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Causes of Bank Runs in Indonesia

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Abstract: This study aims to examine the cause of bank runs in Indonesia. This study used all conventional commercial banks in Indonesia of the years 2007-2016 as the sample. Statistical analysis tool used was Eviews. The technique of data analysis used was time series regression analysis with Error Correction Model (ECM). The finding of this research showed that bank runs in Indonesia in 2007-2016 were caused by the bank fundamental condition, that is the banks lending performance and their non-performing loans

Keywords: bank runs, self-fulfilling, error correction model

I. INTRODUCTION

The role of banks is very helpful in the current economy. In addition to accelerating transactions and providing loans in the form of credit to the community, banks are also a means to invest. However, what happens if customers do not trust the bank anymore and in droves withdraw their funds on a large scale. This is known as bank runs. Bank runs can spread from one bank to another (contagious effect) until it eventually develops into a banking crisis.

In 2007, the United States experienced a financial crisis that culminated in 2008 and eventually developed into a global economic crisis. According to the Ministry of State Secretariat of the Republic of Indonesia, the crisis caused a slowing economic growth and a high rate of inflation in Indonesia at that time. Not only Indonesia experienced the bad effects of the global economic crisis, Greece became the worst victim of the crisis. The acute financial crisis had plagued Greece since 2010 and culminated in 2015. Due to a debt swell and risk of bankruptcy because it could not pay it off, the Greek people panicked and made a massive withdrawal of funds from banks to save their funds. Huffington Post said that the closer the maturity date, bank runs in Greece were on the rise.

Bank Runs can occur because of various factors. According to Deng et al. [1], bank runs are influenced by self-fulfilling factors that trigger imitative behavior among customers. This is supported by Berger et al. [2] who said that when the signal is noisy even a little asymmetric information can lead to self-fulfilling reaction, so that customers rush to withdraw funds as quickly as possible because they believe that other customers will do the same.

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Meanwhile, according to Simorangkir [3][4], in addition to self-fulfilling factor, bank runs are also caused by the banks' fundamental factors, namely bank liquidity, credit distribution (Loan to Deposits Ratio/LDR) and bad credit (Non-Performing Loans), as well as economic fundamentals such as inflation and interest rate (BI Rate).

Bank runs are dangerous for banks because they will deplete the third party funds (DPK) that have been collected by banks so that eventually they can go bankrupt.

A number of factors can cause bank runs and the severity of their impacts, and the authors feel interested to examine the **"Causes of Bank Runs in Indonesia"**

II. LITERATURE REVIEW

The self-fulfilling theory explains that bank runs occur due to a panic process from the customers. This panic response from customers is because they believe that other customers will do the same, so that ultimately imitative behavior occurs among customers ([5]; [6]; [4]).

According to Deng et al. [1], when a customer believes that many other customers will withdraw their funds, he or she will also do the same. This happens because the customer thinks there would be no benefit of changing this strategy if other customers do not. So in a self-fulfilling logic, anything that makes customers to predict that bank runs will occur, then they will withdraw their funds.

While the fundamental theory explains that bank runs may occur due to poor fundamentals of the banks and the economy. This condition will reduce the liquidity and reputation of the banks, so that customers' confidence in the banks will drop and they will make withdrawals to save their funds, regardless of the actions of other customers ([7]; [8]; [9]).

Simorangkir argued that poor bank liquidity causes the bank not have enough funds to meet the withdrawal of customers, so banks are susceptible to bank runs [3].

In her research, Fatimah explained that high inflation will lead to the dredging of savings and money collection [10]. This will certainly make it difficult for banks to raise funds.

Further low interest rates will reduce the public's desire to save so that growth of third party funds (DPK) will decrease [11], while high interest rates will increase the risk of non-performing loans.

Findings from Simorangkir suggest that high number of problem loans owned by banks can trigger the occurrence of bank runs [3].

Mccandless et al. [8] conducted a study of the causes of bank runs in Argentina during the 2001 crisis. The data used are from January to November 2001. The results showed that the fundamentals of banks and macroeconomic fundamentals had a significant effect on bank runs in Argentina in 2001.

