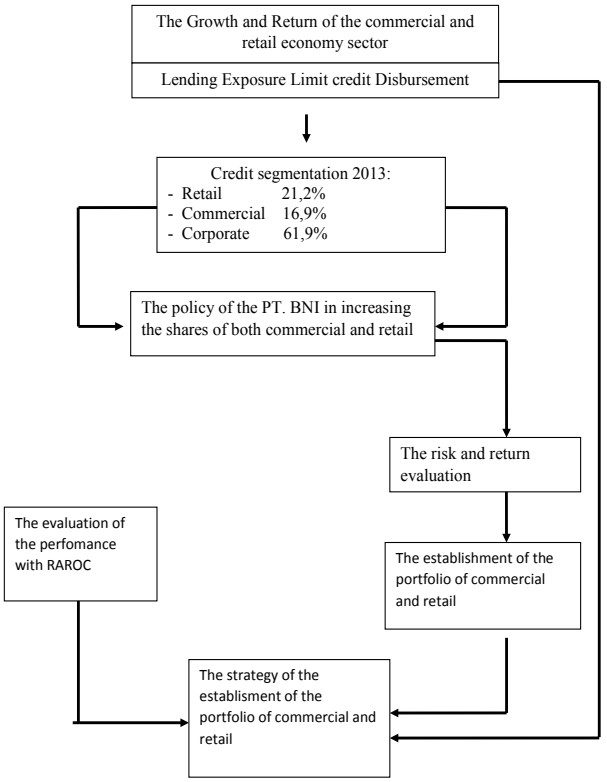

Figure 3. Conceptual Framework
Source: Results of the research data processing, 2014

the optimal portfolios using Markowitz approach to minimize the variance of each alternative portfolio and include the variables of internal and external environment. Utomo (2003) used a General Electric (GE) matrix for the establishment of a portfolio of economic sectors. Chandradewi (2009) used the Markowitz model to establish a portfolio that has the smallest risk, Zuhari et al. (2012) formed the optimal portfolio with Markowitz model and VaR to measure the risk of economic sectors.

Ball (2012) used the Markowitz approach to establish an optimal portfolio by adding the parameter of industrial bankruptcy level for two previous periods. Similar studies using Markowitz approach were undertaken by Kazan and Uludag (2014) in Turkey by considering sectors with decreased performance due to the impact of the American crisis. Study of the formation of the loan portfolio with a mathematical model, among others, using Genetic Algorithm were performed by Ivorra et al. (2007) on case studies of credit portfolio BNP Paribas Spain, as well as Misra and Sebastian (2011) on commercial banks in India. Mohagheghnia (2013) used linear programming and Agarana et al. (2014) used a goal programming to form the optimal portfolio lending.

In previous studies, the establishment of an optimal portfolio has already considered the factors that relate directly or indirectly to the sector forming the portfolio but have not considered the risk appetite of stakeholders. Risk appetite in the banks is a key performance indicator (KPI) for risk management or core instrument for aligning a better corporate strategy in total capital allocation and risk, and help facilitate business portfolio decisions based on considerations of risk and return profile. Risk appetite is usually represented in terms of size, among others, risk size by value at risk or the nominal size of the number of outstanding credit (Hyde et al., 2009).

The establishment of optimal portfolio with the approach of the Single Index Model in PT. Bank XYZ is used because it can provide 3 advantages over other approaches. First, this approach considers the risk appetite of banking managements. BNI LEL policies that represent the composition of the portfolio of economic sectors desired by BNI is the risk appetite of management based on risk profiles and yields. This is reflected in the input variables used: Yield, which is the amount of yield credit per economic sector in each business segments as the approach of profitability, estimation of industry risk factors which is the magnitude of the risk/potential losses in each industry/sub-sector, realization of domestic loans per economic sector in each business segment in the current position in ongoing year, including details of Performing Loan (PL) and the Non-Performing Loan (NPL), adjustment of loan target on the basis of the Bank Business Plan, the expansion plans of business units, which is the expansion plans in net loans per economic sector in the respective business units during the year. Research using portfolio benchmark that is expected return, derived from the policy exposure limit set by the bank so an optimal portfolio consists of sectors of the economy that its beta movement is align with the movement of the beta expected return portfolios PT. Bank XYZ.

Second, studies conducted to establish the optimal portfolio of economic sectors with the approach of Markowitz's Modern Portfolio Theory is based on the preferences of the expected returns and risks and have not considered the possibility of the bank to invest in risk-free assets. Fund placement as an investment decision is, in essence, when a bank may choose to place their funds channeled as loans or in other forms of investment. The benchmarks of fund placement in general are risk-free assets or Bank Indonesia Certificates (SBI). Thus, if banks view lending in certain sectors do not produce higher yields than the yield of the SBI, the bank may reduce or extend credit in the said sector.

