

**THE FACTORS AND BEHAVIOR OF RISK-BASED CAPITAL RATIOS
OF COMMERCIAL BANKS IN INDONESIA IN ACCORDANCE WITH
BASEL II ACCORD**

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Abstract

This research primarily aimed to find out the response of Indonesian banks' capital ratios to changes in the amount of regulatory capital requirement, investigated the relation between banks' characteristics to that particular response as well as the effect of capital quality preference to the banks' risk-based capital ratios under the implementation of Basel II Accord. The data used was secondary data in a form of commercial banks statistics which were obtained from Otoritas Jasa Keuangan (OJK). The method of analysis would be fixed effect Generalized Method of Moments (GMM) with 3 alternative weights: cross-section weight, period weight, and 2SLS weight, and later only one of them which offered the best fit would be selected. The regression result generated by the chosen method then would be analyzed to identify the behavior of capital ratios toward changes in several proposed factors.

Based on analysis using fixed effect Generalized Method of Moments (GMM) with cross-section weight, between 7 proposed factors and capital ratios in this research was proved to have correlations. Capital ratios showed different behaviors toward capital requirement, banks' size as well as their risk tolerance, dependence on core (equity) capital, and also exposure to market discipline. These findings have implications to the observation of capital regulation in Indonesia.

Keywords: commercial banks, capital ratio, relationship, GMM

1. INTRODUCTION

Research Background

Reflecting back to the history, banking industry in Indonesia has been through a series of deregulations in search for the aim to develop a healthy, efficient, and competitive banking system. Many things had happened; previously over-regulated banking system had constrained initiatives from banks, and created a stagnant condition in the economy. This situation pushed Bank Indonesia as a central bank to carry out deregulation in the system to meet the demand of the society, business, and economy as a whole.

Until nowadays, the important role of banking industry to the society is undeniable. Considered vital in payment system as well as facilitating credit and economic growth, the banking industry is one of the most regulated industries overall (Francis and Osborne, 2010). The industry is regulated with several regulations, particularly regarding its capital. Capital regulation takes role to overlook the industry and mandate the institutions to improve the quality and the quantity of its capital (under Basel II) in an objective to be able to absorb shocks and unexpected losses during crisis that could lead to the failure of those banking institutions. A concern then might rise about what the ideal design of capital requirement is, and it forces the regulators to constitute a more fundamental role of regulatory capital requirement in affecting bank behaviors regarding their capital ratio and to stimulate market perception about current bank's risks.

The practice of setting a specific capital requirement under the implementation of Basel II provide a slight impression that it confirms the extent to which capital regulation affects bank behavior, particularly in its capital ratio. Banks do not always respond to capital requirements in a similar fashion. This study contributes to the previous research in two ways. First is the evaluation of the extent to which banks' response rate (to change in capital regulation) depends on various bank-level characteristics. Second contribution is the examination of how the composition of regulatory capital influences bank's choice of capital ratios which in this case is related to the quality and quantity of the bank's capital itself.

Problem Statements

After reviewing the described research background, researcher comes up with three main research questions:

1. In terms of capital ratio, how do banks in Indonesia respond to changes in the amount of minimum regulatory capital requirement set by Bank Indonesia in accordance with Basel II accord?
2. Does this response influenced also by characteristics of the bank (size, composition of capital structure, risk, and exposure to market discipline)?
3. How does the quality of capital affect banks' choice of risk-based capital ratios?

Scope of the Research

In order to limit the discussion on the issues and acquire clearer direction for researcher in the research, commercial banking statistics sampled in this research is under the implementation of Basel II accord in 2009-2013. The data used in this research are the overall data of commercial conventional banks in Indonesia which will be classified into several groups according to their industry. Commercial banking statistics used in this research are issued by Otoritas Jasa Keuangan (OJK).

Objectives and Benefits of the Research

Based on the problem statements, the objectives of this paper are listed as followings:

- a. Finding out the mean of response in terms of capital ratio which Indonesian banks have regarding changes in the amount of minimum regulatory capital requirement set by Bank Indonesia in accordance with Basel II accord.
- b. Investigating whether banks' responses are influenced by banks' characteristics (size, composition of capital structure, risk, and exposure to market discipline).
- c. Investigating the effect of capital quality on bank's choice of risk-based capital ratios.