Levy-yeyati et al. [12] studied market conditions due to the effect of systemic risk using banking crisis data that occurred in Argentina and Uruguay. The results showed that information about past bank fundamentals failed to capture systemic risks so that the information did not affect the occurrence of bank runs.

Simorangkir [4] conducted a research on the causes of bank runs in Indonesia during the crisis of 1997-1998. The data used are monthly data from November 1997 to June 1998 drawn from 44 nondevisa private banks, 14 foreign exchange banks, 19 banks of frozen business activities, and 8 banks of frozen operations. The results showed that self-fulfilling and some fundamental components of banks significantly affected bank runs in Indonesia while macroeconomic fundamentals were not affected.

Simorangkir [3] conducted a study by extending the analysis period of 94 banks with a monthly period from January 1990 to December 2005 on the causes of bank runs in Indonesia using panel data. The results show that self-fulfilling variables, fundamentals of banks and macroeconomic fundamentals significantly affected bank runs in Indonesia.

From several studies above, it can be concluded that in the short and long term fundamentals of banking will be more influential on the occurrence of bank runs. While the fundamental factors in the economy are more influential in causing bank runs in the long run.

III. CONCEPTUAL FRAMEWORK & HYPOTHESES

When someone keeps his money in the bank, he believes that the bank is safe and profitable. Banks that have many customers indicate that the bank is highly trusted. Customer confidence is an important key for the bank to succeed. The number of banks' customers will have an impact on the number of third party funds (DPK) that can be collected by banks.

Third party funds (DPK) will serve as capital for banks.

But when the trust is reduced and even lost, there will be a simultaneously massive withdrawal by customers that is commonly known as bank runs. The loss of trust can be caused by many things, either because of the fundamentals of the bank, the fundamentals of the economy, or the panic of something random happening.

Poor bank fundamentals such as excessive credit distribution and substantial number of non-current loans will cause bank liquidity to become worse. This causes the bank not to have enough funds to meet the withdraws and its obligations. This condition will reduce the customers' confidence, so customers try to withdrawals their funds and this will encourage bank runs.

From the fundamental aspect of the economy, high inflation makes the price of goods rise, so expenditures increase. This will lead to the dredging of savings by customers. In addition, increased spending will also make it difficult for customers to save, making it difficult for banks to raise funds from third parties. This condition, in the end, will make the bank lack of funds and reduce customer confidence so as to encourage the occurrence of bank runs.

In addition to inflation, interest rates are also thought to contribute to the cause of bank runs. Low interest rates will lower interest in saving the community so that banks find difficulty to raise funds from third parties (DPK). High interest rates will increase the risk of non-performing loans. This can lower customer confidence and cause bank runs.

Another factor that causes bank runs is the result of random customer panic reactions. Withdrawal of funds is a rational response from customers, because customers believe other customers also do the same. Withdrawal by a customer can trigger withdrawals by other customers so that eventually trigger the occurrence of bank runs.

This research proposes the following hypotheses: Self-fulfilling action, loans, bad credits, inflation, and interest rates affects the occurrence of bank runs.

IV. RESEARCH METHODS

The population used in the study is all banks in Indonesia. While the sample in this study is conventional commercial bank in Indonesia in the period January 2007 - July 2016. The data used is time series data in the period of 115 months, obtained from the website of Bank Indonesia (www.bi.go.id) and Banking Statistics Indonesia (www.ojk.go.id).

Operational definitions of variables used in the research are shown on the table 1.