Third, the recommendations made in economic sector can also identify the level of risk that cannot be eliminated by diversification. This identification will be useful for banks to know the economic sectors that have a risk that has to be managed specifically.

RESEARCH METHODS

This study uses a case study approach on analysis of the risk and return performance of the loan portfolio as well as the economic sector of medium and small segments each month. Results of the analysis will then be used as the basis for formulating the optimal portfolio formation of economic sectors. The data used is secondary data obtained from historical data of the company. Credit data sampled are direct loans disbursed in the form of rupiah and USD (which has been converted by the exchange rate at the time). Data processing and analysis techniques can be elaborate as follow:

1. Economic Sector Portfolio Performance Evaluation
a. Credir Proportion, measured with formula:

$$W_i = \frac{\sum \overline{L}_i}{\sum \overline{L}_p} \quad \text{.....(1)}$$

Explanation :

Wi : Proportion of economic sector

$\sum \overline{L}_i$: The average of credit in economic sectors i

$\sum \overline{L}_p$: Average of the outstanding loan portfolio

b. The yield of economic sectors is calculated by the formula: (Andiko, 2010)

$$R_i = \frac{\sum I_i}{\sum L_i} \quad \text{.....(2)}$$

Explanation :

Ri : Return of economic sector i

$\sum I_i$: Interest income of economic sectors i

$\sum L_i$: Numbers of credit in economic sector i

c. Expected yield: (Jogiyanto, 2009)

$$E(R_i) = \sum_{j=1}^{m} (R_{ij} . p_j) \quad \text{.....(1.3)}$$

Explanation :

E (Ri)	:	Expected return of economic sector to i
Ri	:	Realization of Return of economic sectors i and j
Pi	:	Probability of profit in credit i and j
m	:	The number of events that may occur

d. Risks of economic sectors: (Jogiyanto, 2009)

$$\sigma_i^2 = \frac{\sum (Ri - \overline{Ri})}{N-1} \quad \text{.....(1.4)}$$

Explanation :

σ*i*	:	Standard deviation of economic sector (%)
Ri	:	Return of economic sector to i (%)
$\overline{R}i$	:	The average value of return in economic sectors i (%)
N	:	The number of observations

e. Portfolio yield is calculated by the formula: (Jogiyanto, 2009)

$$R_p = \sum_{i=1}^{N} (w_i . R_i) \quad \text{.....(1.5)}$$

Explanation :

R_p	:	Credit Portfolio Return
W_i	:	The portion of the economic sector i to all economic sectors in the portfolio
R_i	:	Return from economic sector to i
N	:	Number of economic sectors in the portfolio

f. The yield expected from the Portfolio is calculated by the formula: (Jogiyanto, 2009)

$$E(R_p) = \sum_{i=1}^{N} w_i . E(R_i) \quad \text{.....(1.6)}$$

Explanation :

E (Rp)	:	Expected return of credit portfolio
Wi	:	The proportion of the economic sector credit i
E (Ri)	:	Expectation of Return of economic sector i
N	:	The number of economic sector

g. Portfolio risk is calculated by the formula: (Jogiyanto, 2009)

$$\sigma_{ij} = \sum_{t=1}^{n} [R_{it} - E(R_i)][R_{jt} - E(R_j)p_t] \quad \text{.....(1.7)}$$

Explanation :

∑ij	:	Covariant of sector i and sector j
Rit	:	Return of economic sector i in time t
E(Ri)	:	Expectation of Return of sector i
Pt	:	The probability of occurrence of return to t

Formation of Optimal Portfolio using Single Index Model

a. Determining the expected returns from the LEL portfolio using formula: (Elton et al.,2007)

$$E(R_{lel}) = \sum_{i=1}^{N} (w_{leli} . R_i) \quad \text{.....(2.1)}$$

Explanation :

Wlel	:	Portion of lel i to all sectors in portfolio
Ri	:	Return from economic sector to i
N	:	Number of economic sectors
E(Rlel)	:	Expected Return of Credit Portfolio

b. Formula to calculate beta value: (Elton et al.,2007)

$$\hat{a}_i = \frac{\sigma_{im}}{\sigma_m^2} = \frac{\sum \left[\left(R_{it} - \overline{R}_i \right) \left(R_{mt} - \overline{R}_m \right) \right]}{\sum \left(R_m - \overline{R}_m \right)} \quad \text{.....(2.2)}$$

Next, the formula becomes:

$$\hat{a}_i = \frac{\sigma_{ilel}}{\sigma_{lel}^2} = \frac{\sum \left[\left(R_{it} - \overline{R}_i \right) \left(R_{lelt} - \overline{R}_{lelt} \right) \right]}{\sum \left(R_{lel} - \overline{R}_{lelt} \right)}$$

