MACROECONOMIC AND BANK-SPECIFIC DETERMINANTS OF LOAN LOSS PROVISIONING IN INDONESIA

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ABSTRACT

This paper used Generalized-Linear Model (GLM) with the exposure time to examine the determinants of credit loss provisions in Indonesia's banking sector. The research was motivated by the hypothesis that both macro economic variables and bank - specific have an effect on the quality of loans and loan loss provisions to cover risks. The results showed that loan losses could be explained primarily by a particular bank and macro economic variables. On asset size, the study found a positive relationship between the size of assets and loan loss provisions indicating that there is no benefit for the large banks of their managerial and technological advantages. Well-capitalized bank with a negative impact on loan loss provisions, the bank also showed that the capitalized ones take less credit risk. It appears clear that inefficient banks to risk further demonstrate the validity of the hypothesis of poor management. Using the profitability/Return On Average Assets (ROAA), it was found that there is a negative relationship implying that profitable bank save lower credit risk and also support the hypothesis that good management to take the risk is lower. On the impact of the price index, it was found negative showing higher inflation reduces loan loss provisions. In terms of economic growth/Growth Development (GD), the results provide further evidence that economic growth reduces credit risk and that this provides further support of procyclicality in credit markets.

Key words: Loan Loss Provision, Credit Risk, Poor Management Hypothesis, Procyclicality.

MAKROEKONOMI DAN BANK TERTENTU TERHADAP DETERMINAN PROVISI KERUGIAN PINJAMAN DI INDONESIA

ABSTRAK

Penelitian ini menggunakan Generalized-Linear Model (GLM) dengan waktu paparan untuk menguji faktor penentu provisi kerugian kredit di sektor perbankan Indonesia. Penelitian ini dimotivasi oleh hipotesis bahwa kedua variabel ekonomi makro dan bank - tertentu berpengaruh pada kualitas pinjaman dan provisi kerugian pinjaman untuk menutup risiko. Hasil penelitian menunjukkan bahwa kerugian kredit bisa dijelaskan terutama oleh bank - tertentu dan variabel ekonomi makro. Pada ukuran aset, studi ini menemukan hubungan yang positif antara ukuran aset dan provisi kerugian pinjaman, menunjukkan bahwa tidak terdapat keuntungan bagi bank-bank besar dari aspek manajerial dan teknologi. Bank bermodal besar dengan dampak negatif pada provisi kerugian kredit juga menunjukkan bahwa bank yang dikapitalisasi mengambil risiko kredit yang lebih kecil. Tampak jelas bahwa bank yang tidak efisien terhadap risiko lebih menunjukkan validitas dari hipotesis manajemen yang buruk. Menggunakan profitabilitas/Return On Average Assets (ROAA), ditemukan bahwa terdapat hubungan negatif yang menunjukkan bahwa bank dengan laba memilih risiko kredit yang lebih rendah hal ini mendukung hipotesis bahwa manajemen yang baik akan mengambil risiko yang lebih rendah. Pada dampak indeks harga ditemukan negatif, menunjukkan bahwa inflasi yang lebih tinggi mengurangi provisi kerugian kredit. Untuk pertumbuhan ekonomi/Growth Development (GD), hasilnya memberikan bukti bahwa pertumbuhan ekonomi mengurangi risiko kredit dan memberikan dukungan lebih lanjut procyclicality di pasar kredit.

Kata Kunci: Provisi Kerugian Pinjaman, Risiko Kredit, Hipotesis Manajemen Buruk, Procyclicality.

INTRODUCTION

It has been noted that credit risk is the risk of the most significant of all the risks that bank must manage as it can lead to potential losses and failure. In addition, credit risk is the risk that occurs due to failure of the debtor, which leads to default on the obligation to pay the debt. For example, Bessis (2004) states that credit risk management includes two things, namely the risk of the credit decision process before a decision is made to follow up on loan commitments, plus the risk monitoring and reporting process.

According to the Bank Indonesia Regulation (PBI) No.11/25/PBI/2009 as revision of PBI No. 5/8/PBI/2003 on risk management for commercial banks, it is stated that that the Bank's risk management process shall include at least a measurement and risk assessment approach, structure and parameter limits, and guidelines for risk management, management information and reporting systems, as well as evaluation and management review. Banks need better management of credit risk in the entire portfolio, namely by identifying, measuring, monitoring, controlling credit risk, and ensuring sufficient capital is available, and also that they can obtain appropriate compensation for the risk incurred.

One important aspect of risk management is the ability to provide reserves against potential losses. Bank must create reserves to cover any potential loss in lending and the reserve must be in accordance with the bank risk taken. The identification of credit risk is the first step in managing risk and then subsequently measuring the risk. The results of these measurements will be used to determine the magnitude of the loan loss reserve to cover the risk. Credit risk can be sourced from a variety of functional activities such as bank lending activities, treasury activities and investment activities, trade financing, which can be recorded both on the banking book and the trading book.

