THE BANK BANKRUPTCY PREDICTION MODELS BASED ON FINANCIAL RISK (An Empirical Study on Indonesian Banking Crises)

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ABSTRACT

The shocks in banking industry became one of economy instability factor. Hence, bank has to be prevented from bankrupt condition which can be spread to be banking crisis, because its potentially impact on cost of bankruptcy and social distrust. The failure of a bank which ends with bankruptcy is not suddenly happen, but started by various problems as financial indicators at below standards, such as: high non performing loan (NPL), low net interest margin (NIM), low liquidity problem (GWM), low efficiency level (high BOPO), low capital adequacy ratio (CAR). In order to anticipate and prevent that condition, prediction models which can give early signal of bank bankruptcy is needed. This study is purposed to make bank bankruptcy prediction models based on time dimension and bank groups using financial ratios which are expected can influence bank in bankrupt condition. Beside documentation study and verificative analysis to bank financial report, survey method to bankrupt bank and nonbankrupt bank population is used to get data. Econometric models with linear discriminant analysis technique is used to find distinguishing (discriminator) variables of bankrupt bank and nonbankrupt bank. Then, it is continued with logistic regression analysis, proposed to find variables which influence (estimator) to bank bankruptcy. The results found discriminator variables as many as 27 financial ratios, and estimator variables as many as 20 financial ratios. Bankruptcy prediction models that meet the criteria of goodness of fit are: MP-6, MP-12, MP-24, MP-BK, and MP-BB. While the dominant risk rating on bank bankruptcy are: RP, RK, RL, RM, and RO.

Keywords: Banking crisis, Cost of bankruptcy, Financial risk, Financial ratios, Prediction models.

I. Background

Bank is a financial intermediary institutions in carrying out its business activities rely on public funds and trust. In carrying out the business activities of banks face a variety of risks, both in terms of raising funds (liabilities side of the balance sheet) as well as the allocation of funds (assets side of the balance sheet). Public confidence in the bank will grow when the bank has a good level of health, therefore, banks, health problems become crucial thing that must be constant attention, both by the internal banks and central bank authorities. Soundness of a bank is the interest of all parties involved (stakeholders), both the owner and manager of the bank, the service user and the bank supervisory authority.

The financial crisis that hit Indonesia in the years 1997-1998 has resulted in the decline of Indonesian banking conditions. This crisis has lowered the level of public confidence in the banks, so the government is forced to take on a range of policy measures to save the banking industry and restore public confidence, including through the recapitalization and restructuring of banks that do not cost a bit, as well as a blanket guarantee or assurance against customer deposits bank. The fee is essentially a cost of bankruptcy that amount is not less than Rp 793 trillion or 75% of GDP in the form of government bonds and BLBI, and is cost saving in the highest among the countries hit by the crisis, such as Thailand, Malaysia, and the Philippines (Kuncoro, 2002).

The phenomenon of bankruptcy and the bank will continue to overshadow the lives of banking, business activities in line with the dynamic complexity of the problem and the banking industry. This is evidenced in Indonesia, that after the crisis period, there are a number of bankrupt banks. In 2004, Bank Dagang Bali, Asiatic Bank and Global Bank bankrupt. Then in July 2008, Indover Bank, the only bank owned by the Indonesian government, which is controlled by the Bank, which operates abroad and is headquartered in Amsterdam, liquidated as a result of the liquidity mismatch affected by the global crisis. BI is not able to save as required substantial funds of around Rp 7.2 trillion. Then, in October 2008, Century Bank and the liquidity problem in the forced bailout by the Bank through the Deposit Insurance Agency (LPS) to inject funds to Rp 6.7 trillion, and the last in April 2009, BI revoke the business license of Bank IFI, due to continuous losses due to bad credit.

Some researchers abroad have developed a bankruptcy prediction model for banks, among others: Meyer and Pifer (1970); Stuhr & Wicklen (1974); Sinkey (1975); Korobow, Stuhr and Martin (1977); Santomero & Vinso (1977) ; Martin (1977); Shick and Sherman (1980); Pettway & Sinkey (1980); Peterson & Scott (1985); Short, O'Driscoll & Berger (1985); Bovenzi & Nejezchleb (1985); Sinkey, Terza & Dince (1987); Pantalone and Platt (1987); Whalen & Thompson (1988), Randall (1989), Young (1999); Hermosillo (1999), and Estrella & Peristiani (2000).

The study on the bankruptcy of commercial banks in Indonesia was made by: Santoso (1996), Indira & Mulyawan (1998), Surifah (1999), Mongid (2000), Nasser & Aryati (2000), Qurriyani (2000), Wilopo (2001), Haryati (2001), Aryati & Manao (2002), and Hadad, et al. (2003/2004). From the studies conducted, the majority of studies using models of CAMEL (Surifah, 1999; Mongid, 2000; Wilopo, 2001; Aryati and Manao, 2002), using the Altman Z-Score (Adnan and Taufiq, 2001), using indicators finance (Hadad et al. 2003/2004; Liza, 2004). While studies that use financial risk as a predictor to bank bankruptcy at this point is not made in Indonesia.

In general, each company that has failed to pass through the stages. According J.E. Boritz (1991), the general steps to be skipped include: (i) insolvency, is the inability of the debtor to pay obligations that have matured because of the inability to create cash, (ii) cash shortages, the inability to pay obligations that have matured with cash derived from the business, and (iii) the liquidation, ie the sale or realization of assets of the company to complete all the obligations of the company.

Based on some of the above explanation, obtained a description of the background that is situational, conditional and experimental shows cemented the view that, the failure of a company that later ended in bankruptcy, does not occur immediately and all of a sudden, but take place in stages, starting from various symptoms of problems, which if not addressed will be fatal. This condition applies in the banking industry, the financial services industry which is highly vulnerable to shocks, because it has the characteristics of the fund structure is dominated by relatively short-term funds, while the allocation of funds is relatively long term (potentially mismatch).

With early detection of the condition of banks, it is possible for the bank perform anticipatory measures to prevent financial difficulties promptly handled. But the bankruptcy of some of the models that made the banks, does not show the specific risk factors by type of banking. In addition, the group is based on the amount of total assets of the banks, unnoticed, whereas scale factor of the company's assets to differentiate its ability to generate liquidity in the event of financial distress.
Given the probability of bankruptcy void measurement model based bank's financial risk by using financial ratios, this research is intended to meet these needs. In this research, quantitative analysis using parametric statistics to make a bankruptcy prediction model. The model created a research model modivikasi Altman (1968, 1984), Sinkey (1975, 1985), and Ohlson (1980), using the variables of financial risks, including: credit risk, market risk, liquidity risk, operational risk, and risk capital, plus variations banks based on the amount of total assets.

II. Determinants of Bank Bankruptcy

Risk is the potential occurrence of an event/events which can result in losses of banks. Broadly speaking, risk has two main components, namely the uncertainty and exposure. If one component is missing, then there is no risk. Statistically, the risk of a volatility of something can be revenue, profit, cost, etc.. Volatility is a measure of dispersion (spread) of the statistics measured by the variance (σ^2) or deviation standard (σ). The greater of the variance or deviation standard, so the greater the risk.

"Risk are the adverse impact on the probability of several distinct sources of uncertainty", so said Bessis (1998). Uncertainty facing the banking business in plain sight, where business practices are exposed to business risk management is closely related to its business as a financial intermediary. All these risks will adversely impact the company's financial and become one of important tasks and responsibilities of financial managers to explain how to manage risk well (Griffin and Ebert, 2000). Carelessness in managing risk is a major factor that can worsen the condition of banks, in addition to the devastating blow of the crisis.

Some economists classify risk based on the activities undertaken such as: market risk, changes in the economic environment (Flannery and Guttentag, 1979; Guttentag and Herring, 1988), and risk management and operations (Mullin, 1977; Graham and Horner, 1988), which identified often arise. Other types of risks that have a negative impact such as interest rate risk and the risk of government (Stanton, 1994). Gardener (1986) stated that the bank's risk include: general risk, international risk and solvency risk. General risk is a fundamental risk faced by all banks, including: liquidity risk, interest rate risk, and credit risk. Votja (1973) stated that the risk can be classified based on the bank's operations and activities, including: credit risk, investment risk, liquidity risk, operating risk, fraud risk and fiduciary risk.