Explanation :

βi	:	Beta economic sector i
σilel	:	Covariant between lel return with economic sector i
σ²ilel	:	lel varian
Rit	:	Return of economic sector I period to t
$\overline{R}_i$		The average yield of economic sectors to i
Rlelt		Yield of lel period to t
$\overline{R}_{lelt}$		Average of yield of lel to t

Beta calculation of economic sectors is then used to calculate the value of ERB

c. ERB determines the value, calculated by the formula: (Elton et al. , 2007)

$$\mathbf{ERB} = \frac{\overline{R}_i - R_f}{\hat{a}_i} \quad \text{.....(2.3)}$$

Explanation :

ERB	:	Excess Return to Beta
Ri	:	Expected yields from economic sector i
Rf	:	The yield on risk-free assets
βi	:	Return of economic sector I period to t

ERB counting results are then ranked from the highest ERB result to the lowest.

d. Calculating Cut-off Rate (Elton et al. , 2007)

These calculations are used to determine the economic sector that becomes a candidate of portfolios by comparing the ERB and Ci, if:

- ERB > Ci then the economic sector is qualified as a candidate of portfolio
- ERB < Ci, the economic sector is not qualified as a candidate of portfolio

Cut-off rate is calculated using the formula:

$$C_i = \frac{\sigma^2_{lel} \sum \frac{(\overline{R}_j - R_f)\hat{a}_j}{\sigma^2_{ej}}}{1 + \sigma^2_{lel} \sum \left(\frac{\hat{a}_j^2}{\sigma^2_{ej}} \right)} \quad \text{.....(2.4)}$$

Explanation :

Ci	:	Cut-off Rate
σ^2ilel	:	LEL variant
β_j	:	Beta economic sector j
σ^2ej	:	variant of sectors that are not linked to market
$\overline{R}_j$		Return of economic sector j
Rf		The risk-free return from the average of auction result of Bank Indonesia Certificates (SBI) during the study period (SBI)

e. Proportion of the economic sectors is calculated using the formula: (Elton et al., 2007)

$$W_i = \frac{X_i}{\sum_{j=1}^{k} X_j} \qquad X_i = \frac{\hat{a}_i}{\sigma^2_{ei}} (\text{ERB}_i - C^*) \quad \text{dengan} \quad \text{...(2.5)}$$

Explanation :

Wi	:	Proportion of instruments of investments to i
K	:	The number of sectors in optimum portfolio
βi	:	Beta sector to i
C*	:	Value of cut of point which is the highest value of Ci

f. Beta portofolio (βp) is calculated using the formula: (Elton et al., 2007)

$$\hat{a}_p = \sum_{i=1}^{N} W_i . \hat{a}_i \quad \text{.....(2.6)}$$

g. Calculating the expected return and optimum portfolio risk: (Elton dan Gruber, 2007). This stage is the last step to determine the expected return and optimum portfolio risk.

$$E(R_p) = \acute{a}_p + \hat{a}_p . E(R_p) \quad \text{.....(2.8)}$$

$$\sigma^2_p = \hat{a}^2_p . \sigma^2_{lel} \quad \text{.....(2.9)}$$

Calculations of NPL and RAROC of economic sectors

a. The quality of loan portfolio is calculated by the formula: The credit quality of economic sector is calculated by calculating the total NPL (outstanding loan on the quality of 3, 4 and 5) formed on a monthly basis for a year (2009-2013 study period) divided by total loans in each sector of the economy.

$$\text{NPL}_i = \frac{\sum L_i \text{coll NPL}}{\sum L_i} \quad \text{.....(3.1)}$$

Explanation :

NPLi	:	Ratio of NPL economic sector i
$\sum$ Li coll NPL	:	Creditr quality 3,4,5 economic sector i
$\sum$ Li	:	The amount of the economic sector i

b. RAROC of Economic Sector is calculated by the formula: (Hull, 2007)

$$\text{RAROC} = \frac{\text{RAR}}{\text{Risk Capital}} = \frac{\text{R - C - E}}{\text{Risk Capital}} = \frac{\text{R - C - W}}{\text{W - E}} \quad \text{....(3.2)}$$

Explanation :
TR : loan interest income
TC : Interest cost of funds used for lending.
EL : Expected Loss = mean NPL

This calculation is performed by first subtracting interest income from loans by TC calculation obtained from cost of funds (CoF), which is the cost to be incurred by the banks for any funds that have been collected from various sources before deduction of the minimum liquidity required that always has to be maintained by the banks. Performance will improve if the RAR is greater than the Risk Capital.