This paper focuses on the credit risk which arises from lending activities. As credit risk can have many different sources, the ability of the bank to set optimum loan loss provisions requires both previous and future assessments of the credit risk. In this study, we investigate the determinant of loan loss provisions. We use macro economic and bank specific variables as determinants.

THEORETICAL FRAMEWORK AND HYPOTHESIS

The Loan Loss Reserve in Indonesian Banking Regulation

The adequacy of loan loss reserves and the procedures used do evaluate reserve adequacy are frequently discussed in the banking regulation system. Many approaches to determining loan loss reserve adequacy have been used.

According to Office of Currency Comptroller (OCC) publication in 1998, appropriate evaluation of the valuation reserve must reflect three facts. First, reserve adequacy cannot be defined for any static point in time; it must be viewed in a dynamic sense. Second, adequacy of the resource must be viewed in a conjunction with the prospective quality of the credit portfolios. Third, reserve adequacy is in extricably related to the continuing stream of earnings available to replenish reserves and the capital available in case neither earnings nor reserves prove adequate. In Indonesia, two approaches are applied which are known as general reserves and special reserves.

According to Bank Indonesia Regulation (PBI) No.8/19/PBI/2006 on productive assets and establishment of loss provisions of which is a further amendment of the Board of Directors of Bank Indonesia Decree No.31/147/KEP/DIR dated 12 November 1998, the establishment or provision of funds is called the Allowance or Allowance for Earning Assets (PPAP). In PPAP, the establishment of a reserve or allowance is assessed based on the collectability of the loan borrowers with the following conditions:

1. General reserves (G-PPAP): Credit Cate-

gory Current= 1%
2. Special reserves (S-PPAP):
   a. 5% × Credit Category as Special
   b. 15% × (Credit Sub Category – Value of Collateral)
   c. 50% × (Category Doubtful Loans – Collateral Value)
   d. 100% × (Category Bad Credit – Collateral Value)

Loan loss provisions indicate the level of credit risk. Higher or lower loan loss provisions depend on the ability of the borrower to repay all amounts due according to the contractual terms of the loan agreement. The ability can de judged based on the debtor's payment record, overall financial condition and resources, debt service capacity, financial performance, net worth and future prospects. Because a guarantor can be involved in the loan loss mitigation, the prospects for support from any financially responsible guarantors is also important. When mitigation involves collateral, the nature and degree of protection provided by the value of any underlying collateral is also important.

Perez et al. (2006) note that general provisions usually rise during an economic upturn, as banks give out more loans and the demand for credit is high. During a downturn, loans to riskier companies would incur larger loan losses as risks materialize, and therefore higher specific loan-loss provisions follow.

After the revised FAS55 in 2006, the term of the PPAP was changed to Impairment Loss Reserves, which is often referred to as CKPN. In CKPN, the establishment or a provision of funds assessed from the debtor's credit evaluations conducted by the bank. If a banker thinks that a bank's provisions of credit to a debtors experiencing impairment (decreased), then the bank should establish a fund or reserve for credit. Because the debtor's credit evaluation is based on the decision of each bank, then each bank has its own policy in shaping there serve funds to the debtor's credit.

However, the bank's policy should not deviate from some of the criteria contained in the PAPI (Guidelines for Indonesian Banking Accounting) after a revision of FAS 55. The measurement provisions of reserves by CKPN based PAPI (Indonesia Banking Accounting Manual) Revised 2008 is divided into:

a. Individual Provision, where each bank can choose the calculation to measure the CKPN value of individuals using the methodology. The first, Discounted Cash Flow Method estimates the future cash flows (interest + principal payments) discounted at interest rates. The second, Fair Value of Collateral method calculates provisionsby using the value of cash flows for the guarantee or collateral in the future. The third, Observable Market PriceMethod has the value of provision determined from the market price of the credit.

b. Collective provision or portfolio provision. Bank managers can choose two techniques where the first is based on the calculation of cash flow contractual creditors in the futureand second, the provision is based on the historical loss rates loan debtors after deducting the loan repayment rate.

In short, we can conclude that the establishment of the provision according to PPAP and CKPN is basically similar in purpose but it is clear that the calculation for loan provision using the old methodology is simpler than the CKPN calculations, because we only take into account the allowance for funds based on the collectibility of the loans of borrowers. As for the calculation of CKPN, we need to check one by one if the loan borrower is experiencing impairment or not. After that we will form a reserve fund after there is evidence that the debtor is experiencing impairment.

In the literature, lenders also indirectly contribute to problem loans due to the failure to know the borrowers and understand their business. Lack of applicant verification is an example. Bank's staff may only perform a "remote control analysis" without visiting the borrower in recommending a credit and fail to verify information from the borrower. In a country where credit history

information is lacking, the failure to know the background of the borrower, including his present credit standing and legal status contribute to the excessive level of problem loans. Risk from bank operations are also especially related to the failure of internal system such as failure to know the degree of reliability of the collateral taken and failure to obtain a valid security. Documentation problem scan also exaggerate the problem. All of the points mentioned above are known as problems of selection under asymmetric information theory.