Table 1. Operational Definition of Variables

Variables	Symbol	Definition	Scale	Sources
Bank Runs	gDPK	Percentage change of bank third party funds every month	Ratio	www.ojk.go.id
Self-fulfilling	$gDPK_{t-1}$	Percentage change of bank third party funds each month previous period	Ratio	www.ojk.go.id
Distribution of credit	LDR	The ratio between the total credit disbursed by a bank against the total third party funds owned by the bank	Ratio	www.ojk.go.id
Bad credit	NPL	The ratio between total non-current liabilities (non-performing loans, doubtful loans, and non-performing loans) with total loans disbursed by banks	Ratio	www.ojk.go.id
Inflation	INF	Monthly inflation in Indonesia	Ratio	www.bi.go.id
Interest rate	BI	Monthly BI rate	Ratio	www.bi.go.id

* Data on DPK, LDR, and NPL used are combined with data of all conventional commercial banks in Indonesia per month.
* Credit used is credits granted to non-bank third parties.

Multicolinearity Test. Multicollinearity test is done to find out whether there is a relationship between independent variables used. If the correlation value between independent variables is smaller than 0.8, then there is no multicollinearity. Conversely, if the correlation value between independent variables is greater than 0.8, then there is multicolinearity.

Testing stationarity of data, it is conducted to determine whether the data used has been stationary

or not, because data that is not stationary can produce Spurious Regression. The test was performed using Augmented Dickey-Fuller Unit Root Test. If the data is not stationary at 0 degrees (level), then the test is continued to the next degree that is the first degree (First Difference) or second (Second Difference). The hypothesis for this test is Ho, the data is not stationary (there is a root unit) and Ha, stationary data (no root unit).

Cointegration Test. Cointegration test aims to determine the long-term relationship between the observed variables. Testing is done by using Engle-Granger test. If the residual long-term regression (e) is stationary at 0 degree, then cointegration occurs. If the residual long-term regression (e) is not stationary at 0 degree (level), there is no cointegration.

Error Correction Model (ECM). ECM is used to correct the regression equation between variables that are not stationary individually to return to their equilibrium value in the long run.

Long-term equation:

$$gDPK_t = a_0 + a_1 gDPK_{t-1} + a_2 LDR_t + a_3 NPL_t + a_4 NFI_t + a_5 BI_t + e_t \quad (1).$$

Short-term equation:

$$\Delta gDPK_t = b_0 + b_1 \Delta gDPK_{t-1} + b_2 \Delta LDR_t + b_3 \Delta NPL_t + b_4 \Delta INF_t + b_5 \Delta BI_t + b_6 e_{t-1} + f_t \quad (2).$$

Information:

a_0 and b_0 are the constants of the equation. e_t is residual of long-term equation.

a_1-a_5 and b_1-b_6 are coefficients of equation. e_{t-1} is residual of previous period of long-term equations

f_t is residual of short-term equation. t is time period.

Test t. The t test is used to test the partial effect of each independent variable on the dependent variable with the assumption that the other variable is constant. The hypothesis for this test is Ho, the independent variable has no effect on the occurrence of bank runs and Ha, the independent variable has an effect on the occurrence of bank runs.

Coefficient of Determination (R^2). Coefficient of determination (R^2) is used to determine the contribution of independent variables to the dependent variable under study. The value of R^2 is close to 1 means the stronger the influence of the independent variable to the dependent variable or vice versa.

V. FINDINGS AND ARGUMENT

A. Multicollinearity Test Results

The results of multicollinearity testing of the research variables are shown in table 2 below.

Table 2. Multicollinearity Test Results

Variables	$gDPK_{-1}$	LDR	NPL	INF	BI
$GDPK_{-1}$	1,000000	-0,055147	-0,042799	0,090695	0,005274
LDR	-0,055147	1,000000	-0,853141	-0,079089	-0,327885
NPL	-0,042799	-0,853141	1,000000	0,075678	0,570674
INF	0,090695	-0,079089	0,075678	1,000000	0,696698
BI	0,005274	-0,327885	0,570674	0,696698	1,000000

Source: Processed by the authors

The output in table 2 above shows the correlation value between each variable is smaller than 0.8 except the correlation value between LDR variable with NPL that is above 0.8. However, according to Gujarati [13], this does not violate the classical assumption because LDR is functionally related to the NPL, but the relationship is not linear in the population so the OLS estimator still has BLUE properties. Therefore, it can be concluded that there is no multicollinearity among independent variables in this study.

