Analysis of systemic risk in banking on the Indonesian stock exchange with the conditional-value at-risk method

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ABSTRACT

This study aims to determine the systemic risk of banks as measured using Conditional-Value at Risk. The data used is daily closing price data to determine the daily return of 9 banks listed on the Indonesia Stock Exchange with 5-year from September 28, 2018, to September 22, 2023. Then used to determine the Conditional Value at Risk of each bank. The results of the study can be seen in this article.

Keywords: risiko sistemik,value at-risk, conditional-value at-risk, size firm.

1. Introduction

Banking has a major role in the economic growth of a country. According to Law Number 10 of 1998, banking is everything that concerns banks, including institutions, business activities, as well as ways and processes of carrying out their business activities. Banking has the main function of raising funds, channeling funds and providing other bank services to the public. Therefore, banking is closely related to the economic growth of the community.

In its activities, banking is a sector that is vulnerable to risks and crises (Nabella, 2020) and one of them is systemic risk. Systemic risk can be defined as the potential for instability due to contagious disturbances in part or all of the financial system (Erwin, 2015). This has become a greater concern, especially after the 2008 financial crisis in the United States caused by the subprime mortgage and resulted in systemic risk Indonesia was affected, namely Bank Century which was declared a failed bank and had a systemic impact, so the government decided to save Bank Century by taking it over (Nabella, 2020). Based on the impact and large costs incurred, it is necessary to conduct research on banking systemic risk.

There are several ways to measure systemic risk, such as by using the Marginal Expected Shortfall method as conducted by Derbali (2015) and Hallara (2015) referring to the research of Acharya et al (2010), or by using the Conditional Value at Risk (CoVaR) research method conducted by Ayomi and Hermanto (2013), Nabella (2020) referring to the research of Adrian &

Brunnermeier (2009). This study uses the Conditional Value at Risk (CoVaR) method like the research conducted by Ayomi and Hermanto (2013), Nabella (2020).

Based on the background that has been explained, the problem formulation of this research is as follows:

1. How big is the default risk of each bank in Indonesia?
2. How much does the systemic risk of banks affect the financial system in Indonesia?

The research objectives are as follows:

1. Analyzing the default risk of each bank in Indonesia.
2. Analyzing the systemic risk of banks affecting the financial system in Indonesia.

2. Literature Review

2.1 Financial System Stability

Financial systems are said to be stable if they are strong and resilient to economic disturbances so that they are still able to perform intermediation functions, carry out payments, and spread risk properly (Bank Indonesia, 2018). An unstable financial system can cause major impacts and costs, including a) monetary policy is not effective because the transmission of monetary policy does not function normally; b) growth is hampered because the allocation of funds is not running properly; c) panic behavior of investors to withdraw their funds so that liquidity difficulties occur due to public distrust of the financial system; d) high costs to rescue the financial system in the event of a systemic crisis.

2.2 Bank Fragility

According to Ayomi, Sri & Hermanto (2013), the source of bank failure can be divided into several cases, including 1) excessive expansion of bank creditors; 2) asymmetric information resulting in the inability of depositors to accurately assess bank assets, especially when the bank's economic conditions deteriorate; 3) shocks initiated from outside the banking system, regardless of the bank's financial condition, that cause depositors to change their liquidity preferences or cause reductions in bank reserves; and 4) institutional and legal restrictions that weaken banks and lead to insolvency.

The Prisonners's Dilemma theory can also be the basis of banking vulnerability on the liability side. When public trust in banks decreases or even disappears, there will be a simultaneous and immediate withdrawal of funds (rush or run). This vulnerability is based on the interaction between short-term liquid liabilities and long-term illiquid assets.

2.3 Systemic risk

Systemic risk is a condition when a bank experiences financial distress which will trigger other banks to experience the same thing. The occurrence of financial distress in banks will lead to bank runs and the collapse of the financial system (Adrian & Brunnermeier, 2009). Systemic risk is also the risk of joint failure that occurs from the relationship between the return on assets from the bank's balance sheet (Acharya, 2009).

Systemic risk is like a plague in banking where if one is exposed to distress it can spread to other banks. In a broader sense, systemic risk can be defined as macroeconomic shocks that hurt the financial system as a whole (Fuadi, 2019). It can be a shock that affects one institution and then affects other institutions or spreads (De Bant et al, 2010).

Adrian & Brunnermeier (2011) explained that to calculate systemic risk, it is better to identify the risk contained in a system by measuring the individual systemic of a bank, where the institutions are interconnected and large (too big to fail) so that they can cause negative impacts on other institutions. Therefore, banks with larger total assets will have greater systemic risk. Table 1 is an illustration of the total asset data of 9 banks for the period 2023.

It can be said that if the failure of a financial institution is not handled quickly, it will be contagious (spread) which causes other institutions or several institutions to fail. So that the contagion effect will trigger a systemic crisis in the economic system.