The other source of problems is moral hazard. It is a problem arising after banks disburse money to borrowers. Banks may fail to supervise the utilization of loan proceeds. Borrowers may not fully use the money in accordance with the purpose stated in the loan agreement. Due to disbursement targets, loan officers may neglect the sign of non – compliance of the pre-agreed conditions. However, the lender nevertheless continues to release the facility and it can end up becoming a problem loan.

In reality, banks also tend to reduce costs by ignoring follow up procedures. It can be in the form of no internal review, inadequate internal review systems and in most cases lack of staff to handle the monitoring process. As loan problems emerge, in most case it is not a rapid process but a gradual one. Lack of monitoring can cause banks to fail to recognize early symptoms and adverse signals which in practice are known as "red flags" symptoms of late repayments.

Credit risk is one of the most important areas of risk management. It plays an important role mainly for banking institutions, which try to develop their own credit risk models in order to increase bank portfolio quality. There are three approaches commonly applied. The first is traditional models where bank collect client specific information and then judge if the client is a good quality borrower.

The second is option pricing known as the structural model. It is based on financial option pricing theory developed by Black and Scholes (1973). Here, the value of a firm is modeled as an option price. An important contribution to credit risk modeling was given by Merton (1974). In this seminal paper, Merton introduced the idea of applying option pricing theory to the valuation of risky bonds and loans. In this model, a borrower will have an incentive to default whenever the market value of the firm becomes lower than the amount borrowed.

The third approach is called a reduced form models. These models use the market bond price as an input to derive the default probability and recovery rate. In summary, all approaches area tool to reduce problem loans or what is technically known as probability of default (PD), Loss given default (LGD) and Exposure at Default (EAD).

Together with estimation of loan size (S) and effective maturity (M), these credit risk components can be used for determining the capital requirement when banks apply Internal Ratings-Based Approach (IRB) (Basel Committee on Banking Supervision, 2004). According to Gunadi (2011), the major risk of commercial banks is credit risk. Banks have to maintain a level of capital, which is 92% of the total capital required to absorb credit risks. The credit to core capital and deposit ratio is 80%. The NPL's as a percentage of total loans must be below 5%.

According to Hlawatsch and Ostrowski (2010), when referring to the specific provisions with the occurrence of a credit event according to IFRS, an unnecessary capital increase will result. This holds because the expected loss according to Basel II then equals the product of LGD and EAD, which is usually higher than the specific provision under IFRS. If the specific provision is less than 20%, the risk weighted asset (RWA) is 150%. It increases regulatory capital. At the same time, provisions will be at least at the same amount with the expected loss. An insufficient amount is taken from capital for provisioning and so the liable capital has to be increased. It means loan loss provision must increase too.

Bank Specific Factors

Berger and De Young (1997) produced a seminal paper on problem loans and it is becoming a standard on discussing the sources of problem loan. They employed Granger-causality techniques to test four hypotheses regarding the relationships among loan quality, cost efficiency, and bank capital. The analysis suggests that the intertemporal relationships between loan quality and cost efficiency run in both directions. For the bad luck hypothesis - increases in nonperforming loans tend to be followed by decreases in measured cost efficiency, suggesting that high levels of problem loans cause banks to increase spending on monitoring, working out, and/or selling off these loans, and possibly become more diligent in administering the portion of their existing loan portfolio that is currently performing.

For a bad management hypothesis that applies for the industry as a whole, the data favor the bad management hypothesis that decreases in measured cost efficiency are generally followed by increases in non-performing loans; evidence that bad management practices are manifested not only in excess expenditures, but also in subpart underwriting and monitoring practices that eventually lead to non-performing loans.

For the skimping hypothesis, it is clear that increases in measured cost efficiency generally precede increases in nonperforming loans, suggesting that these banks purposely trade short-run expense reductions for long-run reductions in loan quality. For the moral hazard or capital ratio hypothesis, decreases in bank capital ratios generally precede increases in non-performing loans for banks with low capital ratios, evidence that thinly capitalized banks may respond to moral hazard incentives by taking increased portfolio risks.

Although these four hypotheses are not applied to all banks and have a relatively small effect on banks on average, they may have a substantial effect on individual banks that are most subject to bad luck, bad management, skimping, and/or moral hazard.

The implication is if the bad luck hypothesis is in place, bank failures are caused primarily by uncontrollable external events, and implies that prudential regulation and supervision could reduce the risk of failure by limiting banks' exposures to external shocks.

When bad management is present, the major risks facing financial institutions are caused internally so that bank supervision should consider cost efficiency in the supervising process. When a regulator recognizes the skimping practice, supervisors pay special attention to banks' internal credit control procedures. The moral hazard hypothesis implies that bank supervisors should monitor capital ratios carefully and require actions to raise the ratios quickly when they become low.

