Default Risk as Cause Interbank Contagious On Systemic Risk Banking In Indonesia

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ABSTRACT

This study aims to determine whether contagious interbank that caused by default risk in small banks will cause systemic risk in the banking system as a whole in Indonesia, as well as in large banks. Research method used descriptive verification. Data analysis method used Value at Risk (VAR) to assess risk of individual bank's default, and Conditional Value at Risk (CoVaR) as parameter for assessing the risk of individual banking linkages with the systemic risk of the banking system as a whole (Interbank Contagious).

The results showed that CoVaR, as reflecting the risk of individual banking linkages with the systemic risk, influenced the magnitude of the contribution of systemic risk to the banking system as a whole. The results also indicated that the contribution of the individual small banks default risk did not have systemic impact to the overall banking risk, whereas for banks with middle value assets had a systemic impact. Thus, interbank contagious due to the risk of individual small bank defaults on systemic risks to the whole banking system is less likely. However the Behavioral Finance Theory provides to change the mindset above that sometimes economic actors behave irrationally.

Keywords: Systemic Risk, Default Risk, Interbank Contagious, the Behavioral Finance Theory

INTRODUCTION

Systemic risk in the banking system is a crucial factor in building the stability of the financial system in a country. Systemic risk is the potential instability of contagion in some or all of the financial system due to the interaction of size, business complexity and inter-institutional linkages or financial markets and the tendency of excessive behavior of financial institutions to follow the economic cycle (Bank Indonesia, 2014). Failure of the bank in their performing role as a financial intermediary, in transforming of funds from the depositor as the owner of the funds to the debtor as the user, will bring systemic risks.

The failure of one bank may propagate to the failure of another bank with the interconnection among them through interbank loans. If the failure of a bank can not be handled properly, it will arise the impact of transmission that trigger a systemic crisis in the economic system. This situation results in very high economic costs for a country. This

condition occurred in Indonesia in 1997 where the failure of several banks triggered the failure of the financial system. Those forced the Indonesian government to save the banking sector at a cost of more than Rp 500 trillion (Hadad, Santoso and Arianto, 2003), including the provision of Bank Indonesia Liquidity Assistance (BLBI). Until today the impact of polemic issues has not been resolved completely.

Based on the experience of the 1997 financial system condition had made Bank Indonesia very cautious when deciding the default bank on Century Bank as the impact of the global crisis of 2008. The impact of the global crisis on the Indonesian economy was deep and wide for some important economic aspects of Indonesia, including banking in Indonesia (Somomoeljono, 2014). Debate over Century bank problems began when the Indonesian government declared that there was a potential systemic risk to banks if not bailed it out (Bustaman, 2013). The government in this case the minister of finance and the President Director of Bank Indonesia approved the grant of 6.7 trillion rupiah to Century Bank. The reason at that time Century Bank which experienced financial difficulties was not closed, due to it would have a systemic impact on Indonesian banks. The long controversy mainly related to disagreement with what is meant by systemic risk and how to measure the systemic risk. From the standpoint of traditional economic theory, it is clear that Century Bank did not need to be saved. Because the fundamental data of this bank was very small, both in the amount of assets and its role in the banking system, so it would not infect other banks. But in fact the Indonesian government continued to provide bailout funds. This government decision, although felt by conventional economic theory, is justified by the Behavior Finance Theory. It states that sometimes economic actors behave irrationally. In Century Bank case which was grouped by assets into small banks, would not have systemic impact if it was closed, just would only proper if the economy was in normal condition. In fact, when Century Bank problems occur, the economic condition in Indonesia is facing global economic crisis (not normal) (Somomoeljono, 2013).

Based on the above description it is clear that measuring a default bank that will risk systemic or not to the overall system becomes very important. Therefore this article will examine how the effect of a bank's failure will have a systemic effect on the banking system, especially in small bank. Based on research by Adrian and Brunnermeier (2009) explaining that to conduct an institutional measurement contains systemic risk, it is better to identify whether there is a risk of individual banks connected to a system where the individual bank can cause negative spillover impact on individual bank others.

LITERATURE REVIEW

Systemic Risk in Banking

De Bant et al. (2010) said that this systemic risk is a unique risk in the field of financial services industry, especially the magnitude of the impact caused macro, including the banking industry. The previous literature of De Bandt and Hartmann (2000), divides

the systemic risk into a broad and narrow sense based on the nature of its shock. Systemic risk in the broad sense is defined as the simultaneous failure of a number of institutions or firms resulting from the shock of macroeconomics, whereas the systemic risk in the strict sense is the risk derived from the shock on microeconomics that occurs in a company and then spread to other companies which called contagion effect.