B. Stationarity Test Results

The result of stationarity test using ADF test on each research variable is presented in table 3 below.

Table 3. Stationerity Test Results

Variables	Probability of ADF test	Decision
gDPK	0,4995	Not stationary
$gDPK_{t-1}$	0,5194	Not stationary
LDR	0,4473	Not stationary
NPL	0,6348	Not stationary
INF	0,1018	Not stationary
BI	0,1600	Not stationary

Source: Processed by the authors

The stationarity test for each variable based on table 3 above is concluded. The variables in this study are not stationary at the level because they have an ADF test probability value greater than 0.05, so it is necessary to test the stationarity at the first difference level as presented in the table 4.

Based on the results in table 4 above, all research variables have probability value of ADF test smaller than 0.05, so it can be concluded all variables on first difference have stationary.

Table 4. The Test Results Stationarity at the First Difference Level

Variables	Probability of ADF test	Decision
gDPK	0,0000	Stationary
$gDPK_{t-1}$	0,0000	Stationary
LDR	0,0000	Stationary
NPL	0,0049	Stationary
INF	0,0000	Stationary
BI	0,0001	Stationary

Source: Processed by the authors

C. Cointegration Test Results

If the variable is stationary on the first difference, it can be expected that between the variables observed in the long term cointegration occurs. To prove it, it is necessary to do cointegration test using Engel-Granger test as the result shown in the following table.

Table 5. Cointegration Test Results With Engle-Granger Test

Variable	P_{-Value}	Decision
e	0,0342	Stationary

Source: Processed by the authors

Based on stationary test results on residual long-term equations (Engel-Granger Test), obtained P-value smaller than 0.05 (see table 5 above). This proves that between gDPK, gDPKt-1, NPL, LDR, INF and BI variables there is a cointegration relationship.

D. Error Correction Model (ECM)

If the cointegration test results between variables indicate a long-term relationship, then the appropriate model to show the relationship is the Error Correction Model (ECM). This model is constructed in two equations, ie, long-term equation and short-run equation with results shown in tables 6 and 7 below

Table 6. Long Term Regression Result

Variables	Coefficients	Standart Errors	$t_{-Statistic}$	P_{-Value}
C	12,51460	3,715516	3,368198	0,0010
$gDPK_{t-1}$	-0,216705	0,092054	-2,354106	0,0204
LDR	-0,143971	0,044119	-3,263217	0,0015
NPL	-1,462763	0,469425	-3,116075	0,0023
INF	-0,187839	0,132786	-1,414607	0,1601
BI	0,833897	0,391743	2,128685	0,0356
Adjusted R^2			0,078851	

Source: Processed by the authors

Based on the results in table 6, all variables of gDPKt-1, NPL, LDR and BI except INF statistically have significant influence on bank runs proxyed with changes in third party funds (gDPK). This is evidenced by the P_{-Value} for each variable except the inflation variable (INF) that is less than 0.05.

The effects of self-fulfilling (gDPKt-1), credit distribution (LDR), non-performing loans (NPL) and inflation (INF) on bank runs (GDPK) in the long run

are negative. This means that any change from GDPKt-1, LDR, NPL and INF by one percent, will change the current third-party funds by the coefficients of each variable in the opposite direction. For example, if non-performing loans (NPLs) increase by one percent, then third party funds will decrease by 1.46 percent or vice versa.

Meanwhile, if there is an increase in Bank Indonesia interest rate by one percent, it will increase third party funds by 0.83 percent or vice versa.

The effect between the independent variables on bank runs in the long term has the same direction as the effect in the short term but with different magnitudes, as shown in table 7 below.