2. LITERATURE REVIEW

Theoretical Background

According to Indonesian law of UU No. 10 Th. 1998, banking institutions are those who gather funds from society in a form of savings and distribute them back to society in a form of credit or others in purpose to raise the wealth of the society. There are several types of commercial conventional banks operating in Indonesia, and they are classified as followings:

- a. State-owned bank
- b. Foreign exchange commercial bank
- c. Non-foreign exchange commercial bank
- d. Foreign-owned bank

Capital requirement, also known as regulatory capital, is an amount of money that a bank or other financial organization must have available in relation to the amount that it has lent (Cambridge Business English Dictionary, 2015). In response to capital requirement, banks generally will hold capital ratio. Risk-based capital ratio or also known as capital adequacy ratio is a measurement of bank's core capital to the assets and off-balance liabilities weighted by the risk.

This ratio describes the ability of the core capital of the bank to absorb the potential losses due to the risk of the banking activities.

Tier I capital is core capital which includes only permanent shareholders' equity (issued and fully paid ordinary shares and common stock and perpetual non-cumulative preference shares) and *disclosed reserves* (created or increased by appropriations of retained earnings or other surplus, e.g. share premiums, retained profit, general reserves and legal reserves) while deducting goodwill (Baltali and Tanega, 2011). Changes in the level of goodwill will influence market discipline towards the banks themselves. Market discipline in the banking sector can be described as a situation in which private sector agents including depositors, creditors, and stockholders face costs that are increasing in the risks undertaken by banks and take action on the basis of these costs (Hosono et al., 2005).

Previous Research Findings

The identified relationship between capital requirements and capital ratios has grown interest to the regulators and researchers. Bank's choice of capital and its risk-based capital management practices have been written in many papers. Estrella (2001) presents dynamic model of optimal bank capital in which the bank optimized over costs associated with failure, holding capital, and flows of external capital.

Another research by Alfon et al. (2004), examined that the decision of bank's capital is dependent to its internal risk assessment. The research suggests that capital requirements and banks' capital ratios are positively correlated, while the relationship between capital ratio and risk is estimated to be negative.

Survey findings in the research also noted that the practice of holding excess capital may arise from the firm's need to finance its long term strategy. It is meant to maintain a degree of operational flexibility, as well as avoid adjustment costs associated with raising additional capital.

Research findings from Alfon et al. (2004) was somehow indecisive about the relationship between capital and return on equity which in their analysis becomes the proxy of opportunity cost of capital. They reported a significant positive relationship, if adjustment costs of raising additional capital were taken into account, while if no adjustment was taken, then there would be a weak negative relationships. However, the lack of statistical significance of the return on equity (ROE) as a proxy of opportunity cost of capital makes the results on ROE must be treated with caution (Alfon et al., 2004).

Banks do consider the trade-off between quantity and quality when deciding on their capital structures. A study by Myers and Maljuf (1984) suggested that Tier 1 capital (consists of common equity capital), is more costly to be raised than Tier 2 capital (includes some forms of subordinated debts). They also emphasized that external financing by debt is better than financing by equity in a condition when managers have superior information. Alfon et al. (2004)

indicated in their research that size of the financial institution do have a large influence on firm's capital management practices. Smaller banks choose to have higher capital ratios than larger banks.

Previous research has found evidence that market discipline has an influence on banks capitalization. Banks stakeholders (creditors and depositors) can contain banks to offer a higher rate of return if they assume a higher risk. Particularly for uninsured depositors, have appropriate incentives to take that action, because they are exposed to losses in the event of banks' failure (Nier and Baumann, 2003).

Hypothesis Development

Alfon et al. (2004) previously suggested in their research that capital requirement is positively correlated with banks' capital ratios.

H_{a1} = Capital requirement set by Bank Indonesia affects banks in terms of their capital.

Alfon et al. (2004) stated in their research that size the relationship between capital ratio and risk is estimated to be negative. They are somewhat indecisive about the relationship between capital ratio and coefficient on variable return on equity (ROE). They reported a significant positive relationship, if adjustment costs of raising additional capital were taken into account, while if no adjustment was taken then there will be a weak negative relationships. Later, Alfon et al. indicated in their research that size of the financial institution do have a large influence on firm's capital management practices. Smaller banks choose to have higher capital ratios than larger banks, which means that we can expect a negative relationship between size of the banks and their capital ratio.

Nier and Baumann (2003) in their previous research had found evidence that market discipline has an influence on banks capitalization. Banks stakeholders (creditors and depositors) can contain banks to offer a higher rate of return if they assume a higher risk. Particularly for uninsured depositors, they have appropriate incentives to take that action, because they are exposed to losses in the event of banks' failure.