The capital allocation feature of loan-loss provisions in the Basel II framework may provide incentives for banks to increase provisions to meet the capital requirement. Under the regulation, a bank is required to provide provisions at least the same with the expected loss. Bank that put less capital than the expected loses are penalized by reducing their core capital up to 50%. In particular, banks with low capital levels may increase loan-loss provision levels in order to comply with the regulatory requirement and to mitigate solvency risk. Therefore, banks' capital adequacy ratios could have an important effect on banks' decisions in setting the optimal level of loan loss provisions.

Macroeconomic Factors

Macroeconomic factors may inhibit herding behavior of bankers in relation to future credit risk. Rajan (1994) explained that the herd behavior of the bank managers during expansion periods may be one of the reasons why nonperforming assets (NPA) accumulates immediately after the boom periods because of the competition and peer pressure. During the expansive business cycle, loan quality tends to be better and competition on loan marketing is so high that banks reduce the quality requirement. When the business cycle reverses from boom to bust,

the loan quality deteriorates faster.

Koopman and Lucas (2004) used a multivariate unobserved components framework to separate the credit and business cycles. Credit risk in this study is defined as business failure so when the business failure is high, a bank will experience higher credit risk. They used this model for describing the dynamic behavior of credit risk factors in relation to the real economy. They used data on real GDP, credit spreads and business failure for the US economy. They empirically showed a positive relationship between spreads and business failure rates and negative GDP meaning a higher interest rate spread increased business failure and higher economic growth reduced business failure.

Interesting results on the loan quality and business cycle is provided by Hu, Li and Chiu (2004) that an inverse relationship exists between bank size and NPL's. Their argument is that large banks have better risk management strategies that usually translate into more superior loan portfolios than their smaller counterparts. Hu, Li and Chiu (2004) also found that the banks with higher government ownership recorded lower non-performing loans.

Problem loans consist of both non-performing loans and non delinquent loans, which the banks consider to be particularly doubtful. The example is one of good loan quality but the borrowers experience business disruption due to fire or natural disaster or even deteriorating economic conditions. Banks have to estimate their expected losses on problem loans. There will thus be a close connection between banks' problem loans and the future judgment of economic condition.

Perez, Salas-Fumasand Saurina (2006) note that general provisions usually rise during an economic upturn, as banks give out more loans and the demand for credit is high during this period. During a downturn, loans to riskier companies would incur larger loan losses as risks materialize, and therefore higher specific loan-loss provisions follow.

The impacts of macroeconomic factors as well as microeconomic variables on problem loans were investigated by Das and Ghosh (2007). They examined the factors affecting problem loans of Indian state-owned banks for the period 1994-2005. They took into account both macro and micro variables and found that at the macro level, GDP growth played a very important role and any decrease in economic growth brought a negative impact as it increased credit risk. At a micro level, they found that real loan growth, operating expenses and bank size play an important role in influencing problem loans. Higher loan growth increased credit risk. Inefficient banks tend to take high credit risk.

The GDP growth is the most general and most direct measure of macroeconomic developments. It is regarded as the first and foremost indicator of the demand for banking services, including the extension of loans, and the supply of funds, such as deposits. As such it is a direct determinant of profits. That means, GDP growth is the most useful indicator of the business cycle.

Empirical studies tend to confirm the aforementioned link between the phase of the cycle and credit defaults. Quagliariello (2008) found that the business cycle affects the NPL ratio for a large panel of Italian banks over the period 1985 to 2002. The study covers accounting ratios of 207 banks. When the economic situation worsened, the bank loan quality decreased confirming the importance of the business cycle on loan quality. Cifter, Yilmazer and Cifter (2009), applying a neural network based model, found a lagged impact of industrial production on the number of non-performing loans in the Turkish financial system over the period January 2001 to November 2007. Previously, Salas and Saurina (2002) estimated a significant negative contemporaneous effect of GDP growth on the NPL ratio and inferred a quick transmission of macroeconomic developments to the ability of economic agents to service their loans.

Figure 1
Framework of Analysis
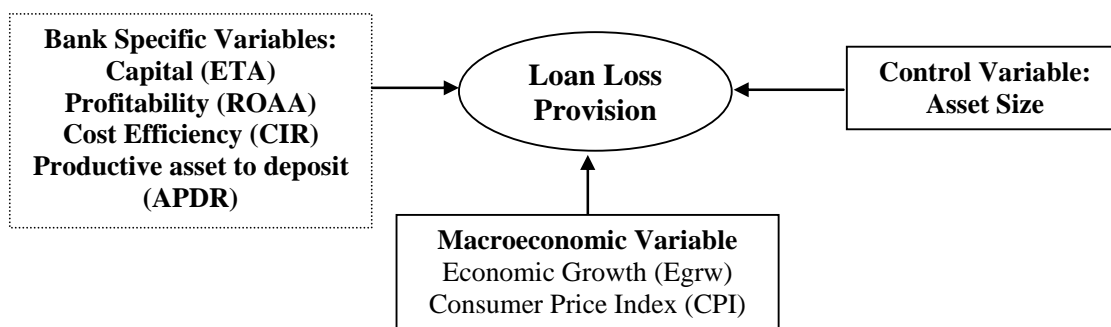
RESEARCH METHOD