Within the narrower scope of an event, the emergence of bad news about the failure of a financial institution, caused by the collapse of financial markets that affect the collapse of one or several financial institutions De Bant et al. (2010). The transmission effects can be caused by the transmission of bank instability through the reaction of retail depositors, interbank markets, payment systems and settlements and other factors arising from endogenous risks from within the bank. Research de Nicolo and Kwast (2002) found that the correlation among banks in increasing returns indicates an increase in systemic risk. Billio, Getmansky, Lo and Pellizon (2011) and Bisias, Flood, Lodan Valavanis (2012) said that the causes of systemic risk are leverage, liquidity, loss and linkage. If the leverage of the bank is too high to pursue high returns, the likelihood of losses will be high. Under such conditions a small loss from one bank may turn into a liquidity problem through negative feedback on the financial system network. If there are negative rumors among depositors against bank losses, and distrust of other banks could lead to bank run.

Bank Fragility

According to Hadad, Santoso and Arianto (2003) banks are very easily affected by external factors, because banks are part of the payment system. The factor is that the amount of cash is very small compared to its immediate liabilities, and on the other side, bank capital is very low compared to its obligations, and the ratio of third-party funds is very short term. Similarly, De Bant et al (2010) mismatche maturity and complex interbank exposure due to payment system operational transactions, interbank lending and interbank derivative transactions.

Bank Run

The classical transmission risk model is a logical implementation model of a single run bank literature for a more complex banking system. Diamond and Dybvig (Lemmen, 1983) examines that are designed to address the instability of a single bank with fractional reserve ownership. Banks can convert long-term deposits into longer-term investments, while customers face "consecutive service" constraints when customers want to withdraw their funds on deposits. When customers have difficulty in withdrawing funds, they will later decide to withdraw all funds deposited in the bank. An important element is that the fear of early withdrawal by a large number of customers can trigger a bank run. In this case the bank run model can also occur due to the existence of self-fulfilling propechy in a short period of time as a result of consecutive services constraints. When occur, these are a signal

from major long-term securities with large-scale deposits that lead to increases in interest rates.

Asymmetric information has the potential to cause systemic risk. De Bant et al., (2010) states that it is because, firstly if there is negative information from the regulator against a bank, the rational depositors will withdraw all funds. Allan and Gale (2004) went on to explain that it resulted in the liquidation of bank assets in fulfilling its obligations. Second, if the condition information of the asset (unproductive loan), the inter-bank exposure is not obtained in full and the depositors only receive noisy information, then it is natural that the depositor then react to the information and make a withdrawal of funds resulting in failure of the bank (Chen, 1999). Finally, the presence of a capital market signal to the fundamental condition of one bank can make depositors coordinate. Rose and Hudgin (2010) stated the same thing that the signal from the market is the ultimate sign of the bank's health condition. The presence of bad signals resulted in the bank run.

Systemic Risk Measurement

In this research, to measure systemic risk used of Value at Risk (VaR) method. VaR is a method of measuring risk using statistical techniques. According to Jorion (2001), in general VaR is defined as a method used to measure the maximum possible losses due in a given period and level of confidence. Adrian and Brunneirmeir (2009) in his research using CoVaR, Value at Risk of a financial institution derived from conditional institutions that are experiencing distress. The concept is how value at risk of individual bank default may be affected others if other bank is in distress condition. Therefore, another parameter is needed to calculate CoVaR (A | B), which is CoVaR bank A which is conditioned on bank B that is experiencing distress. Furthermore Marginal contribution to systemic risk shows the difference between CoVaR and VaR of the financial system. Incremental Value at Risk (Elsinger et al, 2006) describes the contribution of individuals to the overall VaR of the banking system.

The Behavioral Finance Theory

In classical theory, the arbitrage principles of Miller and Modigliani, the portfolio principles of Markowitz, the capital asset pricing theory of Sharpe, Lintner, and Black, and the option-pricing theory of Black, Scholes, and Merton, state that economic actors are rational. So, according to small banks default risk problem, investor will react rationally. Due to fundamental data, both in terms of assets and their role in the banking system do not infect other banks. So, hence these small banks do not have a systemic impact.

However, the Behavioral Finance Theory provides space to change this mindset, namely that sometimes economic actors behave irrationally (Meir Statman, 1999). The tools of behavioral finance include susceptibility to frames and other cognitive errors, varying attitudes toward risk, aversion to regret, imperfect self-control, and preferences as to both utilitarian and value-expressive characteristics. That is to say, small banks that has

financial distress will not have a systemic impact only if the economy is in normal conditions. If the economic condition is in an abnormal condition, the act of financial distress that cause closing down the banks, no matter how small the banks, may be at risk of systemic impact. This is because negative news and sentiment will reduce the credibility of the monetary authority and banking system as a whole in the eyes of the public.