H_{a2} = Characteristics of the bank (size, composition of capital structure, risk, exposure to market discipline) have influences on capital ratio.

The trade-off between quantity and quality is considered when deciding on their capital structures. Myers and Maljuf (1984) in their research suggested that Tier 1 capital (consists of common equity capital) was more costly to be raised than Tier 2 capital (includes some forms of subordinated debts). Banks will always search for an optimal capital structure (a mix of Tier 1 and Tier 2 capital) based on their risk profiles and the decision later would affect their capital ratio.

H_{a3} = Quality of capital has an influence on bank's capital ratio.

The summary of variables' relationships to the capital ratio will be summarized in Table 2.3 below

Table 2.2
Expected Variables' Relationships to the Capital Ratio

Variable	Relationship(s) to the Capital Ratio
Capital Requirement (CR)	Positive (+)
Size (SIZE)	Negative (-)
Risk (LRISK)	Negative (-)
Return On Equity (ROE)	Positive (+) or Negative (-)
Market Discipline (MARKET)	Positive (+)
Quality of Capital (TIER1)	Positive (+)

3. RESEARCH METHODOLOGY

Sampling

The sample of the research will be taken using purposive sampling method. This model is used because researcher intentionally chooses the sample which is considered appropriate for the study. From the acquired sources, based on commercial banking statistics, the researcher decided to use 4 industries of the banks as the research samples. Here are the samples used for the research:

Table 3.1
Samples of Research

No	Bank Industry	Number of enlisted bank
1.	State-owned bank	4
2.	Foreign exchange commercial bank	35
3.	Non-foreign exchange commercial bank	30
4.	Foreign-owned bank	10

Source: Otoritas Jasa Keuangan (OJK) and Bank Indonesia

Data and Data Gathering

Data used in this research are commercial banks statistics from Otoritas Jasa Keuangan (OJK) in period 2009 to 2013 including: the monthly overall return on equity of commercial banks, the monthly overall ratio of risk-weighted assets to the total assets of commercial banks, The monthly overall proportion of qualifying regulatory capital consisting of Tier 1 capital of commercial banks in the year, The monthly overall time demeaned total asset of commercial banks, The monthly overall ratio of subordinated debt to total liabilities of commercial banks, and individual capital requirement set by Bank Indonesia.

Variable Measurement

In this research, the total risk-based capital ratio is calculated as the ratio of total regulatory capital (the sum of eligible Tier 1, Tier 2, and if applicable Tier 3 capital) to total risk-weighted assets in the banking and trading book, while The individual capital requirement is measured by using a regulatory bank-specific capital requirement set by Bank Indonesia. In the analysis, researcher used the return of the minimum capital requirement that the banks hold to be able to explain the relationship of how changes in the amount of capital requirements will affect capital ratios.

In this research, the indicators of banks' characteristics will be served by variable: ROE, RISK, SIZE, and MARKET. ROE (return on equity) is measured by the ratio of net income to firm's book equity, as a proxy of the direct opportunity cost of holding excess capital which also used in this research as an indicator of banks' capital structure. Variable Risk will be measured as the ratio of risk-weighted assets to total assets. Risk only enters in a lagged form (LRISK) referring to the previous regulatory measure of asset risk. The data of risk-weighted asset used from period August 2010 – December 2011 are risk-weighted assets with operational risks due to the unavailability of the data in the banking statistics. A proxy for bank size will be measured by taking the time-demeaned value of the log of total assets of the bank, which are the combined value of all assets that a company have. The exposure to market discipline is measured by a proportion of subordinated debt to total liabilities. Due to the data unavailability of subordinated debt of foreign-owned banks from period January 2010 – July 2011 and from January 2012 – December 2013, the data used during those periods will be the data of one period prior to those missing periods.

In terms of measuring the effect of quality of capital to the banks' capital ratios, in this research we include capital quality variable Tier 1, or the proportion of total regulatory capital consisting of Tier 1 equity capital. Tier 1 will act as an indicator of capital quality in this research.