At the level of analysis, the financial risk is shown in the form of financial ratios which is a surrogate measure in observing the actual characteristics of a company. Financial ratios are a representation of the quality of corporate management in managing financial risk. Financial ratios are useful, because it has uses: (i) as a predictor of the bankruptcy, failure or success of a corporation (Altman, 1968; Altman and Lorris, 1976; Beaver, 1966, 1968a, b; Sinkey, 1975/1980; Ohlson, 1980; Zain, 1994; Avianti, 2000; Aryati and Manao, 2002; Setyorini and Halim, 2002; Hadad, et al, 2003/2004), (ii) as an indicator in the determination and long-term lending (Horrigan, 1966) (iii) as a tool for predicting future earnings growth and cash flow company (Ou, 1992; Penman, 1992; Parawiyati and Baridwan, 1998; Zainuddin and Hartono, 1998; Fun and Sulistyo, 2000), (iv) as a predictive tool on stock returns (O'Connor, 1973; Machfoedz, 1994).

From the findings of empirical research findings in various countries around the world, including in Indonesia, showed that the financial risk factor is a cause of bank bankruptcy. Financial risks that caused the bankruptcy of a country with other countries having different combinations, is dependent upon the risk profile is owned and inherent in the banking system and economic structure of the country. Therefore, the internal side of the bank, a bank's success (maintain business continuity) or a bank failure (failure to maintain business continuity ended with bankruptcy), is largely determined by the success of the bank management in managing risk.

In line with Basel II, the Bank for International Settlements (BIS), there are 8 types of risks inherent in the banking industry, such as credit risk, market risk, liquidity risk, operational risk, legal risk, strategic risk, reputation risk, and compliance risk. But the experience shows that, there are major risks that often appear to be the cause of a bank facing a variety of complicated issues. These risks are grouped into four (4) main groups, namely the risks associated with: (i) Credit Risk (Sinkey, 1975/1985; Stuhr, and Wicklen, 1974; Fraser, 1990; Hadad, 2003/2004); (ii) Market Risk (Sinkey, 1975/1985; Fraser, 1990; Hempel, et al., 1994), (iii) Liquidity Risk (Sinkey, 1975/1985; Faser, 1990; Korobow, Stuhr, and Martin, 1977; Hadad , 2003/2004), (iv) Operational

Risk (Sinkey, 1975/1985; Fraser, 1990; Stuhr, and Wicklen, 1974; Martin, 1977), and (v) Capital Risk (Sinkey, 1975/1985; Fraser, 1990; Hempel, et al, 1994; Korobow, Stuhr, and Martin, 1977; Hadad, 2003/2004) .
In a more detailed understanding of each of the following financial risks of financial ratios as representation, described below.

2.1 *Credit Risk*

Credit risk is the risk that occurs due to uncertainty or failure of a business partner (counterparty) to meet its obligations. This risk comes from various functional activities of banks, such as credit, treasury, investment and trade finance bank listed in the administration. Sources of credit risk include the following: (i) lending risk, ie the risk due to the debtor or the customer is not able to repay the loan obligation, (ii) counterparty risk, ie the risk arising from a business partner is not able to repay their obligations, and (iii) issuer risk, ie the risk arising from a securities issuer can not repay their obligations.
In this study, the credit risk variables are measured with sub-variables: 1) Troubled Earning Assets (*NPA ratio*), 2) Non Performing Loans (*NPL ratio*); 3) Provision for Loan Losses (*PLL Ratio*); 4) Loss of Earning Assets (*LEA Ratio*); 5) Earning Assets to Total Assets (*EAA ratio*), and 6) Loans to Total Assets Ratio (*LTA Ratio*).

2.2 *Market Risk*

Market risk is the risk arising from movements in market variables on the bank's portfolio that can cause harm. This risk is inherent in treasury activities, investment securities and money market investments in other financial institutions, the provision of funds, financing activities and the issuance of debt securities, as well as trade finance activities. Market risk includes interest rate risk and exchange rate risk.

Measurement of risk based on the marked to market of assets, liabilities and off balance sheet. Marked to market is one of the techniques that reflect the value of assets, derivative transactions, and other financial instruments as well as a precise method for measuring the position of risk assets and financial instruments. In a dynamic market conditions and competitive, bank profitability is very dependent on the level of efficiency, so that if a bank is not managed efficiently then the bank would suffer losses up to a certain level where the banks would be insolvent and illiquid further.

In this study the market risk variables are measured with sub-variables: 1) Net Interest Margin (*NIM Ratio*); 2) Interest Expense to Earning Assets (*IEEA Ratio*); 3) Profit or Loss of Foreign Exchange (*PLFX Ratio*); 4) Interest Income to Total Income (*IITI Ratio*); 5) Interest Income to interest Expense (*IIIE Ratio*), and 6) Interest Expense to Cost of Funds (*IECF Ratio*).

2.3 *Liquidity Risk*

The definition of liquidity management is the activity of the Bank for managing liquidity risk and optimize the available liquidity. Liquidity risk is the risk that, among others, caused the bank is unable to meet obligations that have matured. In practice, liquidity risk can be divided into two types, namely asset liquidity risk, liquidity risk and funding liquidity risk. Liquidity risk assets or often referred to as market/product liquidity risk, which arises when a transaction can not be executed at the market price because of the value of the transaction relative to the size of the market. Funding liquidity risk or often called cash-flow risk, which is the inability to meet obligations that have matured.

In this study liquidity risk variables are measured with sub-variables: 1) Loan to Deposit Ratio *(LDR)*; 2) Statutory Reserves *(Reserve Requirement/GWM Ratio)*; 3) Primary Reserve to Current Liabilities (*PRCL Ratio*); 4) Core Deposits to Total Liabilities *(CDL Ratio)*; 5) Current Assets to Total Deposits (*CAD Ratio*), and 6) Current Assets to Current Liabilities (*CACL Ratio*).

2.4 *Operational Risk*

Operational risk is the risk of loss as a result of human actions, processes, infrastructure or technology that weighed the impact of the bank's operations. Included in these risks are events that lead to the occurrence of fraud (fraudulent), failure management, inadequate control systems and operational procedures. Technical errors can cause damage to information systems, transaction processing damage, malfunction of settlement system or back-office operation.

Broadly speaking, the operational risks are divided into two levels, namely: (i) technical levels, a condition in which the risk assessment of information systems or weak., And (ii) the organizational level, a condition where there are weaknesses in risk monitoring. Specifically, the risk of error in recording techniques include transactions, information system weaknesses, and is not available an adequate tool for the measurement of risk. Risk includes the risk of organizational information systems, reporting, and subsequent events.

In this study the operational risk variables are measured with sub-variables: 1) Operating Expenses to Operating Income (*BOPO Ratio*); 2) Return on Total Assets (*ROA Ratio*); 3) Net Operating Income to Total Assets (*NOIA Ratio*) , 4) Overhead Cost to Total Assets (*OCA Ratio*); 5) Risk of Off-Balance Sheet (*OBS Ratio*), and 6) Non Interest Income to Total Assets (*NIIA Ratio*).

2.5 *Capital Risk*

The concept of *solvency* is essentially static since measurements were only performed at a given point in time so it cannot fully describe the actual condition of the bank. To improve the solvency approach required an assessment that is more oriented to the

front (forward-looking) that includes determinants insolvency, among others, include asset quality and poor profitability, qualitative factors, such as poor management, internal control and external failures and the potential impact of events/external phenomena. Greenspan (1997) and Indira (1998) stated that, the likelihood of insolvency is determined by the level of capital a bank holds, the maturities of its assets and liabilities, and the riskiness of its portfolio.

This view states that insolvency is closely related to the bank's capital structure, liquidity management, as reflected in the maturity profile of the source and fund investment and risk management. Meanwhile, from an economic standpoint, the condition of insolvency occurs when the present value of the expected net cash flow is negative and exceeded the amount of the bank's capital. Banks with relatively low net worth (undercapitalized banks) would be very vulnerable, in the sense of easy to collapse in the event of loss or shock, such as changes in policy, asset price collapse and so on.