METHODOLOGY

This research used descriptive verification research based on explanation level with associative/relationship parameter. The population of this study is a banking company with total assets of at least 10 trillion rupiah and a maximum of 85 trillion rupiahs in 2009 to 2016. There are 14 small banks in accordance with the order listed in Bank Indonesia.

This research is exploratory reasearch in measuring systemic risk of individual bank to banking system. Phase of data processing (Sri Ayomi and Bambang Hermanto, 2013), as described below. The first stage is to calculate the market value of banking assets, especially for banks that go public. Cooperstein, Pennacchi and Redburn (2003) provide models to estimate market value and asset volatility using bank financial statements. In this paper, the estimated market value of bank assets is performed using profit and loss statement data. Return of assets of each bank and the return of assets of the banking system are expressed as:

$$X_t^i = \left(\frac{A_t^i - A_{t-1}^i}{A_{t-1}^i}\right) \text{ dan } X_t^{sys} = \left(\frac{A_t^{sys} - A_{t-1}^{sys}}{A_{t-1}^{sys}}\right) \quad \text{..... (1)}$$

By $A_t^{sys} = \sum_i A_t^i \, . X_t^{sys}$ shows the total assets of the entire banking system; and A_{t-1}^{sys} shows the total assets of the previous banking system. To obtain the time variation over the distribution between Xi and Xsys, this distribution is estimated as a function of a set of macro variables that can affect the amount of asset returns. The equation specification to estimate the return value of a bank asset is:

$$X_t^i = \alpha^i + \beta^t M + \varepsilon_t^i \quad \text{..... (2)}$$

$$X_t^{sys} = \alpha^{sys} + \beta^{sys} m + \varepsilon_t^{sys} \quad \text{..... (3)}$$

The second stage is to calculate the probability of default of individual banks and the banking system in general. Lehar (2005), and Adrian and Brunnermeier (2009) used the stock price to estimate this default probability value. In this study, we estimated the VaR values of individual and VaR banking systems using the following specifications:

$$VaR_t^i = \hat{\alpha}^i + \hat{\beta}^i M \quad \text{..... (4)}$$

$$\mathrm{VaR}_t^{sys} = \hat{\alpha}^{sys} + \hat{\beta}^{sys} \mathrm{M} \quad \text{..... (5)}$$

VAR is value at risk of bank i in period t, and VARsys is value at risk banking system in period t. M is a vector of macro variables including BI-rate, JIBOR and IHSG; all three are calculated in their growth value.

$$\mathrm{BIrate}_t = \frac{\mathrm{BIrate}_t - \mathrm{BIrate}_{t-1}}{\mathrm{BIrate}_{t-1}} \quad \text{..... (6)}$$

$$\mathrm{JIBOR}_t = \frac{\mathrm{JIBOR}_t - \mathrm{JIBOR}_{t-1}}{\mathrm{JIBOR}_{t-1}} \quad \text{..... (7)}$$

$$\mathrm{IHSG}_t = \frac{\mathrm{IHSG}_t - \mathrm{IHSG}_{t-1}}{\mathrm{IHSG}_{t-1}} \quad \text{..... (8)}$$

The third stage is to calculate the Conditional Value at Risk (CoVaR) parameter based on Value at Risk on individual banks and the entire banking system. The magnitude of CoVaR actually reflects systemic risk in terms of the influence of a bank on the banking system as a whole. Technically, the CoVaR estimation on t is performed using the estimated coefficients of bank system return and substituting the VaR t estimation on the Ysys coefficient:

$$\mathrm{X}_t^{syd} = \hat{\alpha}^{sysIi} + \hat{\beta}^{sysIi}\mathrm{M} + \hat{\gamma}^{sysIi}\mathrm{X}_t^i + \varepsilon_t^{sysIi} \quad \text{..... (9)}$$

$$CoVaR_t^t = \hat{\alpha}^{sysIi} + \hat{\beta}^{sysIi}\mathrm{M} + \hat{\gamma}^{sysIi}\mathrm{VaR}_t^i \quad \text{..... (10)}$$

Where ; CoVar i on t is the conditional value at risk of banking system at VaR bank i; while α sys | i, β sys | i, γ sys | i are parameters in estimation. The next step is to calculate the systemic risk contribution of the banking system of each individual bank in the form of**:**

$$\Delta\mathrm{CoVaR}_t^i = \mathrm{CoVaR}_t^i - \mathrm{VaR}_t^{sys} \quad \text{..... (11)}$$

RESULTS

1. Probability Default Analysis

First is to calculate the market value of banking assets, using the bank's financial statements. To obtain the time variation over the distribution between Xi and Xsys, this distribution is estimated as a function of a set of macro variables that can affect the amount of asset returns. Next is to calculate the probability of default of individual banks and the banking system in general. In this study, we estimate the value of individual VaR and VaR banking systems.