Method of Analysis and Hypothesis Testing

In calculating capital ratio or capital adequacy ratio, we can use the formulated equation below (Muljono, 1999):

$$CAP = \frac{\text{Tier 1 Capital} + \text{Tier 2 Capital}}{\text{Total Risk Weighted Assets}} \quad (i)$$

In this research, researcher will estimate the relationship using generalized method of moments (GMM). Generalized method of moments method is preferable because GMM has made econometric evaluation reliable for studying dynamic asset-pricing models, under more allowance and (correlation, heteroskedasticity) realistic assumptions (Jagannathan, 2002). GMM put an ease by enabling variables of interest to be serially correlated and conditionally heteroskedastic. The estimated version of our research model includes these variables and it is formulated as followings:

$$CAP_{i,t} = \beta_0 + \beta_1 ROE_{i,t} + \beta_2 LRISK_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 TIER1_{i,t} + \beta_5 CR_{i,t} + \beta_6 MARKET_{i,t} + \varepsilon_{i,t} \varepsilon_{it} \quad (ii)$$

where ε is a potentially serially correlated and heteroskedastic disturbance term. Except for LRISK, all of the variables are simultaneous. This implies that we model the bank's choice of risk-based capital ratio as a function of capital ratios and regulatory risk one month before and current attributes.

In processing the data using EViews 7 software, the method which will be used in the regression of equation (6) is GMM method with a fixed effect for both of cross-section and period. Observing the difference in the characteristics of each bank classifications, cross-section weights will be used due to the assumption to the presence of cross section heteroskedasticity (Quantitative Micro Software, LLC, 2010).

Hypothesis testing will test the significance of individual hypothesis using t-test. The significance level then can be determined by looking at the number of probability test that each hypothesis has and comparing them to the confidence level of 95% ($\alpha = 0.05$) which in this case is set to be the parameter.

4. DATA ANALYSIS

Table 4.1
Cross-section Weight Regression Analysis

Dependent Variable: CAP

Method: Panel Generalized Method of Moments

Cross-sections included: 4

Total panel (balanced) observations: 240

Cross-section weights instrument weighting matrix

Instrument specification: CAP C ROE LRISK SIZE TIER1 CR
MARKET

Variable	Coefficient	Prob.
C	222.7181	0.0000
ROE	0.536941	0.0208
LRISK	-41.25399	0.0000
SIZE	-31.36840	0.0000
TIER1	1.77E-05	0.0014
CR	5.697714	0.0005
MARKET	38.05268	0.0010

Source: Appendix 8

The Interpretation of Regression Results Using GMM Method with Cross-section Weight

The first objective of the research is to find the response of capital ratio towards changes in the amount of minimum regulatory capital requirement set by Bank Indonesia. The result of regression analysis confirmed that capital requirement (CR) does have a relationship towards capital ratio (CAP) as the dependent variable. This significantly positive association is supporting the previous findings on the effect of regulatory capital requirements in UK banks. The positive result implies that banks in Indonesia are assumed to increase (decrease) the amount of capital that they hold when the capital requirements set by the government is higher (lower). Evidence presented in research by Alfon et al., showed that the dependency of capital ratios and capital requirements was greater for the banks operating in capital close to the regulatory requirements or in this case was larger banks. It can be assumed that the impact of the changing in capital requirement will affect larger banks more than smaller banks (Alfon et al., 2004).

Second objective of the research is to investigate whether banks' responses in changing capital ratios are influenced by banks' characteristics namely size of the banks, their capital structures, their level of risk tolerance, and the level of exposure to market discipline. All of those tested characteristics showed

significant results which indicate that the change in banks' characteristics. The size of a bank (SIZE) was highly significant in 5% significance level using GMM method and generated a negative relationship, suggesting that large banks such as state-owned banks which experience economies of scale are better to diversify risks, thus holding a lower capital ratio than smaller banks. Banks' opportunity cost to hold equity capital also showed a statistically significant result in a 5% significance GMM method. which was in line to the previous research findings which was indecisive about relationship between ROE and capital ratio. However, there is evidence observed in a research by Jokipii and Milne (2008), which pointed out that variable ROE may reflect revenues, thus those stronger banks with higher ROE had better ability to increase capital ratios through higher retained earnings. LRISK was negatively correlated to capital ratios and the finding is consistent with the idea that changes in bank capital levels may not move in the same direction with the change in the level of risk, as proxied by risk-weighted assets in particular. Referring to the research by Alfon et al. (2004), this negative result implies that banks with higher risk appetite will generally hold lower capital ratios (as cited in Francis and Osborne, 2010). Interestingly, the extent to which a bank is exposed to market discipline has a significant impact on banks' capital management practices. The coefficient on our proxy for market discipline, MARKET, showed a significant positive relationship to capital ratio. This fact indicates that market forces, through their ability to affect banks' funding costs, for example a more demanding market discipline will provide banks with incentives to hold higher capital ratios.