Risk Capital in Enterprise Risk Management can basically use regulatory capital or economic capital. Regulatory capital under Basel II and III is capital calculated by a formula provided by the regulator. In this study, risk capital is calculated using Economic Capital calculation that is derived from the difference between Worst loss and Expected loss. Kipkalov (2009) stated that Economic Capital is used to quantify risk by calculating how much capital the company is allocated to risk.

Worst Loss (WL) is calculated (WL) using formula: (Prabowo, 2009)

$$\text{W} = \text{E} + \frac{Z_c \sigma}{\sqrt{N}}$$

Explanation :

Zc	:	Confidence level
σ	:	Standard deviation
N	:	Total of value.

WL, which is variable of unexpected losses, is calculated using the average maximum variable or worst of monthly NPL during study period. WL is also estimated with a confidence level of 99%, which means that there is a probability or odds of 1% that the actual losses will exceed the economic capital.

RESULT AND DISCUSSION

Performance evaluation of economic sectors portfolios in the commercial and retail segments during the study period from the year 2009-2013 shows that the performance of each segment in terms of the performance of RAROC, most sectors of the economy has given an adequately good performance shown by index value of RAROC > 1. Meanwhile the result of risk and return evaluation shows that the yields obtained at the targeted level of risk have not provided results as expected by BNI. Therefore, the recommendation for optimum portfolio of economic sectors is then composed using Single Index Model approach that can yield and with better risk level. Discussion on performance evaluation and portfolio formation are outlined as follows.

Risk and return approach observes the risk by the magnitude of deviation between the returns expected compared by its realization. Economic sector performance calculations using formulas (1.1) s / d (1.4), Table 4 shows that the yields in the retail segment of the construction sector is quite high with an average of 5,68%, followed by the business services sector amounted to 1,19% and electricity, gas and water by 1%. The lowest yield was agriculture. The highest risk of economic sectors is also the construction sector. Similarly, the commercial segment of electricity, gas and water that have the highest yields, have the highest risk. These conditions are in accordance with the concept of high risk high return.

Table 4. Performance of Economic Sector in 2009-2013

Economic Sector	Retail		Commercial	
	Return	Risk	Return	Risk
	(%)			
Manufacturing Industry	0,93	0,009	0,89	0,115
Business world service	1,19	1,122	0,86	0,101
Community social services	0,84	0,091	0,86	0,101
Construction	5,68	5,558	0,87	0,104
Electricity, gas and water	1,00	0,010	5,41	3,674
Trade	0,99	0,010	0,86	0,086
Mining	0,92	0,009	0,87	0,105
Agriculture	0,85	0,009	0,87	0,106
Transportation	0,96	0,010	1,00	0,172

Source : Results of research data processing, 2014

The performance of Portfolio was computed by using the formula (1.5) up to (1.7), the result of the return computation compared with the target during the research period is presented in table 6. The target of return set for commercial segment is 0,9216% at the risk level of 0,2171% and the target of return for retail segment is 1,2918% at the risk level of 0,2110%. However, the return received at those risk levels is 0,8483% in the commercial segment and 0,3470% in the retail segment. It means with the risk level targeted by BNI the return on the commercial segment has already almost reached the target, whereas in the retail segment the return received is still far from the targeted risk level.

The beta of each economic sector should have been known first prior to the formation of portfolio with Single Index. The assumption used in this research was the expected return of LEL that is expected return wanted by the company as proxy (Rm) so that the return moved in the direction of the movement of the expected return of LEL during the research period. The result of computation using the formula (2.1) up to (2.9) recommends economic sectors which form optimal portfolio in each segment with different weights of the economic sectors as compared to the weights of existing portfolios as presented in table 6.

Table 5. Portfolio Performance against the Target in 2009- 2013

Segment	Existing Portfolio		Target	
	Return	Risk	Return	Risk
	(%)			
Commercial	0,8483	0,2110	0,9216	0,2110
Retail	0,3470	0,2171	1,2918	0,2171

Source : Results of research data processing, 2014

Table 6. Weight of Optimal Portfolio of the Economic Sector

Commercial Segment		Retail Segment	
Economic Sector	Weight (%)	Economic Sector	Weight (%)
Electricity, Gas and Water	11.82	Construction	17.13
Transportation	16.27	Electricity, Gas and Water	24.28
Trade	20.31	Transportation	14.54
Agriculture	17.15	Mining	10.44
Business World Service	19.68	Trade	10.62
Mining	14.77	Manufacturing Industry	13.54
		Agriculture	9.46
Total	100.00		100.00

Source : Results of research data processing, 2014

The above optimal portfolios recommend certain economic sectors with different weights as compared to the existing portfolios (table 7). The sectors that are not recommended in the commercial segment are sectors of community social service, manufacturing industry and construction that have negative beta against the LEL's return expectation. The same is true for the retail segment for the sectors of community social service and business world service. It means the beta of the economic sector falls under defensive against LEL, this sector moves against the expectation of result wanted by BNI. When the result expected by the economic sector increases 1% then the result of that sector decreases β x 1%. The community social service sector in the commercial segment has the highest negative beta of -0,4754 against the expectation of LEL's result. Furthermore, the sectors of construction and manufacturing industry have beta of -0,1711 and -0,2524 respectively. The same goes for retail segment, the highest negative beta of 1,7129 is for community social service sector, and of -0,8453 is for business world service. Those sectors, in the computation of Single Index Model, are not recommended to be included in the portfolio.