Generalized linear models (GLMs) are mainly used for relating responses to linear combinations of predictor variables. It is able to handle discreet or continuous dependent variables to establish models for rates, proportions, binary variables, ordinal variables as well as multinomial variables. The GLM approach is attractive because it is able to provide a general theoretical framework for many commonly encountered statistical models and to simplify the implementation of these different models in statistical software, since essentially the same algorithm can be used for estimation, inference and assessing model adequacy for all GLMs. See Rabe-Hesketh and Everitt (2006).

The paper's contribution to the topic of loan-loss provisions is of an empirical nature. To our knowledge, there is no prior work done on the determinants of loan-loss provisions in the Philippines. This study mainly follows approach used by Louzis, Vouldis and Metaxas (2010) and Bonfim (2009) that study the impact of micro and macroeconomic influences on credit risk. The study combines both micro internal and macro economic aspects that influence the credit risk. The difference with both studies is the measure of credit risk. Previous studies use non performing loans, whereas we apply loan loss provisions as a measure of credit risk. We are aware that credit risk is multifaceted and requires many aspects of consideration. Both macroeconomic and bank-specific factors appear to have a role to play, with real GDP growth and price index

being the most important determinants according to procyclicality or business cycle theory. As the study aims to find a link between bank-specific factors and the macroeconomic environment on loan loss provision, the implication is useful for policy assessment purposes.

Bikker and Metzemakers (2004) analyze the cyclical patterns of bank loan loss provisions. They find that loan loss provisions have a pro-cyclical effect, as they are negatively related to GDP growth. Furthermore, bankers mitigate this pro-cyclical behavior of loan loss provisions by applying income smoothing practices. Bankers put less provision in the expansion period and higher provisions during difficult economic condition.

We include GDP growth to investigate the procyclical effect of provisioning. The common view is that an economic upswing and rising incomes indicate improving conditions for firms and reduce the likelihood of loan defaults, whereas a recession will have an impact on higher loan defaults. Bankers are expected to reflect this situation in their decision making process by lowering provisions during an economic expansion and increasing them during slowing economic conditions.

Attention should be given as most of the data used in the study are accounting data and It is possible that accounting ratios may also experience a managerial intervention. The risk that data experiencing some treatment such as earnings smoothing is unavoidable. The framework of the study is presented in Figure 1.

Table 1
Variables, Definition and Data Sources

No.	Variable	Definition	Hypothesis	Sources
1	LLRGL	Loan loss reserve to loan	Tested Variable	Bank
2	LASSET	Logarithm of total asset	(-) Size	Bank
2	ETA	Equity to total asset	(-) Bad Management	Bank
3	CIR	Cost to income ratio	(-) Skimping	Bank
4	ROAA	Return on Average Asset	(-) Bad Management	Bank
5	APDR	Productive asset to total deposit	(-) Moral Hazard	Bank
6	CAR	Equity Capital to Risky asset	(-) Moral Hazard	Bank
7	CPI	Consumer Price index (100=2007)	(-) Pro-cyclicality Business Cycle	Statistics Office
8	EGRW	Economic Growth	(-) Pro-cyclicality Business Cycle	Statistics Office

DATA ANALYSIS AND DISCUSSION

Different data sources were collected for empirical analysis. It then conducts a panel data approach. The bank-level data on financial statement report is solely collected from the database of Bank Scope, produced by Bureau Van Dijk Corporation. Macroeconomic variables are obtained from Indonesia Statistic Office. The variables and their definition are present in Table 1.

To examine the determinants of loan loss provision to total loan (LLR) in Indonesia, It uses a simple general linear model (GLM).The general linear model (GLM) is a flexible statistical model that incorporates normally distributed dependent variables and categorical or continuous independent variables. The model can be formulated as the following.

$$ROA = \alpha + \beta 1\ LASSET + \beta 2\ ETA + \beta 3\ CAR + \beta 4\ APDR + \beta 5\ CAR + \beta 6\ EGRW + \beta 7\ CPI + \varepsilon \qquad (1)$$

To assess the ability of the model to explain the loan loss provision (LLR), we use a Maximum Likelihood (ML) technique, because traditional regression testing techniques such as t-tests and F-test are not applicable. In this study, goodness of fit is tested using Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC) and Log likelihood ratio. These tests are used to test the capability of the model to explain the variability of the LLR. To asses the capacity of the individual variable, we use the t-test. In this study, we assume that the variance function (V(u)) follows the Poisson Distribution and the link function (g(u) = u) is assumed to be an identity function.