Table 1. VaR Individual and VaR systems

Bank name	Individual VaR	Rate
Bank A	6.19%	14
Bank B	15.1%	12
Bank C	16.41%	10
Bank D	20.6%	4
Bank E	16.58%	9
Bank F	17.38%	7
Bank G	18.65%	6
Bank H	20.42%	5
Bank I	16.16%	11
Bank J	25.94%	3
Bank K	29.48%	2
Bank L	12.62%	13
Bank M	33.28%	1
Bank N	16.6%	8
SISTEM	0.21%	
rata-rata	18.96%	

Source : Processed data

Based on the research result of average VaR individual bank reached 18.96%. Bank M is the bank with highest individual risk that is 33.28% and Bank A is the bank with the lowest individual risk that is 6.19%, while the risk of banking system is only 0.21%. The average size of individual VaR is contributed by VaR M and Bank K, the two lowest performing banks are private commercial banks without internal government interference.

2. Measuring the Individual Systemic Bank Risk

Table 2. Individual Systemic Bank Risk (CoVaR)

Nama Bank	Individual VaR	Rate	CoVaR	Rate
Bank A	6.19%	14	0.02%	5
Bank B	15.1%	12	0.06%	1
Bank C	16.41%	10	0.05%	2
Bank D	20.6%	4	-0.2%	13
Bank E	16.58%	9	-0.12%	11
Bank F	17.38%	7	0.04%	4
Bank G	18.65%	6	-0.35%	14
Bank H	20.42%	5	0.01%	6
Bank I	16.16%	11	-0.11%	10
Bank J	25.94%	3	-0.05%	8
Bank K	29.48%	2	-0.08%	9
Bank L	12.62%	13	-0.04%	7
Bank M	33.28%	1	-0.12%	12
Bank N	16.6%	8	0.04%	3
SISTEM	0.21%	-	-	-
rata-rata	18.96%	-	-0.06%	-

Source : Processed data

From the result of the average CoVar calculation data is -0.06% and it can be concluded that each individual default risk of the bank (VaR), is different from the level of systemic risk of individual bank (CoVaR). Based on the above table, Bank M with 30 trillion rupiahs assets had the highest individual default risk rating, but the lowest the individual systemic risk that was at -0.12%. Contrary to Bank B with an asset of 10 trillion rupiahs had the 3rd lowest individual default risk level was at the highest individual systemic risk that was 0.06%. This means that banks with high probability of failure are not necessarily at systemic risk. We can see from the results of data above,

the possibility of a low failure bank on 10 trillion rupiahs assets can impact systemic risk.

3. Systemic Individual Bank Risk Contribution To Systemic Risk System Banking

From the results of the data below shows the average system risk is -0.26%. Interesting to be observed at Bank B where the individual systemic risk is the highest but the contribution to the system is the lowest. Contrary to what happens to Bank D, where the individual default risk was the lowest, but its contribution to the system was the highest.

Table 3. Individual Systemic Risk Contribution to the Systemic Risk of the Banking System

Bank Name	Individual VaR	Rate	CoVaR	Rate	ΔCoVaR	Rate
Bank A	6.19%	14	0.02%	5	-0.19%	9
Bank B	15.10%	12	0.06%	1	-0.15%	14
Bank C	16.41%	10	0.05%	2	-0.16%	12
Bank D	20.60%	4	-0.20%	13	-0.41%	1
Bank E	16.58%	9	-0.12%	11	-0.33%	4
Bank F	17.38%	7	0.04%	4	-0.35%	3
Bank G	18.65%	6	-0.35%	14	-0.19%	10
Bank H	20.42%	5	0.01%	6	-0.41%	2
Bank I	16.16%	11	-0.11%	10	-0.16%	13
Bank J	25.94%	3	-0.05%	8	-0.26%	7
Bank K	29.48%	2	-0.08%	9	-0.29%	6
Bank L	12.62%	13	-0.04%	7	-0.25%	8
Bank M	33.28%	1	-0.12%	12	-0.33%	5
Bank N	16.60%	8	0.04%	3	-0.17%	11
SISTEM	0.21%					
rata-rata	18.96%		-0.06%		-0.26%	

Source : Processed data

From the three data of the research above, explains that banks with 30 trillion assets have a low probability of Default but systemic impact (the contribution to the system) was low, as happened in Bank B. This means the failure of a bank (small bank category) has a systemic impact but the interbank relationship is low, then the transmission caused by its bank does not have systemic impact on the banking system.