Furthermore the result of the research shows that on the average the existing portofolios are still under the percentage of LEL portfolio, except for the manufacturing industry and trade in the commercial sector, that is 37,07% and 23,5% respectively. There are four sectors in the retail segment that are more than on the average of the LEL, i.e. the sectors of community social service (7,29%), trade (53,2%), mining (0,66%) and agriculture (6,51%). The weight excess of the economic sector against the weight of LEL as presented in table 6 has not yet produced results as expected.

Table 7. Comparison of portfolios of LEL, existing and optimal of commercial and retail segments in 2009-2013

Economic Sector	Commercial			Retail		
	LEL	Existing	Optimal	LEL	Existing	Optimal
	(%)					
Manufacturing Industry	34,98	37,07	-	10,62	9,98	13,54
Business World Service	8,69	7,36	19,68	18,95	13,06	-
Community Social Service	2,43	3,04	-	2,41	7,29	-
Construction	13,74	12,98	-	6,72	6,42	17,13
Electricity, Gas and Water	1,49	0,88	11,82	0,22	0,21	24,28
Trade	22,83	23,5	20,31	51,36	53,2	10,62
Mining	2,83	2,53	14,77	0,65	0,66	10,44
Agriculture	5,85	5,83	17,15	6,31	6,51	9,46
Transportation	7,17	6,8	16,27	2,77	2,67	14,54

Source : Results of research data processing, 2014

The result of computation by using Single Index Model shows that the result and risk produced are better than the existing portfolios, as well as the determined target (table 8). The result of optimal portfolio of the commercial segment is 1,4942% at the risk level of 0,0562% and in the retail segment the result of optimal portfolio can be increased to 1,7641% at the risk level of 0,0998%.

The result of this research strengthens the results of the previous researches by Wirananto (2002), Andiko (2010), Misra and Sebastian, Kazan and Uludag (2014) that used different parameters. Return can be increased and risk can be reduced by modifying the portfolio composition of the economic sector. Therefore, the consequence of optimal portfolio is the modification of the weight of each economic sector in the portfolio.

The problem of forming the portfolio of economic sector in BNI could not stop after the formation of optimal portfolio, it was needed other additional parameters that could be used to accommodate the determination of the weight of the economic sector which was not recommended by the optimal portfolio. As has been explained previously the parameters used to assist the formation of the portfolio of economic sector is RAROC, which is a performance measurement based on capital allocation. Therefore, prior to the formation of portfolio, the economic sector of RAROC performance should be computated first.

The evaluation of RAROC performance using the average data of NPL in each economic sector was computated by using the formula of (3.1) up to (3.3). The table of the ratio of the number of non performing loan as compared to the loan disbursed in the commercial segment shows that all economic sectors have NPL above the recommendation of the financial authority, i.e. 5% maximal, except electricity, gas and water. Meanwhile in the retail segment, the community social service, business world service, trade, and electricity, gas and water show the credit quality or a quite good NPL level.

From the RAROC computation, the community social service sector in the commercial segment gives a RAROC weight of 1,09; it means the performance

Table 8. Return and Risk Portfolio against Optimal Portfolio of Commercial and Retail Segments in 2009-2013

Segment	Existing Portfolio		Optimal Portfolio		Target	
	Return	Risk	Return	Risk	Return	Risk
	(%)					
Commercial	0,8483	0,2110	1,4942	0,0562	0,9216	0,2110
Retail	0,3470	0,2171	1,7641	0,0998	1,2918	0,2171

Source : Results of research data processing, 2014

of investment in this economic sector is vulnerable to NPL increase. Transportation sector has different performance, the net weight of RAROC is 18,62 whereas the NPL in this sector is higher than the other 7 economic sectors; it means high NPL, but the net income received is also high. The net income of the economic sector of manufacturing industry in the retail that has high NPL (7,56 %) has not been able yet to cover the allocated capital (0,59). The construction sector gives a net weight of profit of 38,02 although the NPL in this sector is higher as compared to the other 5 economic sectors.