In this study the variable capital risk is measured by the sub-sub-variables: 1) Capital Adequacy Ratio (*CAR*); 2) Net Open Position (*NOP Ratio*); 3) Return on Equity (*ROE ratio*); 4) Core Deposits to Equity (*CDE Ratio*); 5) Liabilities to Total Assets (*LITA Ratio*); 6) Fixed Assets to Capital (*FAC Ratio*), and 7) Provision for Possible Losses to Equity (*PPLE Ratio*).

From some of the results of previous empirical study regarding the bankruptcy prediction, especially in predicting bankruptcy of banks, using parametric statistical analysis techniques, it turns out techniques Discriminant Analysis and Logistic Regression widely used and produce higher prediction accuracy than other analytical techniques. Therefore, in this study used discriminant analysis technique to obtain financial ratios as a differentiator (discriminator) between the bank and the bank is not insolvent bankrupt, then performed logistic regression to determine the effect and estimate the probability of bankruptcy and the bank will not bankrupt.

III. Research Method

3.1 Observation Unit

Conditions bank predicted expressed by the status of a bank, bankrupt or not bankrupt. Bank bankruptcy status, which is located on the banks of bankruptcy legal situation, in which the company was legally declared bankrupt under the laws of bankruptcy (Altman, 1992 in Brigham & Gapenski, 1997). The bankrupt banks in the study include banks status: In Liquidation Bank (BDL), Bank Stop Operation (BSO), *Take Over* Bank (BTO), Frozen Bank Business Activity (BBKU), by a decree issued by Bank Indonesia (PBI. 3/25/PBI/2001).
1) Bank in Liquidation (BDL), is a bank operating license revoked by the government on 1 November 1997 so it does not perform banking operations again.
2) Stop Bank Operations (BSO), also called Operation Frozen Bank (BBO), is a government bank which liquidated in 1998 because of its performance gets worse after using BLBI more than 500% of the issued fully paid, or more than 75% of the total assets of the bank concerned.
3) Bank Take Over (BTO), is a bank that was taken over by the government through IBRA (now PPA) from the original owner and is still in operation serving customers. BTO has considered bankruptcy one year prior to being taken over by BPPN.
4) Frozen Bank Business Activity (BBKU), is a bank that was liquidated by the government on March 13, 1999 because it can not meet its long-term obligations, no prospects and can not follow the recapitalization program.
5) The Recapitalized Bank (Bank Recap), is a bank recapitalization program, which the government made a capital investment in the concerned bank through the issuance of bonds, so that the ownership of the majority of the banks are recapitulated in the hands of the government and is temporary (to be divested later days), but in the end the bank does not succeed disehatkan. Recap Bank has set a year before the bankruptcy of the bank recapitulated.

The argument uses several definitions of the bankrupt banks is that the banks are legally bankruptcy phenomenon in Indonesia just rife since the government liquidate 16 National Private Banks (BUSN) on 1 November 1997, and then followed by the freezing of bank policy (4 April and 21 August 1998), the BTO policy, BBO, BBKU and Recapitalization Program. Though the incident almost never occurred in previous years. In the period prior to 1 November 1997, these banks still continue to operate as a depository institution. Table 1 informs in detail about the number of banks that go bankrupt category and not bankrupt during the crisis period.

Table 1: Number of Bankrupt Bank and Not Bankrupt Bank

Period	Bank Population			% Bankrupt Bank
	Bankrupt	**Not Bankrupt**	**Total**	
2 years before benkrupt (year 1996)	16	222	238	06,72
1 year before benkrupt (year 1997)	14	208	222	06,31
6 months before benkrupt (year 1998)	38	170	208	18,27

Sourcer: Bank Indonesia, Indonesia Banking Statistic (processed).

In theory, the condition of liquidation, and the freezing of bank operations may not happen immediately, but it always begins with the problems faced by the bank, among others, is experiencing financial distress. Therefore, before the policy is implemented is considered there are some banks experiencing financial difficulties are reflected in the financial statements with financial ratios.

3.2 Research Model

Historically the study of business bankruptcy is indispensable to study the existence of profile analysis and distress prediction analysis. Pioneer study of profile analysis is Fitz Patrick, 1932; Winakor & Smith, 1935, and Merwin, 1942 (Beaver, 1966), whereas studies pioneer distress prediction analysis is Beaver (1966) for univariate models and Altman (1968) for the multivariate models. In profile analysis indicated that there were marked differences between the financial ratios of the company's bankruptcy and non-bankruptcy. The distress prediction analysis is more emphasis on the power of prediction of financial statements information about the important things, such as business bankruptcy. The results of that study were based on the average value and the financial ratios of the company (for profile analysis) and the extent of dispersion (for distress prediction analysis) for some time prior to bankruptcy.

Because of bankruptcy banks do not occur suddenly the predictive models built predictive models include 6 months (MP-6), 12 months (MP-12), and 24 months (MP-24) prior to bankruptcy. As independent variables (predictors) are financial indicators such as financial ratios represent the bank's financial risk. The data is usually displayed in the published financial statements of banks. Furthermore, given the size of assets also have contributed to the performance and risk profile of the bank, the model also includes specifically created by a group of banks, including: Small Bank (BK), Medium Bank (BM), and Big Bank (BB) .

3.3 Operationalization of Variables

Financial ratios are used as a representation of the results of the financial risk management, with consideration of: (i) wish to present a more realistic quality of bank management, (ii) the previous empirical studies, financial ratios is an indicator that is almost always the cause of bank failures, and (iii) any decision of the bank's management can pose risks to decide on a combination of bank failures. Thus, these ratios are intended as a proxy for the quality of bank management in managing portfolio risk.

Table 2: Definition and Operationalization of Variables

Variables	Definition	Sub Variables	Operasionalisasi Variables	Indicator	Scale
A. Dependent Variable (Y)					
Bank conditions are predicted	Possible Bank's Bankruptcy		Bank condition: BDL, BBO, BBKU, BTO, Recap Bank	Bankrupt → Y=1 Nonbankrupt → Y= 0	Nominal
B. Independent Varible (X)					
1. Credit Risk	Risks arising as a result of the failure of the counter-party to fulfill its obligations (PBI. 5/8/PBI/2003). This risk comes from various functional activities of banks, such as credit, treasury, investment and trade finance bank listed in the administration.	1. Troubled Assets *(NPA Ratio)*	PPAP / Total Asset	Percentage (%)	Ratio
		2. Non-performing Loans *(NPL Ratio)*	PPAP Credit / Total credit	Percentage (%)	Ratio
		3. AP backup Deletion *(PLL Ratio)*	PPAP / Total AP	Percentage (%)	Ratio
		4. AP Losses *(LEA Ratio)*	Elimination of losses AP / Total AP	Percentage (%)	Ratio
		5. AP composition *(EAA Ratio)*	Total AP / Total Asset	Percentage (%)	Ratio
		6. Composition of Credit *(LTA Ratio)*	Total Credit / Total Asset	Percentage (%)	Rasio
2. Market Risk	Risk arising from movements in market variables (adverse movement) of the portfolio held by banks, which could hurt the bank (PBI. 5/8/PBI / 2003). This risk is inherent in treasury activities, investment in securities and money market investments in other financial institutions, the provision of funds, financing activities and	7. Net Interest Income *(NIM Ratio)*	(Interest Income - Interest Expense) / Total AP	Percentage (%)	Ratio
		8. Expense Interest Earning Assets *(IEEA Ratio)*	Interest Expense / Total AP	Percentage (%)	Ratio
		9. Foreign Currency losses *(PLFX Ratio)*	Forex Income / Valas Neto Position	Percentage (%)	Ratio
		10. Interest Income Contributions *(IITI Ratio)*	Interest Income / total Revenue	Percentage (%)	Ratio
		11. Interest Income Margin *(IIIE Ratio)*	Interest Income / Interest Expense	Percentage (%)	Ratio
		12. Interest Expense Fund *(IECF Ratio)*	Interest Expense / Total Funds Budgeted		