According to the literature, credit risk is lower for large banks as a large bank has an advantage in the credit management system and the bank can buy better risk management tools to manage credit risk. On the equity side, a weak capital position can increase credit risk (LLRGL) as a weak capital bank tends to take more risk at the cost of depositors and the deposit insurance company. On the efficiency side, lower CIR increases credit risk (LLRGL) as the bank tends to reduce costs for loan monitoring.

On the profitability side, a lower ROAA increases LLRGL as ROAA indicates the bad management situation. A bad performing bank is a reflection of bad management quality. Banks that put more assets into productive forms may reflect moral hazard behavior as the management may be ignoring the liquidity risk as management is too focused on profit and not risk. Excess regulatory capital (CAR) may reduce credit risk (LLRGL) as banks comply with regulation.

Various macroeconomic indicators can be used as explanatory variables relating to the indicator of the credit risk in the banking system. Interest rates and gross domestic product (GDP) are most commonly considered in this context in the literature. Gross

Table 2
The Descriptive Statistics of the Data

No	Variable	Obs	Mean	Std. Dev.	Min	Max	Coeficient Variation (CV)
1	LLRGL	237	3.49	3.16	0.32	29.72	0.91
2	LASSET	237	14.73	1.39	10.81	17.92	0.09
3	ETA	237	11.79	7.14	0.47	50.92	0.61
4	CIR	237	60.25	56.45	16.77	873.58	0.94
5	ROAA	237	1.69	1.02	-1.33	5.74	0.61
6	APDR	237	8.84	117.80	0.76	1814.65	13.32
7	CAR	237	22.08	16.07	8.08	129.94	0.73
8	CPI	237	101.88	16.09	75.22	124.42	0.16
9	EGRW	237	5.70	0.61	4.58	6.54	0.11

domestic product (GDP) is a basic indicator of the cyclical position of the economy. Consumer price index (CPI) indicates the condition of the economy where higher CPI figures provide information that there are imbalances in the economy. Higher CPI increases credit risk (LLRGL). A decline or low growth in GDP affects credit risk. A rise in interest rates affects the loan portfolio in a similar way, increasing the credit risk. However, in this study we exclude interest rates as it is correlated with CPI.

Result

Table 2 presents the description of the data employed in this study. The average value for LLRGL is 3.49% with minimum 0.32%, maximum 29.72% and standard deviation is 3.26%. The coefficient of variation (CV)is measured as the standard deviation divided by the mean value, and takes a value of 91%. Asset size (LASSET) has a mean value of 14.73 with a minimum of 10.81, a maximum of 17.92 and the CV is 9%. The average value for equity to total asset (ETA) is 11.79, with a maximum of 50.92 and a minimum of 0.42. The CV is 61% meaning the variation is 61% of its mean value.

On the efficiency ratio (CIR), the mean value is 60.25, the minimum is 16.77 and the maximum is 873.58. The CV for CIR is 94%. The mean value of profitability (ROAA) is 1.69, with a minimum of -1.33

and a maximum of 5.75, with the CV 0.61. The ratio of productive asset to deposit (APDR) has a mean value of 8.84, a minimum of 0.76 and a maximum of 1814 and a standard deviation of 117.80. The CV is 1300%. For the regulatory capital (CAR), the mean is 22.08, the minimum is 0.08 and maximum is 129%. The CV for CAR is 73%.

For the macroeconomic variables, the mean of the price index (CPI) is 102 with a minimum value of 75.22 and a maximum around 124. Please note that it is an indexed ratio where 2007 is set as the basis. The economic growth (EGRW) has a mean value of 5.7 with a minimum of 4.58 and a maximum of 6.54. The CV for EGRW is 0.11. From the normality test, we find that all data is not normally distributed.

Table 3 presents the GLM regression results. Before we discuss the results, an explanation on the fitness of the model is provided here. As the estimation uses maximum likelihood, the first statistics that should be considered is log likelihood. The log likelihood is -535.54 with Akaike Information Criterion (AIC) 4.6 and Bayesian Information criterion -865.79. It is clear that the model can be used for further analysis.

The result shows that size of asset is positive and significant at 1%. It means larger banks put aside more loan provision than smaller banks indicating the large banks

Table 3
The GLM Result

Variable	Coefficient	Std Error	t-Statistics	Significant
LASSET	0.290	0.094	3.080	0%
ETA	-0.064	0.025	-2.580	1%
CIR	0.008	0.005	1.740	8%
ROAA	0.652	0.132	4.940	0%
CAR	0.016	0.013	1.250	21%
APDR	0.002	0.001	1.740	8%
EGRW	-0.562	0.207	-2.720	1%
CPI	-0.024	0.009	-2.700	1%
_cons	-3.940	1.926	-2.050	4%

experience more problem than smaller bank. We expect that the sign will be negative to indicate the benefit in managerial skill and system support. It is understandable as large banks are state banks that must perform some government credit program such as people business credit (KUR).