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The above result of computation shows that NPL not necessarily causing the low performance of economic sector. As has been stated previously that NPL is timely payment grouping, therefore it cannot yet be used as the basis of computation of not received income. Nevertheless, a good NPL management should be conducted by BNI. Obamuyi (2011) through his research in Nigeria concluded that providing a loan in the commercial banking is conducted by taking into consideration several things, such as business prospect, financial power, financing, management capacity, relationship and historical repayment in other banks, and its business risk. The commercial segment, referred to the said research, needs to strengthen the financial and performance analysis, especially the community social service. The retail segment that provides a loan using asset based pattern needs to be selective related to the marketability of the guarantee submitted in order that the second way out credit will be more secured, especially in the sectors of manufacturing industry and mining. NPL that can be pressed as minimal as possible will, in its turn, increase the weight of net income, so that it becomes bigger than the allocated capital. Another strategy to improve performance can be done by credit disbursement mapping, so that the liquidity need can be planned well and focused on cheap fund.

Another strategy of forming the portfolio of commercial and retail segments is by conducting simulation of Single Index Model optimal portfolio supported by RAROC performance. Constraint in the

Table 9. NPL and RAROC Performance of Commercial and Retail Economic Sectors in 2009-2013

Economic Sectors	Commercial			Retail		
	(%)					
	Proportion	NPL	RAROC	Proportion	NPL	RAROC
Manufactoring Industry	37,07	6,42	21,26	10,62	7,56	0,59
Business World Service	23,5	5,95	8,14	18,95	3,06	12,55
Community Social Service	12,98	16,44	1,09	2,41	2,73	8,75
Construction	7,36	6,72	17,56	6,72	6,16	38,02
Electricity, Gas dan Water	6,8	4,61	22,46	0,22	0,94	61,79
Trade	5,83	6,78	5,63	51,36	4,9	3,15
Mining	3,04	6,58	11,47	0,65	7,4	0,64
Agriculture	2,53	5,84	6,34	6,31	6,84	4,57
Transportation	0,88	7,25	18,62	2,77	5,45	3,13

Source : Results of research data processing, 2014

strategy of forming portfolio is the increase of weight of the economic sector is not allowed to be more than 20%. Simulation is conducted with the following criteria: 1) The optimal portfolio and recommendation of economic sectors out of the portfolio is maximally 50% of LEL and reducing the economic sector with the lowest RAROC performance; 2) The optimal portfolio and recommendation of economic sector out of the optimal portfolio is maximally 50% by adjusting the weights of 2 economic sectors with the lowest LEL space available. There is an overweight in the retail so that it is allocated to the trade sector; 3) Growth to optimize LEL with the amount value of fund allocation in line with LEL 2014; 4) The return growth of the economic sector is in line with the 2014 Bank Business Plan, i.e. increasing of 20%. Risk of 0,21% is to be maintained in all segments. Based on the simulation conducted on the above four alternatives, it is recommended the portfolio alternative 2 in the commercial segment in the view of this alternative gives the lowest risk per unit of result as compared to other alternatives. The selection of alternative 3 (alternative according to the LEL portion) in the retail segment was based on historic data of the dominant trade share as well as the still smaller risk per unit of result as compared to the other 2 alternatives (II and IV). Besides that, perceiving that the composition of the average of the existing portfolio in the trade sector is dominant (53,2%), if alternative I is used there will be many loans that have been disbursed in the trade sector need to be paid up, therefore it cannot be applied in the retail segment ritel although the risk per unit of return is better (0,0510%).

In the commercial segment in table 12, the recommended portfolio gives a better risk per unit of result as compared to the existing portfolio. The recommended portfolio of commercial segment gives the expected result of 0,9992 % per month, higher than the expected result of 0,9216 % per month from the existing portfolio. The portfolio risk shows the expected risk value per unit of result is also better amounting to 0,1789 % per month. If the assumption of the actual return in 2014 is the same as before or achieved of 92,05 % that is 0,9198 % per month, then the risk per unit of result is also better, it becomes 0,1944 % per month. The weights of the economic sectors that have negative beta according to the Single Index Model computation in the commercial segments are reduced, i.e. sectors of manufacturing industry, construction, and community social service, by maximal 50% of the economic sector of the LEL portion.

The retail segment in table 12 also shows that the expected result of 1,2918 % per month can also be increased to 2,7014 % per month or it increases by 200,12 %. The average of result during the research period was 0,3470 % per month or 26,86% achieved. If the similar achievement assumption in 2014 is applied, the result has a potentiality to be increased to 0,7255 % per month with a risk level per unit of return getting better of 0,3417 % per month. The portion of trade weight in the recommendation portfolio is reduced to 49,86%.