Table 1
Total assets of banks in Indonesia quartal 2 2023

No	Bank Name	Total Assets (Trillion Rupiah)	Rating
1	BMRI	1.908	1
2	BBRI	1.822	2
3	BBCA	1.321	3
4	BBNI	1.012	4
5	BBTN	400	5
6	BNGA	329	6
7	NISP	238	7
8	BDMN	203	8
9	BTPN	203	9

Source: data processed, ojk 2023

3. Research Methodology

This research uses a quantitative approach. The type of data used in this study is secondary data, namely daily closing stock price data except Saturdays, Sundays and stock exchange holidays. The sample used is 9 banks with the largest total assets listed on the Indonesia Stock Exchange and listed on the exchange before September 28, 2018. The research variable used to detect Conditional Value at Risk is the stock return value for a period of 5 years, from September 28, 2018, to September 22, 2023. The data used is obtained from www.yahoofinance.com.

4. Results

4.1 Banking Systemic Risk

The growing banking sector encourages the emergence of various risks, systemic risk itself is defined as the failure of an agency which can then spread and cause failure. Systemic risk can arise due to failures caused by financial distress. Based on this, systemic risk needs to be measured by individual bank and system risks through Value at Risk (VaR). VaR reflects how

much risk is likely to be obtained by banks and banking systems. The results of the calculation of Var can be seen in Table 2.

Table 2
Banking Systemic Risk

No	Bank Name	Individual Risk	
		VaR(1%)	Rating
1	BMRI	-5%	4
2	BBRI	-4%	5
3	BBCA	-4%	5
4	BBNI	-6%	3
5	BBTN	-8%	1
6	BNGA	-7%	2
7	NISP	-4%	5
8	BDMN	-7%	2
9	BTPN	-5%	4
10	Banking System	-2%	

Source: data processed

It can be seen in Table 2 that the largest VaR(1%) value is BBTN with a value of -8% which means that BBTN has an individual systemic risk where there is a 1% chance of experiencing a loss of -8%. The lowest individual systemic risk is BBRI, BBCA, and NISP with the value of VaR(1%) which is -4%. And the VaR value of the banking system is 7%.

4.2 Bank Systemic Risk Contribution

Conditional Value at Risk is used to measure the systemic risk contribution of each bank to the banking system developed by Adrian and Brunnermeier (2011). Each bank has a contribution to the banking system, both banks with large and small assets. The systemic risk contribution can be seen in Table 3.

Table 3
Systemic Risk Contribution

No	Bank Name	Systemic Risk Contribution	
		CoVaR	Rating
1	BMRI	-11%	1
2	BBRI	-8%	4
3	BBCA	-6%	6
4	BBNI	-8%	4
5	BBTN	-10%	2
6	BNGA	-9%	3
7	NISP	-6%	6
8	BDMN	-9%	3
9	BTPN	-7%	5

Source: data processed

Table 3 shows that the largest systemic risk contribution is owned by BMRI at 11% and the lowest systemic risk contribution is BBCA and NISP with a value of 6%. BMRI has the largest covar value in line with its position as the bank with the largest total assets. However, it can be seen that BBTN has a CoVaR of 10% and occupies the second systemic risk contribution even though its total assets are in the 5th position, as well as BBCA where its total assets are in the third position, but its systemic risk contribution is in the sixth position with a value of 6% and BDMN with a systemic risk contribution of 9% is in the third largest position even though its total set is only in the eighth position. This is following research conducted by Erwin & Muharram (2017) which states that the size of the bank (total assets) does not necessarily cause the amount of systemic risk contribution.

It can be seen in Table 2, where BBTN has the highest individual risk value with a value of 8%, while in Table 3 the value of BBTN's systemic risk contribution is in second place with a value of 10%. BMRI with its risk is in fourth place but has a systemic risk contribution in first place. This means that the amount of individual bank risk is not directly proportional to the bank's systemic risk contribution.

5. Discussion

Each bank has externalities to the existing financial system so there are allegations of potential systemic risk in certain individual banks (Ayomi & Hermanto, 2013). This study uses Conditional Value at Risk (ΔCoVaR) developed by Adrian & Brunnermeier (2009) to measure the contribution of each bank to the banking system.

The amount of assets of a bank does not mean it has a large systemic risk as well, this result is in line with research (Muharam & Erwin, 2017) which states the same thing. So it needs to be a consideration for policymakers to keep not only banks with large assets but also banks with smaller assets because these banks may have a large systemic risk to the financial system.

6. Conclusion

Based on the calculations that have been done, it is concluded that banks with high individual risk do not necessarily have high systemic risk contributions. This needs to be considered by regulators not only focusing on individual risk but also on the contribution of systematic risk. Likewise, a large bank size does not always make a bank have a large systemic risk contribution.

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