It is also reality that after the banking crisis in 1998, the large state banks kept their problem assets in their balance sheet and it made the banks set aside more reserve to compensate with these quality problems. In short, the study is in contrast to Hu et al. (2004) that found an inverse relationship between bank size and credit risk (NPL). Such differences may come from the difference in the measurement definition of credit risk and country setting. We may interpret that large banks may prefer to put aside larger reserves than smaller bank as management are aware that their risk is larger and more sensitive to external sources of risk.

On the capital ratio (ETA), the study finds that strong capital has a negative impact on credit risk or loan loss reserves. It means the banks that have higher capital have lower credit risk as they put create smaller loan loss provisions. There is a tendency that well capitalized bank that is generally controlled by good management team, experience lower credit risk. In other situations, lower capital banks take more credit risk as part of management gambling with the bank. It is supporting the evidence that there is the possibil-

ity of a bad management hypothesis applicable in the industry. The evidence also rejects the possibility that strong banks generously put aside more capital.

On the cost efficiency (CIR), we find that inefficient banks take more credit risk and are forced to provide more loan loss reserves. The CIR is positive and significant at 8%. This finding supports the skimping hypothesis that inefficient banks undertake excessive risk taking which indicates that the bad management hypothesis is stronger than the skimping hypothesis. Low cost efficiency is positively associated with increases in future nonperforming loans. We expect that banks which devote less effort to ensure higher loan quality will seem to be more cost-efficient but will have higher problem loans due to a lack of supervision and monitoring. It seems the bad management bank, characterized as high cost to income ratio, is stronger.

On the profitability measure (ROAA), the coefficient is positive and significant at 1% meaning that profitable banks put more into loan loss reserve. We may interpret the result in two different ways. On profit oriented banks, they are willing to take more risk to earn more profit (moral hazard). In other way around, profitable banks put more loan loss reserves to shield against the tax (bad management). It seems that both moral hazard and bad management may be intertwined.

Table 4
Summary of the Results, Hypothesis and Conclusion

No.	Variable	Coeff	Hypothesis	LoS	Conclusion
1	LASSET	0.29	(-) Size	0%	Larger bank has higher risk
2	ETA	-0.06	(+) Moral hazard / Bad management	1%	Strong capital reduce risk
2	CIR	0.01	(-) Skimping or (+) Bad management	8%	Inefficient bank has higher risk (bad management)
3	ROAA	0.65	(-) Bad Management	0%	Profitable bank has lower risk (Good management)
4	APDR	0.00	(-) Moral Hazard	8%	Aggressive management has higher risk (bad management)
5	CAR	0.02	(-) Moral Hazard	21%	
6	CPI	-0.02	(-) Pro-cyclicality Business Cycle	1%	CPI is more purchasing power not business cycle
7	EGRW	-0.56	(-) Pro-cyclicality Business Cycle	1%	EGRW is business cycle indicator

LoS=Level of Significant.

For profit purposes, bank managers are required to invest resources into productive assets. To see how deposits are invested into productive assets (APDR), we use the productive asset to deposit ratio. The result shows that the coefficient for APDR is 0.002 and is significant at 8%. It means that as the management undertakes aggressive bank management, the credit risk is increased in term of loan loss provision. The result supports the bad management hypothesis that an aggressive management attitude increases risk.

On the impact of regulatory capital (CAR), the study reveals that CAR is not important for credit risk as the measure of credit in this study is based on *ex post* risk (LLRGL) whereas CAR is more focused on *ex-ante* risk (risk weighted asset). The coefficient is 0.02 and not significant as the t-statistics is 1.25. It is clear that loan loss reserve are not related to the strength of bank capita..

It is expected that the CPI will have a negative sign to indicate that higher CPI means unstable economic conditions. The fact that the CPI has coefficient -0.02 and significant at 1% confident level, shows that during the period of study, the CPI is not a good indicator of the business cycle. We are aware that the CPI may also reflect the demand power or purchasing power that has an opposite impact with the business cycle on credit risk. However, we can also interpret that inflation rate during the period of the study as a period of low inflation. In the previous decade, Indonesia experienced double digit inflation from time to time.

On the economic growth, we can see that the coefficient is -0.56 and significant at 1%. It means higher economic growth, indicates a positive business cycle, and reduces the credit risk. It is clear that EGRW is a good predictor for credit risk providing further evidence on the impact of macroeconomic variables on loan quality.

Our study provides some insights into how the behavior of credit risk as measured by loan loss provision varied during 2004 to 2011 as shown in Table 4. On the asset size, it clear that the coefficient is positive indicating the positive relationship between asset size and loan loss provision. Our previous assumption that larger size bank may be beneficial for better risk management and expertise in loan decision, is not valid. Large

banks experiences higher loan loss indicating that large banks are not immune from making wrong decision in their credit process.

As most of large banks in this study are government banks, that naturally play a role as an agent of development, we can conclude that the result is reasonable. It is also supported by the fact that during the economic crisis in 1998, only small banks can survive without government support. All large banks experience dramatic problem loan and this forced them to provide more loan loss provision during early 2000.