The result of the research shows there are several differences of weights of the economic sectors as compared to the existing weights in the recommendation of portfolios taken for the commercial and retail segments. As has been presented in table 12 that matter has a consequence of a strategy modification by the management, because the weights of several economic sectors were increased. With regard to that strategy modification, if a problem mapping is conducted, it shows that there are economic sectors that need the

Table 10. Alternatives of Portfolios of Commercial and Retail Segments (in percentage)

Economic Sectors	Commercial				Retail			
	Alt.I	Alt.II	Alt.III	Alt.IV	Alt.I	Alt.II	Alt.III	Alt.IV
Transportation	16,27	16,27	12,12	17,08	14,54	14,54	5,52	0,99
Trade	3,41	19,81	23,26	20,99	10,62	44,00	49,86	7,75
Agriculture	17,15	17,15	5,08	17,53	9,46	9,46	6,79	27,56
Business World Service	19,68	19,68	9,00	19,16	4,95	4,95	16,51	0,00
Electricity, Gas and Water	11,82	2,50	2,50	12,41	24,28	0,22	1,25	12,52
Mining	14,77	3,43	3,43	12,83	10,44	0,65	0,62	4,75
Community Social Service	1,62	1,62	3,23	0,00	1,05	1,05	2,09	0,00
Construction	7,12	7,12	14,23	0,00	17,13	17,13	8,62	33,29
Manufacturing Industry	8,14	12,40	27,13	0,00	7,54	7,54	8,75	13,14
Total weight	100,0	100,0	100	100	100	100	100	100
E (R)p	1,4224	0,9992	1,6276	1,104	3,06818	3,0632	2,7014	1,548
Portfolio risk	0,4430	0,1788	0,53	0,21	0,1565	0,3171	0,2397	0,21
σ/r	0,3114	0,1789	0,3256	0,1902	0,0510	0,1035	0,0887	0,1357

Source : Results of research data processing, 2014

Tabel 11. Comparison of Portfolio Weights of the Commercial and Retail Segments (in %)

Economic Sector	LEL	Existing	Recommendation	Remarks	+/- against the Existing
Commercial Segment:					
Manufacturing industry	34,98	37,07	12,4stra0	Reduced	-24,67
Business world service	9,00	7,36	19,68	Increased	12,32
Community social service	3,23	3,04	1,62	Reduced	-1,42
Construction	14,23	12,98	7,12	Reduced	-5,86
Electricity, gas and water	2,50	0,88	2,5	Increased	1,62
Trade	23,29	23,50	19,81	Reduced	-3,69
Mining	3,43	2,53	3,43	Increased	0,90
Agriculture	5,11	5,83	17,15	Increased	11,32
Transportation	12,12	6,80	16,27	Increased	9,47
Total	100,00	100,00	100,00		
Actual return		0.8483			
Expected return		0.9216	0.9992		
Risk		0.2110	0.1788		
σ/ E(R)p		0.2289	0.1789		
σ/R		0.2605	0.1944		
Retail Segment:					
Manufacturing industry	8,75	9,98	8,75	Reduced	-1,23
Business world service	16,50	13,06	16,51	Increased	3,45
Community social service	2,09	7,29	2,09	Reduced	-5,20
Construction	8,62	6,42	8,62	Increased	2,20
Electricity, gas and water	1,25	0,21	1,25	Increased	1,04
Trade	49,86	53,20	49,86	Reduced	-3,34
Mining	0,62	0,66	0,62	Reduced	-0,04
Agriculture	6,79	6,51	6,79	Increased	0,28
Transportation	5,52	2,67	5,52	Increased	2,85
Total	100,00	100,00	100,00		
Actual return		0,3470			
Expected return		1,2918	2,7014		
Risk σ/E (R)p		0,2171	0,2397		
		0,1680	0,0887		
σ/R		0,6256	0,3417		

Source : Results of research data processing, 2014

strategy modification because their weights need to be increased (table 12). The table shows that in the middle segment the weights of 5 economic sectors need to be increased, whereas in the small segment there are 4 economic sectors. Three economic sectors need to be increased in two segments, i.e. electricity, gas and water, agriculture and transportation.

The result of the research shows there are several differences of weights of the economic sectors as compared to the existing weights in the recommendation of portfolios taken for the commercial and retail segments. As has been presented in table 12 that matter has a consequence of a strategy modification by the management, because the weights of several economic

sectors were increased. With regard to that strategy modification, if a problem mapping is conducted, it shows that there are economic sectors that need the strategy modification because their weights need to be increased (table 12). The table shows that in the middle segment the weights of 5 economic sectors need to be increased, whereas in the small segment there are 4 economic sectors. Three economic sectors need to be increased in two segments, i.e. electricity, gas and water, agriculture and transportation.

The realization as compared to the target in the retail segment was only 26.86% achieved, whereas in the middle segment it was 92.05% achieved. The whole return realization of the economic sector in the retail segment has not yet been in line with the expected return. The domination of the trade sector caused the expected return in this sector was high, that is 0,5353%, whereas the average realization of the return was only 0,2539 %. Therefore, the domination of the trade share should be reduced gradually.