	the issuance of debt securities, as well as trade finance activities. Market risk includes interest rate risk and exchange rate risk.				
3. Liquidity Risk	Partly due to the risk the bank is unable to meet obligations that have matured (PBI. 5/8/PBI / 2003). The definition of liquidity management is the activity of the Bank for managing liquidity risk (liquidity risk) and optimize the available liquidity.	13. *Loan to Deposit Ratio (LDR)*	Total loans / Total Deposits	Percentage (%)	Ratio
		14. Statutory (GWM *Ratio*)		Percentage (%)	Ratio
		15. Primary backup to current liabilities *(PRL Ratio)*	BI Demand deposits / Total Third-party Fund (Cash + BI Demand deposit)/ Current Liabilities	Percentage (%)	Ratio
		16. *Core Deposits to Total Liabilities (CDL Ratio)*		Percentage (%)	Ratio
		17. Current Assets toTotal Deposits *(CAD Ratio)*	(Demand deposit + savings + Time deposit) / total Liabilities	Percentage (%)	Ratio
		18. Current Risk Ratio *(CACLratio)*	(Cash + BI Demand deposit + Placement + Securities) / Total Third-party Fund	Percentage (%)	Ratio
			Current Assets / Current Liabilities		
4. Operational Risk	Among other risks caused by inadequate or non-functioning of the internal processes, human error, system failure, or the presence of external problems that affect the operations of the bank (PBI. 5/8/PBI / 2003). Included in these risks are events that lead to the occurrence of fraud (fraudulent), failure management, inadequate control systems and operational procedures.	19. Efficiency ratio (BOPO *Ratio*)	Operating Expenses / Operating Income	Percentage (%)	Ratio
		20. Asset profitability *(ROA Ratio)*	Net Income / Total Asset	Percentage (%)	Ratio
		21. Net Operating Income *(NOIA Ratio)*	Net Operating Income / Total Asset	Percentage (%)	Ratio
		22. Overhead Cost Ratio *(OCA Ratio)*	*Overhead Cost* / Total Asset	Percentage (%)	Ratio
		23. Off-Balance Sheet Risk *(OBS Ratio)*		Percentage (%)	Ratio
		24. Non-interest income contribution *(NIIA Ratio)*	Credit facilities are not used/Fees and Commissions	Percentage (%)	Ratio
			Non-interest income / Total Asset		
5. Capital Risk	Size showed a certain level where the amount of capital to protect depositors, to cover losses in order to keep the bank going concern, to purchase fixed assets for the sake of continuation of Caran-bank services, and to meet the stipulations-master regulators in order to maintain the expansion of assets that are not justified (BC. Leavitt, in Hempel, et al., 1994).	25. Capital Adequacy *(CAR)*	Total Equity / Risk weighted asset (ATMR)	Percentage (%)	Ratio
		26. Net Open Position *(NOP Ratio)*	Net Foreign Currency Position / Equity	Percentage (%)	Ratio
		27. Capital profitability *(ROE Ratio)*	Net Income / Total Equity	Percentage (%)	Ratio
		28. Structure of Deposits *(CDE Ratio)*		Percentage (%)	Ratio
		29. Financing structure *(LITA Ratio)*	Total Third-party Fund / Total Equity	Percentage (%)	Ratio
		30. Financing Fixed Assets *(FAC Ratio)*	Total Liabilities / Total Asset	Percentage (%)	Ratio
		31. load Losses AP *(PPLE)*	Total Fixed Assets / Total Equity	Percentage (%)	Ratio
			Provision for loan-losses (PPAP) / Total Equity		

Source: Processed from the various source (Sinkey, 1975; Fraser, 1990; Hempel, 1994; Gup, 1996; Santoso, 2003; BI, 2004; Hadad, 2004)

3.4 Analysisn Design and Hypothesis Testing

In order to answer all the problems that have been previously determined, this study will estimate the research model, to further testing of the hypothesis that the model estimation results. From the results of these estimates, then the conclusion can be drawn

regarding the relationship between the independent variables in the form of ratios relating to financial risk (credit risk, market risk, liquidity risk, operational risk, and risk capital) on the dependent variable is probablitas the bank insolvency.

The prediction model will be built based on Linear discriminant model for acquiring financial ratios that serve as a discriminator between the bank and the bank is not insolvent bankrupt, and then performed the estimation using logistic regression models or logit models to determine how strong the effect of the bank insolvency.

3.4.1 Linear Discriminant Models

Linear discriminant model is a data analysis technique, if the dependent variable is categorical data (nonmetrik, nominal or ordinal qualitative). While the independent variable as a predictor metric data (interval or quantitative ratios). The purpose of this discriminant analysis, among others: (i) create a discriminant function of predictor or independent variables that can discriminate or distinguish categories of the dependent variable, or in other words able to distinguish an object entering a group or category of the same, (ii) to test whether there significant differences between categories or groups associated with the predictor or independent variables, (iii) determine the independent variables or predictors that contributed most to the differences between groups, and (iv) evaluate the accuracy of classification.

General model of discriminant analysis related with combine linear in formula as follows:

$$D = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n$$

where:
D   = discriminant *score*
β_0 = constanta
β_i = coefficieni or weights
Xi   = independent variable (financial ratios)

So that discriminant model used in this study to include a range of variables, is as follows:
$D = \beta_0 + \beta_1 NPA + \beta_2 NPL + \beta_3 PLL + \beta_4 LEA + \beta_5 EAA + \beta_6 LTA + \beta_7 NIM + \beta_8 PLFX + \beta_9 IITI + \beta_{10} IIIE + \beta_{11} IEEA + \beta_{12} IECF + \beta_{13} LDR + \beta_{14} GWM + \beta_{15} PRCL + \beta_{16} CDL + \beta_{17} CAD + \beta_{18} CACL + \beta_{19} BOPO + \beta_{20} ROA + \beta_{21} NOIA + \beta_{22} OCA + \beta_{23} OBS + \beta_{24} NIIA + \beta_{25} CAR + \beta_{26} NOP + \beta_{27} ROE + \beta_{28} CDE + \beta_{29} LITA + \beta_{30} FAC + + \beta_{31} PPLE$
.... (3.1)

Discriminant analysis trying to produce the best linear combination of two or more independent variables that will separate the group, in this case the banks bankruptcy of the bank is not insolvent. Or in other words discriminant function coefficients or weights estimated such that the banks in this case are grouped into insolvent banks and insolvent banks do not have a value (*score*) of different discriminant functions.

In estimating the discriminant model, often used for simultaneous or *stepwise* method. Method of simultaneous equations completed by entering all variables simultaneously into the discriminant function without seeing it first the ability of *discriminate* each variable. While the stepwise method begins by choosing the independent variables that have the best *discriminate* ability.

3.4.2 Logistic Regression Models

Logistic regression models also called logit model, is a special form of regression analysis with response variables are categories, continuous or a combination of both. This regression called logistic regression, since the establishment of the model based on the logistic curve shape.

Logistic regression models were used in this study is a model derived from the following general formula:

$$P = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \cdots + \beta_n X_n)}}$$

where:
P   = probability of occurrence of a bank status
e   = natural logarithm
β_0 = constants
β_i = logistic regression coefficients
Xi   = financial ratios

Given the function of the above equation is a nonlinear function, it is necessary to logit transformation to obtain a linear function. So the linear regression model used in this study to include a range of variables, is as follows:
$P\,(Y{=}1|Xi) = \beta_0 + \beta_1 NPA + \beta_2 NPL + \beta_3 PLL + \beta_4 LEA + \beta_5 EAA + \beta_6 LTA + \beta_7 NIM + \beta_8 PLFX + \beta_9 IITI + \beta_{10} IIIE + \beta_{11} IEEA + \beta_{12} IECF + \beta_{13} LDR + \beta_{14} GWM + \beta_{15} PRCL + \beta_{16} CDL + \beta_{17} CAD + \beta_{18} CACL + \beta_{19} BOPO + \beta_{20} ROA + \beta_{21} NOIA + \beta_{22} OCA + \beta_{23} OBS + \beta_{24} NIIA + \beta_{25} CAR + \beta_{26} NOP + \beta_{27} ROE + \beta_{28} CDE + \beta_{29} LITA + \beta_{30} FAC + \beta_{31} PPLE + \varepsilon_{1i}$
.... (3.2)

To achieve the goal of research is to construct predictive models using logistic regression model formulation, it is a necessary step verification *goodness of fit test* and Wald test of statistical significance of the regression model equations.

a. *Goodness of fit test.*

In this researchusing the *Chi-square Hosmer and Lemeshow*. *Chi-square test of Hosmer and Lemeshow* measure the difference between observe and predicted value of the dependent variable. The smaller the difference between the two models is obtained then the better / decent (Hair et al., 1998).
H_0 : there is no difference between observed and predicted classification bankrupt-banks not bankrupt
H_1 : there is a difference between the observed and predicted classification bankrupt banks-not bankrupt

With criteria:
If the value Sig. > α☐(1%), H_0 accepted
If the value Sig. < α(1%), H_0 rejected

Given that the model constructed is not the usual multiple regression model, but the logistic regression model, then use *McFadden R-square (ρ)* to show the degree of relationship between the dependent and independent variables, or in other words using the *McFadden R-square (ρ)* may show predictive power of the model is quite high, especially for measuring the probability of bank insolvency.