The last objective of the research is to investigate the impact of capital quality on bank's choice risk-based capital ratios. From the result of regression analysis, the quality of capital variable (TIER1) was positively related to capital ratios and consistent with the previous expectations. The relationship was significant at the 5% level in the GMM specification and it was proved that capital quality does have an impact to banks' capital ratios. The analysis result suggests that banks that rely to a greater extent on higher-quality (and presumably higher-costing) Tier 1 capital tends to maintain higher total risk-based capital ratios (everything else constant) given that those banks faced fewer constraints in raising lower-quality capital which is less costly (Francis and Osborne, 2010).

The adjusted R-squared value of 94% indicates that all of the independent variables used in the research can explain 94% of the dependent variable in the research model which is a good fit, while the rest 6% can be assumed to be explained by other variables outside the stated research model. Thus, it can be assumed that our research has accomplished a good fit to explain the relationship between stated independent variables to the capital ratio as the dependent variable.

5. CONCLUSION

Conclusion

In the application of the GMM method, the researcher tries to identify the factors and behavior of capital ratios in Indonesian commercial banks which are classified according to their industries in monthly period from 2009 to 2013. A positive relationship is obtained in the relationship between capital requirement and capital ratio which indicates that banks in Indonesia do respond in the same pace to changes in the amount of capital requirement set by Bank Indonesia.

Banks responses to capital requirements in a form of capital ratios are influenced by banks' characteristics (size, composition of capital structure, risk, and exposure to market discipline) and are proved significant in a regression test using GMM method. The size of a bank (SIZE) is negative to the capital ratio suggesting that large banks such as state-owned banks which experience economies of scale are better to diversify risks, thus holding a lower capital ratio than smaller banks. Banks' opportunity cost to hold equity capital (ROE) shows a significant positive result to the capital ratio. Jokipii and Milne (2008) points out in their research that variable ROE may reflect revenues, thus those stronger banks with higher ROE have better ability to increase capital ratios through higher retained earnings. Level of risk allowance (LRISK) is negatively related to capital ratios. The finding is consistent with the idea that changes in bank capital levels may not move in the same direction with the change in the level of risk, as proxied by risk-weighted assets in particular. The extent to which a bank is exposed to market discipline (MARKET) has a significant impact on banks' capital management practices. This fact indicates that market forces, through their ability to affect banks' funding costs, for example a more demanding market discipline will provide banks with incentives to hold higher capital ratios.

In terms of quality of capital, the positive results indicates that banks in Indonesia that rely to a greater extent on higher-quality and higher cost Tier 1 capital tend to maintain higher total risk-based capital ratios which also supported by fewer constraints to raise a lower quality capital.

Limitations of the Research

Several limitations are set in this research due to the researcher's time constraint and other external factors. The sample used in this research was classified according to the four industries of commercial banks in Indonesia which in fact created an impression of small number of the sample. This research was also done in the period range under the Basel II accord implementation which gave an out of date impression relative to the present time. In addition to this, it was somewhat irrelevant to project how banks will behave during more prolonged economic cycle under the implementation of Basel III accord. In this research, variable SIZE was assessed in a book-value orientation which was based on total assets of each bank industry.

Suggestions for Further Research

There are several suggestions which are proposed to enhance the future exploration of this topic. This research aimed to provide a whole picture of factors and behavior of capital ratio in commercial banks, thus the researcher decided to determine the sample size of commercial banks based on their industry. Further research could use sample of commercial banks individually or even classifying them according to their capital level in order to expand the small impression of sample size used in this research.

This research was mainly done in 2014-2015 which was the transition from the implementation of Basel II to Basel III accord. Therefore, researcher decided to choose the year range where Basel II accord was implemented (2009-2013). To extend the research about this topic, future researchers could try to give an up to date impressions to their research by focusing on discussions about this topic under Basel III accord, or even comparing the topic under the implementation of both regulations.

Future researchers could expand the point of view of this research by assessing variable SIZE in market-value orientation which is based on market capitalization of each bank industry. How banks calculate the size of capital margin that they aim to hold above the regulatory minimum could also be discussed in further research. This could be an interesting fact that the future researchers should explore more deeply in order to enhance the development this topic.

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