Tabak et al. (2011) was of the opinion that there are two strategies of forming the credit portfolio, i.e. diversification strategy and concentration strategy. Bebzuk and Galindo (2008) in Sari (2012) studied about the impact and evolution of credit portfolio diversification during the financial crisis in 2001-2002 in Argentina. The result of their study concluded that diversification has a positive impact to the return. The result of a research in Indonesia conducted by Christianti (2011) regarding the level of economic sector diversification towards the profitability and probability of failure of the banks that have been listed in the stock exchange concluded that the value of the bank's assets was proved to be able to make clearer the relationship capacity between the credit diversification towards the profitability and probability of the bank's failure. The research of Sari (2012) regarding the already go public banks in Indonesia concluded that concentration and diversification did not have any impacts on the return and concentration had a positive significant impact on the non-performing loan.

The result of the research conducted by BNI shows that the commercial segment that has a more diversificated portfolio as compared to the retail segment has a return close to the target, likewise the result of risk calculation per unit of return is better than the retail segment. This strengthens the research conducted by Bebzuk and Galindo (2008) and Christiani (2011). BNI as a bank in the category of Commercial Bank of Venture Group (BUKU) IV or a bank with the core capital of above 30 trillion rupiahs can be categorized as a big size bank, therefore concentration is not suitable to be applied in BNI.

Table 12. Mapping of the weight increase of the economic sector

Economic Sector	Commercial	Retail
Business World Service	√	
Electricity, gas and water	√	√
Mining	√	
Agriculture	√	√
Construction		√
Transportation	√	√

Source : Results of research data processing, 2014

According to PBI No. 14/22/PBI/2012 in which the Bank of Indonesia requires national banks to disburse loans to Small and Medium and Micro Businesses of minimal 20 % gradually from 2013 until 2018 (BI 2013), the composition of banking business portfolio as depicted in picture 1 shows that the corporation segment during the research period moved to dominate the portfolio more and the level of NPL was also better as compared to the commercial and retail segments. Therefore, the credit growth in the corporation segment that has already been good should be followed by the good growth in the commercial and retail segments. The recommendation of portfolio according to table 12 can become a reference for improving the share of the commercial and retail segments as well as can give a better result and keep paying attention to the disbursement growth in each economic sector.

This forming of optimal portfolio by using Single Index Model approach can be used for the next period with an assumption that BNI keeps updating LEL every year as the policy that has been applied. Updating LEL will be useful for providing benchmark for the portfolio organizer, especially at the operational level in order to adjust the portfolio according to the direction of the result as expected by the management. Therefore, every year an evaluation of LEL should be constantly conducted by paying attention to the available variable inputs. Updating LEL will determine the direction of credit disbursement of the economic sector according to the management's risk appetite.

CONCLUSION

During the research period in 2009-2013 it showed that in the commercial segment the return performance of portfolio has already been close to the determined target. The reason for the commercial segment has not achieved the target is that all sectors had returns under the target and the lowest one was the agriculture sector that had an average return of 0,0004% whereas the targeted return was 0,0503 %. The annual return performance of portfolio was getting worse although it managed to improve in 2012, this was because the returns of the manufacturing industry sector with the biggest average proportion (37,1 %) became lower in each period. The risk of portfolio of this segment was getting worse in every period. The retail segment had a return performance that was quite far from the target. This was due to the trade sector with weight domination of 53,12 % targeted a return of 0,5352 % whereas the average return was only 0,2539 %, likewise the construction sector that targeted a return of 0,3580 % only achieved averagely 0,0285 %. The return performance of portfolio in every period

decreased, also the risk of the portfolio. In 2012 the return performance of trade, mining, agriculture and transportation was getting better; however, it had not given any contribution yet to the improvement of the return of portfolio in that year.

The formation of commercial optimal portfolio using the Single Index Model approach, the recommendation for the economic sector is business world service (19,68 %), electricity, gas and water (11,82 %), trade (20,31 %), agriculture (17,15 %), transportation (16,27 %) and mining (14,77 %). The expected return is 1,4242 % and the risk received is 0,00562 %. The recommendation for the retail segment is for the sectors of electricity, gas and water (24,28 %), construction (17,13 %), transportation (14,54 %), manufacturing industry (13,54 %), trade (10,62 %), mining (10,44 %) and agriculture (9,46 %). The expected return is 1,7641 % whereas the risk is 0,0998 %. It has been proven that the second composition of the optimal portfolio was able to give a better expected return and a better risk as compared to the existing portfolio; however, keeping in mind that only the weight of the trade sector in the commercial segment that was close to the existing portfolio and the unused drawing rights of LEL, strategy modification is needed in conducting credit disbursement.

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