This index is also called the *likelihood ratio* index by the following formula:

$$(\rho) = 1 - \frac{i(\beta)}{1(\beta)}$$

This index is used as an alternative to the coefficient of determination (R^2), since the coefficient of determination have problems if applied to the logit model (Gijarati, 2003).

Prediction is considered correct if it meets the following criteria:
1) Because the dependent variable in the logit model are 1 and 0, then if the predicted results> 0.5 are classified 1, whereas if the predicted results <0.5 were classified 0.
2) prediction is considered correct if it meets the criteria in paragraph (a), and is considered one if it does not meet these criteria.

b. *Significance Wald statistics*

Wald statistics examine the significance of logistic regression coefficients of each predictor, with the formulation of statistical hypotheses as follows:
H_0 : αr = 0,
H_1 : αr ≠☐0; where, r = 1, 2, 3, …, n

With criteria: If Sig. > α, maka H_0 accepted
If Sig. < α, maka H_0 rejected

Therefore, this research conducted on the population of the significance of logistic regression coefficients is not required as the *Wald statistic* test performed on the sample data.

Then, proceed with testing the *power of the regressions* to predict (the power of prediction models predictive) opportunities bankrupt bank or not. The prediction model will result in a score between 0 (zero) and 1 (one) which is interpreted as a probability figure. With a *cut-off-point* the specific predictive models will yield estimates 3 categories, namely: a precise estimate, estimation errors Type I and Type II error estimate (Santoso, 1996). A *cut-off point* is a value to determine whether a bank is estimated as the bank is bankrupt or not bankrupt.

To further illustrate the stages of the model building process is conducted in this study, ranging from the determination of the phenomenon to the formation of a bankruptcy prediction model, as shown in figure at Appendix 1.

IV. Discussion of Results

4.1 General Overview

Referring to the BI policy of Indonesia Banking Architecture (API), of which set the minimum capital requirement and the classification of banks based on the amount of paid-in capital, the number of banks in Indonesia will be slightly up ranged from 50 to 60 banks alone, which consists of: (i) international banks ranged from 2 to 3 banks have capital above Rp 50 trillion, (ii) national banks ranged from 3 to 5 banks have capital of between Rp 10 trillion sd Rp 50 trillion, (iii) the bank's business activities are focused as much as 30 to 50 banks with capital of Rp 100 billion sd Rp 10 trillion, and (iv) a bank with limited business activities of the RB class with a capital below Rp 100 billion.

Meanwhile, based on the classification of banks by total assets grouped into three (3) banks (PBI. 8/9/PBI/2006), namely: (i) large banks with total assets above Rp 10 trillion, (ii) Medium banks with total assets between Rp 1 trillion sd Rp 10 trillion, and

(iii) Small Banks with total assets under Rp 1 trillion. From Table 3 shows that the middle class and small banks dominant in number, but in terms of total assets is dominated by large banks, although small.

Table 3: Bank Classification based on Total Aset
(Rp milliard)

Bank Class	Bank- Bankrupt bank			Bank-Non Bankrupt bank		
	Total	Total Aset	(%)	Total	Total Aset	(%)
Big Bank	2	30.401	22.18	27	1.260.835	85.35
MediumBank	37	89.711	65.44	57	196.017	13.27
Small Bank	47	16.974	12.38	47	20.475	1.38
Total	86	137.086	100.00	131	1.477.327	100.00

Source: BI, Bank Indonesia Statistic (processed)

As for the unit of analysis in this study include financial ratios derived from financial statements of banks, it is also one form of accountability over the management of picture performance. Financial ratios are obtained by arithmetical calculation is the relationship between certain items in the balance sheet, profit and loss, as well as commitments and contingencies are shown in percentage terms (%). Financial ratios are used as independent variables as explanatory variables (predictors) to the dependent variable namely: the status of a bankrupt bank and not bankrupt bank.

4.2 Discussion of Results

4.2.1 Analysis of Research Model

Analysis of the model study was conducted based on the results of all tests using the statistical analysis techniques as needed, either partially or testing simultaneously. The results of the model estimation will then be linked to the research objectives and hypothesis verification.

Specifications econometric model used in this study are:

$$P(Y=1|Xi) = \beta_0 + \beta_1 NPA + \beta_2 NPL + \beta_3 PLL + \beta_4 EAA + \beta_5 LTA + \beta_6 NIM + \beta_7 PLFX + \beta_8 IITI + \beta_9 IIIE + \beta_{10} IEEA + \beta_{11} IECF + \beta_{12} LDR + \beta_{13} CDL + \beta_{14} CAD + \beta_{15} BOPO + \beta_{16} ROA + \beta_{17} NOIA + \beta_{18} OCA + \beta_{19} OBS + \beta_{20} NIIA + \beta_{21} CAR + \beta_{22} NOP + \beta_{23} ROE + \beta_{24} CDE + \beta_{25} LITA + \beta_{26} FAC + \beta_{27} PPLE + \varepsilon_{1i}$$

Where:

$P(Y=1)$	=	Bankrupt Bank Pailit
$P(Y=0)$	=	not Bankrupt Bank
β_0	=	constants
NPA	=	Non Performing Asset
NPL	=	Non Performing Loan
PLL	=	Provision for Loan Losses
EAA	=	Earning Asset to Asset
LTA	=	Loan to Total Asset
NIM	=	Net Interest Margin
PLFX	=	Profit/Loss of Forex
IITI	=	Interest Income to Total Income
IIIE	=	Interest Income to Interest Expense
IEEA	=	Interest Expense to Earning Asset
IECF	=	Interest Expense to Costed Fund
LDR	=	Loan to Deposit Ratio
CDL	=	Core Deposit to Liabilities
CAD	=	Current Asset to Deposit
BOPO	=	Operating Expenses to Operating Income
ROA	=	Return On Asset
NOIA	=	Net Operating Income to Asset
OCA	=	Overhead Cost to Asset
OBS	=	Off Balance Sheet
NIIA	=	Non Interest Income to Asset
CAR	=	Capital Adequacy Ratio
NOP	=	Net Open Position
ROE	=	Return On Equity
CDE	=	Core Deposit to Equity
LITA	=	Liabilities to Total Asset
FAC	=	Fixed Asset to Capital
PPLE	=	Provision for Possible Losses to Equity

Based on the results of the regression analysis resulted in a model estimated as follows:

1)   Bankruptcy Prediction Model Based on Time Dimension

  a) Bankruptcy Prediction Model for 6 months (MP-6)

P (Y=1|Xi) = -0.115238 + 0.009368*NPA* + 0.001059*NPL* + -0.006032*PLL* + 0.001708*EAA* +   -0.000249*LTA* +- 0.004784*NIM* + 0.000976*PLFX* + -4.65E-05*IITI* + 0.000668*IIIE* + 0.000308*IEEA* + 0.001090*IECF* + 3.03E-05*LDR*+ 0.000209*CDL* + 1.53E-06*CAD* + 0.000579*BOPO + -0.017029*ROA* + 0.009003*NOIA* + 0.001896*OCA* + -2.39E-07*OBS* + 0.000635*NIIA* + 0.006745*CAR* + 2.69E-05*NOP* + 0.002471*ROE* + -1.84E-05*CDE* +0.008081*LITA* + 0.000239*FAC* + -0.000228*PPLE*

From the results of the regression models obtained by the coefficient of determination (R2) respectively logit equation of 0.996654. It can be concluded that the variables in the model is able to predict the bankruptcy of the bank amounted to 99.6654%, while the remaining 0.3346% influenced by other variables outside the model.