However we can not eliminate the possibility of accounting treatment or income smoothing. Although this study does not discuss this practice thoroughly, the possibility the large banks using loan loss provision as a tool for income smoothing is not closed. Various studies such as Fonseca and González (2008) and Kanagaretnama, Krishnan and Loboc (2010) unveiled the practice of income smoothing in the banking industry using loan loss provision.

On the capital side, the moral hazard and bad management hypothesis is evidence. There is strong evidence that stronger capital bank results in less loan loss provision. Under moral hazard theory, higher capital bank takes less risk but the lower capital bank takes more risk. If we use loan loss provision as credit risk measure, it clear that a lower capital bank takes more risk.

We can not make a strong decision as to which one is better, the skimping or bad management, in explaining the cost inefficiency. However, the bad management hypothesis is more realistic as it is positive to cost inefficiency. Low cost efficiency is positively associated with increases in future nonperforming loans. A bad management bank hypothesis, assumes that when the bank is badly managed, the inefficiency is high. As our measure of efficiency is cost to income ratio (CIR), it is clear that inefficient banks own higher loan loss provision.

On the ROA, there is strong evidence that the bad management hypothesis is strong. We expect the sign to be negative to indicate the bad management hypothesis. However, our empirical evidence shows the opposite situation. This situation indicates the evidence of tax shield where the profitable banks try to reduce tax payment by putting more income as a provision.

On the macroeconomic variables, the price is producing totally different expectation. We expect a positive relationship to indicate the inflation rate increased credit risk. The result is negative meaning higher CPI reduces credit risk or loan loss provision.

Economic growth is a good indicator for procyclicality. When economic growth is high, the credit risk in terms of loan loss provision is lower. Perez et al. (2006) note that general provisions usually rise during an economic upturn, as banks give out more loans and the demand for credit is high during this period. During a downturn, loans to riskier companies would incur larger loan losses as risks materialize, and therefore higher specific loan-loss provisions follow. Bankers on average create too little provisions in good times and are then forced to increase them during cyclical downturns. The behavior can magnify losses during the bad time as bank incur loses and at the same time must provide loan loss reserve.

When referring to the specific provisions with occurrence of a credit event according to IFRS an unnecessary capital increase will result. This holds because the expected loss according to Basel II then equals the product of LGD and EAD, which is usually higher than the specific provision under IFRS. Therefore, an insufficient amount is taken for provisioning and so the liable capital has to be increased.

CONCLUSION, IMPLICATION, SUGGESTION AND LIMITATIONS

In this study, a GLM approach was applied in which it includes time as an exposure variable to investigate the determinant of loan loss provision in Indonesian banking during 2004 to 2011. Not all banks are included in this study. And no selection crite-

rion is set. The selection of bank in the sample is merely on the availability of the data. We examine the determinant of loan loss provisions in Indonesian banking using macroeconomic and bank specific variables.

It was found that macroeconomic variables play an important role in the determination of the ratio of loan loss provisions. Economic growth has a negative impact on loan loss provisions meaning higher economic growth reduces credit risk and then loan loss provisions. Economic growth provides evidence that procyclicality of behavior of credit risk is viable and ignoring can result in a devastating impact on bank financial stability. On the inflation rate, the result shows that a higher inflation rate (CPI) reduces loan loss provisions. The result is opposite to the prior expectation that a higher inflation rate increases credit risk.

Furthermore, bank specific variables such as assets provide interesting results. Large banks tend to own higher loan loss provisions indicating the non existence of managerial as well as technological benefits of large banks. The result probably because most of the large banks in the sample are state banks that, beside doing business for a profit motive, also serve as an agent of development especially in the implementation of government credit programs.

On the capital (ETA) we find that moral hazard behavior is evident where lower capital banks take more risk and so put aside more loan loss provision than strongly capitalized banks. It means the banks that have a higher capital have lower credit risk as they put less loan loss provision. There is a tendency that well capitalized bank that is generally controlled by a good management team experience lower credit risk. In other words, a lower capital bank takes more credit risk as part of management gambling with the bank.

On the cost efficiency (CIR), we find that inefficient banks have more credit risk. This finding supports the bad management hypothesis that badly managed banks take excessive risks and indicating that the bad management hypothesis is stronger than skimping hypothesis. Low cost efficiency is positively associated with increases in future nonperforming loans. It seems the bad management bank, characterized as high cost to income ratio, is stronger. On the profitability measure (ROAA), the coefficient is positive and significant at 1% meaning that profitable banks take more risks and then put more into loan loss reserves. On the impact of regulatory capital (CAR), the study reveals that CAR is not important for credit risk as the measure of credit in this study is based on *ex post* risk (LLRGL) where CAR is more focused on *ex-ante* risk (risk weighted asset).

The study implies that regulation on loan loss provisions should also consider the future economic conditions, especially the prediction of economic growth. The inclusion of an economic variable will provide better prediction of loan loss provisions required to cover credit risk.

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