Table 4. Systemic Risk of Banks against Banking System Risk

Bank Name	ΔCoVaR	% ΔCoVaR Threshold 10%	
Bank A	-0.19%	6.04%	Not Systemic
Bank B	-0.15%	4.91%	Not Systemic
Bank C	-0.16%	5.33%	Not Systemic
Bank D	-0.41%	13.39%	Systemic
Bank E	-0.33%	10.78%	Systemic
Bank F	-0.35%	11.29%	Systemic
Bank G	-0.19%	6.06%	Not Systemic
Bank H	-0.41%	13.27%	Systemic
Bank I	-0.16%	5.25%	Not Systemic
Bank J	-0.26%	8.43%	Not Systemic
Bank K	-0.29%	9.58%	Not Systemic
Bank L	-0.25%	8.20%	Not Systemic
Bank M	-0.33%	10.82%	Not Systemic
Bank N	-0.17%	5.39%	Not Systemic
rata-rata	-0.26%	8.48%	

Source : Processed data

Risk contribution of a bank to banking system can be categorized as having systemic impact if risk contribution has rank above 10 percent (referring to Sri Ayomi and Bambang H, 2013). The results in Table 4 show that Banks with total assets of 50-80 trillion rupiahs are systemic (Bank D, E, F, H and M), while for banks that have no systemic impact are banks with total assets of 10-50 trillion rupiahs (Bank A, B, C, G, I, J, K, K, L and N).

Further analysis found that banks would mutually condition each other. When a small bank is being distressed and declared bankrupt does not mean that the bank does

not have a large systemic impact. Theoretically, the failure of a bank will give a strong negative effect. Therefore, the bank will be encouraged to invest in the same industry in an effort to survive or will fail together. This strategy is called collective risk. The consequence of this strategy is that banks with assets that are highly correlated failed to lead a simultaniously bank failure or are called the existence of "negative externalities" Acharya (2001). The possibility of this failure depends on the size of the bank failed, the uniqueness of the bank failed, as well as failed banks case that are still not using and taking over these bank facilities.

The spread of failed bank risks through institutional interconnection can come from coordination failure and liquidity difficulties. The spread of the crisis related to liquidity will have an impact on systemic transmission to the bank. Systemic risk caused by difficulties in the financial system will more severely hit other banks when shocks spread quickly.

MANAGERIAL IMPLICATION

Based on the research results on the measurement of the bank's individual risk contribution to the risk of the banking system can be stated that the determination of a systemic to a small bank default risk for the banking system as a whole can not be seen from conventional economic theory alone (which states that small banks have no systemic impact), but also must be seen from the financial behavior theory that states that small banks do not affect systemic only under normal conditions. The results of the study are in accordance with traditional economic theory, which explains that small banks do not have a systemic impact. These because in fundamental data, both in terms of assets and their role in the banking system do not infect other banks. However, the Behavioral Finance Theory still provides space to change this mindset, namely that sometimes economic actors behave irrationally (Meir Statman, 1999).

That is to say, small banks that are closed due to financial distress will not have a systemic impact only if the economy is in normal conditions. If the economic condition is in an abnormal condition, the act of closing down the bank no matter how small the bank may be at risk of systemic impact. This is because negative news and sentiment will reduce the credibility of the monetary authority and banking system in the eyes of the public. It is more important for the authhority to maintain the stability of the financial system.

CONCLUSION

This study provides some interesting empirical conclusions that can be an opening discourse about the systemic risk of banking. Using commercial banks datas which have assets of 10-85 trillion rupiah as research samples, the empirical conclusions obtained:

1. The average probability of bank defaults during the study periods (2009-2016) using Value at Risk is 18.96%, CoVaR analysis reflects the risk of individual banks with an average of -0.06% influencing the contribution to systemic risk of the banking system. The magnitude of the bank's individual risk contribution to system risk with an average

of -0.26% indicates that of the surveyed banks (small bank category) refers to the research of Sri Ayomi and bambang H, 2013

2. Overall transmission caused by individual default risk among banks is very low where ΔCoVaR averages only -0.26% in whole system. This situation is caused by the object of research are the banks with a small bank category.
3. The Behavioral Finance Theory provides to change the mindset above that sometimes economic actors behave irrationally, so even small banks can have systematic risk.

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