While the LR-based test statistics yield a coefficient of 2867.340> F-table at α = 1%. It can be concluded that the variables in the model together (simultaneously) were able to significantly affect bank bankruptcy.

  b) Bankruptcy Prediction Model for 12 months (MP-12)

P (Y=1|Xi) = 1.942408 + -0.123733*NPA* + 0.002876*NPL* + 0.135398*PLL* + 0.0*EAA* + 0.000204*LTA* + -0.053698*NIM* + 0.005693*PLFX* + 0.001408*IITI* + -0.000925*IIIE* +   -0.002269*IEEA* + -1.43E-06*IECF* + 0.000400*LDR* + 0.000773*CDL* + -0.000493*CAD* + 0.001844*BOPO + -0.002734*ROA* + -0.154188*NOIA* + 0.102877*OCA* + 0.050539*OBS* + 6.63E-07*NIIA* + -0.063240*CAR* + -0.000290*NOP* + 0.023044*ROE* + 0.000193*CDE* + -0.008682*LITA* + -0.000452*FAC* + 0.005870*PPLE*

From the results of the regression models obtained by the coefficient of determination (R^2) respectively logit equation of 0.728555. It can be concluded that the variables in the model is able to predict the bankruptcy of the bank amounted to 72.8555%, while the remaining 27.1445% is influenced by other variables outside the model

While the LR-based test statistics yield a coefficient of 35.37964> F-table at α = 1%. It can be concluded that the variables in the model together (simultaneously) were able to significantly affect bank bankruptcy.

  c)   24 months of bankruptcy prediction model (MP-24)

P (Y=1|Xi) = -0.001127 + 0.055548*NPA* + 0.135219*NPL* + -0.055870*PLL* + 0.0*EAA* + -0.000995*LTA* + -0.004990*NIM* + -1.26E-05*PLFX* + 0.000195*IITI* + 0.001412*IIIE* + -0.000195*IEEA* + 0.0*IECF* + 0.0*LDR* + -5.51E-05*CDL*+ -0.000619*CAD* + -0.001600*BOPO + 0.003709*ROA* + 0.032503*NOIA* + 0.0*OCA* + 0.0*OBS* + -0.000245*NIIA* + 7.26E-05*CAR* + -0.000616*NOP* + -0.004324*ROE* + 3.37E-05*CDE* + 0.005325*LITA* + 0.000720*FAC* + -1.42E-06*PPLE*

From the results of the regression models obtained by the coefficient of determination (R^2) respectively logit equation of 0.999667. It can be concluded that the variables in the model is able to predict the bankruptcy of the bank amounted to 99.9667%, while the remaining 0.0333% influenced by other variables outside the model.

While the LR-based test statistics yield a coefficient of 32091.81> F-table at α = 1%. It can be concluded that the variables in the model together (simultaneously) were able to significantly affect bank bankruptcy.

2)   Bankruptcy Prediction Model Based Bank Group

  a) Bankruptcy Prediction for Small Bank Model (MP-BK)

P (Y=1|Xi) = 0.245696 + 0.213442*NPA* + -0.061263*NPL* +   -0.069551*PLL* + -0.004714*EAA* + -0.002886*LTA* + -0.068370*NIM* + -0.028111*PLFX* + -0.005080*IITI* + 0.002527*IIIE* + -0.004244*IEEA* + 0.004490*IECF* + 0.002107*LDR* + 0.006968*CDL* + 0.000386*CAD* + 0.000351*BOPO + 0.003839*ROA* + -0.141798*NOIA* + 0.109854*OCA* + -0.010613*OBS* + -0.002623*NIIA* + 0.006745*CAR* + -0.043174*NOP* + 6.91E-05*ROE* +   0.002633*CDE* + -0.006564*LITA* + 0.102921*FAC* + 0.245696*PPLE*

From the results of the regression models obtained by the coefficient of determination (R^2) respectively logit equation of 0.522006. It can be concluded that the variables in the model is able to predict the bankruptcy of the bank amounted to 52,2006%, while the remaining 47,7994% is influenced by other variables outside the model.

b) Bank Bankruptcy Prediction for Medium Bank Model (MP-BM)

P (Y=1|Xi) = -0.126410 + 0.633741*NPA + 0.060513*NPL + -0.524385*PLL + 6.06E-05*EAA + -0.007038*LTA + 0.024050*NIM + 0.002313*PLFX+ -0.000551*IITI + -0.027215*IIIE + -0.000763*IEEA + 0.006851*IECF + 0.000600*LDR + 0.006258*CDL + 0.001496*CAD + 0.0*BOPO + 0.012891*ROA + 0.406273*NOIA + 0.122987*OCA + -0.017685*OBS + -0.003326*NIIA + -0.001283*CAR + -0.043277*NOP + 0.000192*ROE + 0.020924*CDE + 0.005039*LITA + -0.013605*FAC + -0.126410*PPLE

From the results of the regression models obtained by the coefficient of determination (R^2) respectively logit equation of 0.468124. It can be concluded that the variables in the model is able to predict the bankruptcy of the bank amounted to 46.8124%, while the remaining 53.1876% is influenced by other variables outside the model.

c) Bankruptcy Prediction for Big Banks Model (MP-BB)

P (Y=1|Xi) = 0.178045 + 0.322672*NPA + -0.000587*NPL + 0.065479*PLL + 0.000203*EAA + -0.024397*LTA + 0.0*NIM + -0.000375*PLFX + -0.000931*IITI + 0.014970*IIIE + 0.113270*IEEA + -0.001113*IECF + 0.033367*LDR + 0.0*CDL + -0.019410*CAD + -0.009939*BOPO + -0.085708*ROA + 0.0*NOIA + 0.0*OCA + 0.002400*OBS + 0.0*NIIA + -0.000753*CAR + 0.0*NOP + 0.000112*ROE + -0.103709*CDE + 0.004839*LITA + -0.000393*FAC + 0.178045*PPLE

From the results of the regression models obtained by the coefficient of determination (R^2) respectively logit equation of 0.999998. It can be concluded that the variables in the model is able to predict the bankruptcy of the bank amounted to 99.9998%, while the remaining 0.0002% influenced by other variables outside the model.

3) Influence of Financial Risk Model

The analysis model used is:

P (Y=1|Xi) = β_0 + β_1 Credit Risk + β_2 Mrket Risk + β_3 Liquiditi Risk + β_4 Operational Risk + β_5 Capital Risk

Where:
Credit Risk (RK)   → NPA, NPL, PLL, LEA, EAA, dan LTA
Marker Risk (RP)   → NIM, PLFX, IITI, IIIE, IEEA, dan IECF
Liquidity Risk (RL)   → LDR, GWM, PRCL, CDL, CAD, dan CACL
Operational Risk (RO) → BOPO, ROA, NOIA, OCA, OBS, dan NIIA
Capital Risk (RM)   → CAR, NOP, ROE, CDE, LITA, FAC, dan PPLE

a) Small Bank Influence Model (MP-BK)

P (Y=1|Xi) = 0.317890 + 0.014408*RK + 0.259629*RP + 0.020248*RL + 0.004772*RO + 0.190504*RM
The dominance effect is variable in sequence: Market Risk (z-stat.16.91981), Risk Capital (z-stat.15.86826), Liquidity Risk (z-stat. 2.687174), Credit Risk (z-stat. 2.107095), and Operational Risk (z-stat. 0.538236).

b) Bank Medium Influence Model (MP-BM)

P (Y=1|Xi) = 0.210393 + 0.103859*RK + 0.342115*RP + -047004*RL + -0.018161*RO + -0.000480*RM
The dominance effect is variable in sequence: Market Risk (z-stat. 8.997806), Liquidity Risk (z-stat. -7.000768), Credit Risk (z-stat. 6.079817), Operational Risk (z-stat. -0.739429), and risk Capital (z-stat. -0.084788).

c) Big Banks Influence Model of (MP-B)

P (Y=1|Xi) = 0.028351 + 0.063330*RK + 0.095063*RP + -0.003635*RL + -0.003320*RO + 0.007217*RM
The dominance effect is variable in sequence: Market Risk (z-stat. 9.662111), Credit Risk (z-stat. 3.624398), Operational Risk (z-stat. -2.827716), Liquidity Risk (z-stat. -0.496940), and risk Capital (z-stat. 0.455673).

4.2.2 Implications of Research Results

Based on the results of the analysis of the research model and hypotheses associated with the research objectives obtained findings that can be used as an input to strategic decision-making process and further research. Summary of research findings as presented in Table 4 below.

Table 4: Summary of Research Findings

Sort of Model	Model Estimation Results		
1. Time Dimension Model	**MP-6**	**MP-12**	**MP-24**
	Variables significant effect was: NPA, PLL, EAA, NIM, PLFX, IIIE, IEEA, IECF, CDL, BOPO, NOIA, OBS, CAR, NOP, ROE, CDE, dan LITA = **17 ratios.** R^2 value of 0.996654 for the logit model, which means that 99.6654% variables in the model is able to predict the bankruptcy of the bank. 100% prediction accuracy rate Bankrupt Banks, and 99.6% Bank is not Bankrupt.	Variables significant effect was: NPA, PLL, NIM, PLFX, IITI, IIIE, IEEA, LDR, BOPO, ROA, NOIA, OCA, OBS, CAR, ROE, CDE, LITA dan PPLE = **18 ratios.** R^2 value of 0.778555 for the logit model, which means that 72.8555% variables in the model is able to predict the bankruptcy of the bank. Prediction accuracy rate of 100% for both the Bankrupt Bank and the Bank is not Bankrupt.	Variables significant effect was: NPA, NPL, PLL, LTA, NIM, IITI, IIIE, PLFX, CDL, CAD, BOPO, ROA, NOIA, NIIA, CAR, NOP, ROE, CDE, LITA, dan FAC = **20 ratios**. R^2 value of 0.999667 for the logit model, which means that 99.9667% variables in the model is able to predict the bankruptcy of the bank. Prediction accuracy rate of 100% for both the Bankrupt Bank and the Bank is not Bankrupt.
2. Model Bank Group	**MP-BK**	**MP-BM**	**MP-BB**
	Variables significant effect was: NIM, PLFX, IITI, IECF, OBS, CAR, NOP, LITA, dan FAC = **9 ratios.** R^2 value of 0.522006 for the logit model, which means that 52.2006% variables in the model is able to predict the bankruptcy of the bank. Prediction accuracy rate of 100% for both the Bankrupt Bank and the Bank is not Bankrupt.	Variables significant effect was: NPL, IIIE, CDL, CAD, CAR, CDE, dan FAC = **7 ratios**. R^2 value of 0.468124 for the logit model, which means that 46.8124% variables in the model is able to predict the bankruptcy of the bank. Prediction accuracy rate of 100% for both the Bankrupt Bank and the Bank is not Bankrupt.	Variables significant effect was: NPA, EAA, LTA, PLFX, IITI, IIIE, IEEA, LDR, CAD, ROA, CDE, dan PPLE = **12 ratios**. R^2 value of 0.999998 for the logit model, which means that 99.9998% variables in the model is able to predict the bankruptcy of the bank. Prediction accuracy rate of 100% for both the Bankrupt Bank and the Bank is not Bankrupt.
3. Influence Risk Model	**MP-BK**	**MP-BM**	**MP-BB**
	Variables significant effect was: RP, RM, RL, dan RK = **4 variables**. R^2 value of 0.932001 for the logit model, which means that 93.2001% variables in the model is able to predict the bankruptcy of the bank.	Variables significant effect was: RP, RL, dan RK = **3 variables**. R^2 value of 0.903520 for the logit model, which means that 90.3520% variables in the model is able to predict the bankruptcy of the bank.	Variables significant effect was: RP, RK, dan RO = **3 variables**. R^2 value of 0.988282 for the logit model, which means that 98.8282% variables in the model is able to predict the bankruptcy of the bank.

Source: Result Data Processing.

Based on the table above exposure to a number of important things, among others:

1) There are 11 sub-variables are financial ratios significant effect on the entire time dimension prediction model (MP-6, MP-12 and MP-24), namely: NPA, PLL, NIM, IIIE, PLFX, ROA, Noia, CAR, ROE , CDE, and LITA.
2) While the influence of banks on the model are variables that have a significant effect on the model, namely: RP and RK effect on the entire model (MP-BK, BM-MP, and the MP-BB), RL and RM in two models, Sedangka RO influence on one model (MP-B).
3) From the several influence models show the variablesof RP and RK as superior because variables have a significant effect in all models.
4) These variables exhibit a strong influence on the bankruptcy of banks on all models in every kind of model, and should be of concern and progress monitored continuously, either by bank management, bank regulatory authorities, as well as the partners and customers.
5) Prediction models that meet the criteria of the banks model (*goodness of fit*) are:
   a) Bankruptcy Prediction Model for All Banks are: MP-6, MP-12 and MP-24
   b) Bankruptcy Prediction Model for the Banks Group are: MP-BK and MP-BB.
6) Variables of RP, RK and RO pressing a lot against the bankruptcy group B, while for BK and BM group is strongly influenced by variables RP and RM, and RL. This suggests that the RP be a factor that suppresses the entire group of bank bankruptcy.
7) When compared with the results of analysis based on the model predictions indicate that the group of banks, financial ratios have a significant effect on BK and BM groups is almost the same, while in the group BB generate financial ratios more. This is consistent with the theory that the *too big to fail*, the larger the size the greater the risk that the bank presses to failure.

8) Based on the search in the original data observation unit and the unit of analysis showed that, the Small Bank group (LB) and the Medium Bank Group (BM) has a degree of financial ratios are almost the same, and different from the Big Bank Group (BB).

V. Conclusions and Recommendations

5.1 Conclusions

1) Based on the results of the estimation model using linear discriminant analysis, financial ratios that serve as a discriminator is as much as 27 ratio, namely: NPA, NPL, PLL, EAA, LTA, NIM, IEEA, PLFX, IITI, IIIE, IECF, LDR, CDL, CAD, BOPO, ROA, NOIA, OCA, OBS, NIIA, CAR, NOP, ROE, CDE, LITA, FAC, and PPLE.
2) Based on the results of logistic regression analysis using financial ratios (sub variable discriminator), yielding bank bankruptcy prediction model as follows:
   a) <u>Bankruptcy Prediction Model for 6 months (MP-6)</u>
      Financial ratios as independent variables of a significant effect on bank bankruptcy is as much as 17 ratio, namely: NPA, PLL, EAA, NIM, PLFX, IIIE, IEEA, IECF, CDL, BOPO, NOIA, OBS, CAR, NOP, ROE, CDE, dan LITA, with a significance level 99.6654%.
   b) <u>Bankruptcy Prediction Model for 12 months (MP-12)</u>
      Financial ratios as independent variables of a significant effect on bank bankruptcy is as much as 18 ratio, namely: NPA, PLL, NIM, PLFX, IITI, IIIE, IEEA, LDR, BOPO, ROA, NOIA, OCA, OBS, CAR, ROE, CDE, LITA dan PPLE, with a significance level 72.8555%.
   c) <u>Bankruptcy Prediction Model for 24 months (MP-24)</u>
      Financial ratios as independent variables of a significant effect on bank bankruptcy is as much as 20 ratio, namely: NPA, NPL, PLL, LTA, NIM, IITI, IIIE, PLFX, CDL, CAD, BOPO, ROA, NOIA, NIIA, CAR, NOP, ROE, CDE, LITA, dan FAC, with a significance level 99.9667%.
   d) <u>Bankruptcy Prediction Model of Small Bank (MP-BK)</u>
      Financial ratios as independent variables of a significant effect on bank bankruptcy is as much as 9 ratio, namely: NIM, PLFX, IITI, IECF, OBS, CAR, NOP, LITA, and FAC, with a significance level 52.2006%.
   e) <u>Bankruptcy Prediction Model of Medium Bank (MP-BM)</u>
      Financial ratios as independent variables of a significant effect on the bank is as much as 7 bankruptcy ratio, namely: NPL, IIIE, CDL, CAD, CAR, CDE, dan FAC, with a significance level 46.8124%.
   f) <u>Bankruptcy Prediction Model of Big Bank (MP-BB)</u>
      Financial ratios as independent variables of a significant effect on bank bankruptcy is as much as 12 ratio, ie: NPA, EAA, LTA, PLFX, IITI, IIIE, IEEA, LDR, CAD, ROA, CDE, dan PPLE, with a significance level 99.9998%.
3) Financial risks (RK, RP, RL, RO, and RM) as independent variables that significantly influence the bank's bankruptcy is:
   a) <u>Bankruptcy Prediction Model of Small Bank (MP-BK)</u>
      Financial risk variables that have a significant effect was: RP, RM, RL, dan RK, with a significance level 93.2001%.
   b) <u>Bankruptcy Prediction Model of Medium Bank (MP-BM)</u>
      Financial risk variables that have a significant effect was: RP, RL, dan RK, with a significance level 90.3520%.
   c) <u>Bankruptcy Prediction Model of Big Bank (MP-BB)</u>
      Financial risk variables that have a significant effect was: RP, RK, dan RO, with a significance level 98.8282%.
4) Dominance rank variables influence the financial risk to the bank's bankruptcy in order are: RP, RK, RL, RM, dan RO.
5) There are 11 sub-variables of financial ratios as provided by sub-variables, because a significant effect on the whole prediction models, namely: NPA, PLL, NIM, IIIE, PLFX, BOPO, NOIA, CAR, ROE, CDE, dan LITA.
6) Bank Bankruptcy Prediction Models that meet the criteria of a good model (*goodness of fit*) using the *McFadden R^2* are:
   a) Bankruptcy Prediction Model for Time Dimension is: MP-6 with McFadden R^2 value of 0.996654 and the classification accuracy rate of 100% (*original data*) and 99.6% cross validation of data, MP-12, with R^2 values 0.728555 and the classification accuracy rate of 100% (*original data* and *cross validation*), and the MP-24 with R2 values 0.999667 and the classification accuracy rate of 100% (*original data* and *cross validation*).
   b) Bankruptcy Prediction Model Bank Group are: MP-B with R^2 values 0.999998 and the classification accuracy rate of 100% (*original data* and *cross validation*), and MP-BK R2 value of 0.522006 and the classification accuracy rate of 100%. (*original data* and *cross validation*).

5.2 Recommendations

1) Prediction models MP-6, MP-12, MP-24, MP-BK, and MP-B meets the criteria of a good model and has a strong predictive power and accurate classification, then this model can be used as a reference for the development of a model by subsequent researchers.
2) For Bank Indonesia as the supervisory of bank authority, in order to conduct a health assessment models reformulation of the bank (CAMELS) in terms of the determination of risk weights. Assigned risk weights that differ by group of banks (Small, Medium, and Big Bank), different risk profiles.

3) The format of published financial statements need to be re-evaluated, at least fulfilled the openness (*transparency*) of the basic principles of good corporate governance (GCG), which suggests openness in material and relevant information and decision-making process. The financial statements include the financial ratios that can significantly affect the bank's bankruptcy

4) To meet the needs of the *stakeholders* regarding the health condition of the bank, Bank Indonesia to publish the results of periodic health assessments of banks nationwide circulation through the mass media (*know your bank* programs).

5) As an incentive for the bank's policy of performing Very Good (Composite Rating 1 or PK-1) and Good (Composite Rating 2 or PK-2) are given incentives in the form of relief in the provision of statutory reserves (reserve requirement) is lower than the normal rate, and charged a lower insurance premium rates in the deposit insurance program.

6) The authority to do the synchronization and harmonization cross-sectoral policies and rules of the banking industry, capital markets and fiscal, to avoid counterproductive policies and rules.

7) Considering the trend of banking development in Indonesia, that number of BK is decreasing and BM (medium bank) and BB (big bank) increased, associated with the results of the analysis, that the group BK (small bank) and BM (medium bank) have similar characteristics, then the next grouping of banks are 2 (two) categories: (1) the group of Small and Medium Banks (BKM) with assets of up to Rp 10 trillion, and (2) group of Big Banks (BB) with assets above Rp 10 trillion.

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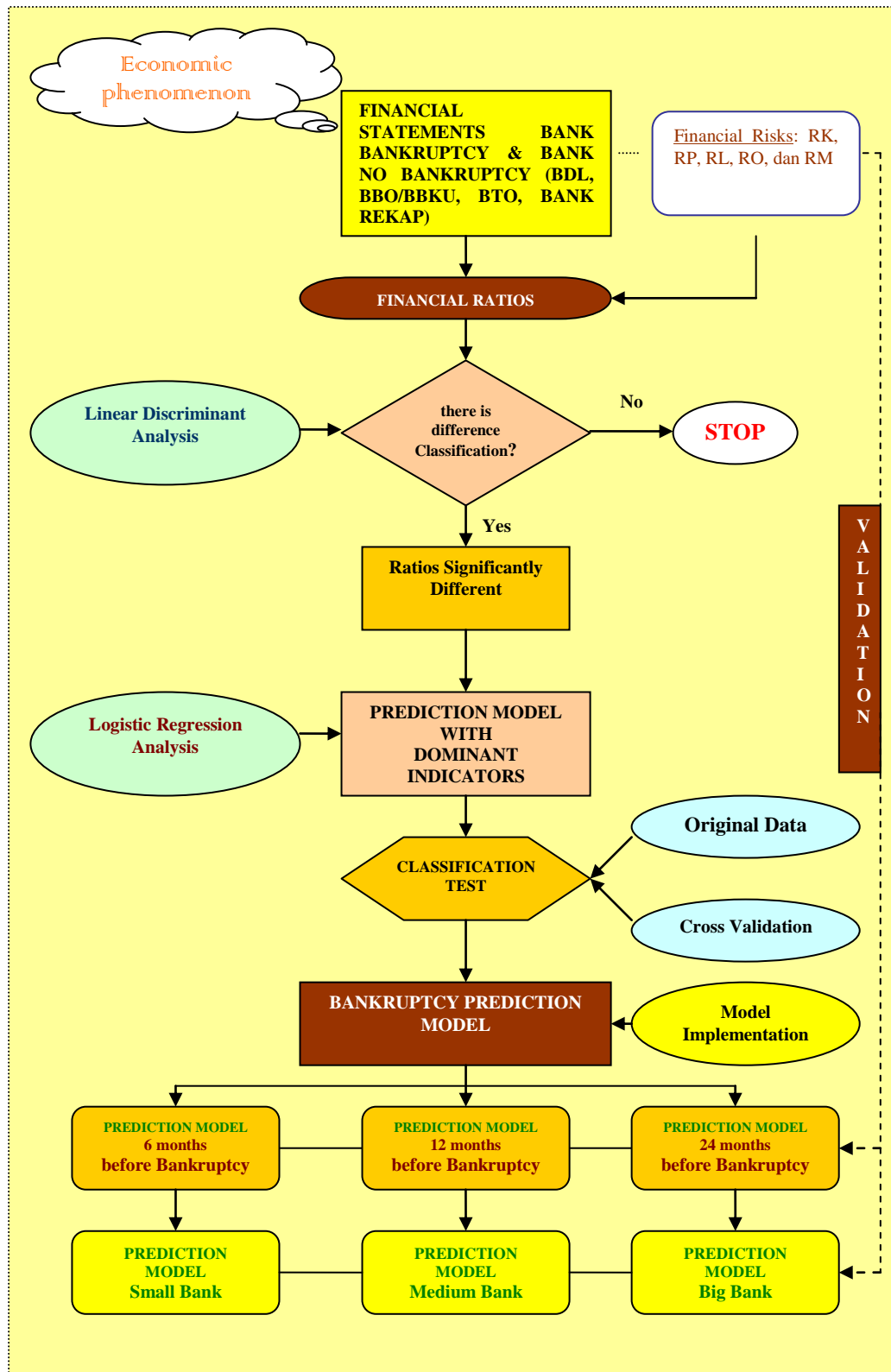Zikmund, William G. (1997), *Business Research Methods,* fifth edition., The Dryden Press, Orlando, Florida.

Figure 1
Model Making Processed