Table 7. Short Term Regression Results

Variables	Coefficients	Standart Errors	$t_{\text{-Statistics}}$	$P_{\text{-Value}}$
C	0,155111	0,111405	1,392317	0,1667
$D(gDPK_{t-1})$	-0,124010	0,054821	-2,262096	0,0257
D(LDR)	-0,988972	0,112605	-8,782694	0,0000
D(NPL)	-5,176119	0,629563	-8,221761	0,0000
D(INF)	-0,154214	0,162015	-0,951849	0,3433
D(BI)	2,024499	0,689540	2,936015	0,0041
e(-1)	-1,065505	0,089608	-11,89075	0,0000
Adjusted R^2			0,797957	

Source: Processed by the authors

From table 6 and 7 above, it can be concluded that the more influential variable in causing the occurrence of bank runs is the variable of bad credit (NPL), which in the long term gives an effect of 1.46 percent greater than other variables. While the effect of this NPL variable in the short term amounts to 5.18 percent against changes in third party funds (DPK) reflecting the bank runs.

The variable that gives the smallest effect to long term bank runs is credit distribution variable (LDR) with contribution of 0.14 percent, while in the short term it is self-fulfilling variable (gDPKt-1) with about 0.12 percent.

Another interesting finding is that the e-1 regression coefficient of 1.065505 indicates a speed of adjustment, which means that short term imbalances of third party funds will decline by about 1.1 percent due to a change in self-fulfilling (GDPKLAG1), lending (LDR), non-performing loans (NPL), inflation (INF) and interest rate (BI) for each period.

Increased third party funds will reduce bank runs or vice versa.

E. Partial Testing (t test)

The test results for each variable whether statistically have significant effect on bank runs or not in the short and long term are shown in the following table 8.

The results in this table show that all variables of $GDPK_{t-i}$, LDR, NPL and BI all in the long term and short term are statistically significant at the 5 percent confidence level. This fact is indicated by the value of $P_{\text{-Value}}$ of each of these variables that is smaller than 5 percent. But the INF variable is not statistically significant in realizing the occurrence of bank run, because $P_{\text{-Value}}$ of INF variable is greater than 5 percent for both short and long term.

Table 8. Partial Test of Variables

Variables	Short Term		Long Term	
	$P_{\text{-Value}}$	Decision	$P_{\text{-Value}}$	Decision
$gDPK_{t-1}$	0,0257	Significant	0,0204	Significant
LDR	0,0000	Significant	0,0015	Significant
NPL	0,0000	Significant	0,0023	Significant
INF	0,3433	Not significant	0,1601	Not significant
BI	0,0041	Significant	0,0356	Significant

Source: Processed by the authors

F. Coefficient of Determination (R^2)

The coefficient of determination gives an illustration of how much the contribution of independent variables involved in this study have an effect on bank runs.

Based on the Adjusted R^2 value in tables 6 and 7 above, the magnitude of the influence of self-fulfilling ($gDPK_{t-1}$), credit distribution (LDR), bad

credit (NPL), inflation (INF) and interest rate (BI) on the bank runs (gDPK) in the long run is 7.89 percent and in the short term is 79.80 percent, while the remaining is respectively 92.11 percent and 20.20 percent for other variables that are not involved in this study such as asymmetric information, bank profitability, exchange rates, and so on.

Based on the results of data processing above, various analyzes for each variable of research can be presented that may cause the occurrence of bank runs.

Self-fulfilling has a significant negative effect on bank runs in both the long and short term. Negative influence is not as expected, because self-fulfilling should have a positive influence on bank runs. The negative effect indicates that the decrease of DPK in the previous period did not result in the decrease of DPK in the current period so that bank runs that occurred in one bank did not result in bank runs in other banks because there was no imitation behavior among the customers. This is because customers have a good knowledge of banking, so customers do not easily believe in issues that arise. The results of this test are consistent with Levy-yeyati et al. [12].

Variables of credit distribution are statistically significant to have a negative effect on bank runs, both in the long run and short term. This indicates that the greater the percentage of LDR, the greater the credit increase compared to the public funds collected by the bank so that the smaller the bank liquidity will further increase the bank's vulnerability to bank runs. The results of this test are consistent with the research by Simorangkir [3].

Other findings are that non-current loans have a negative and significant influence on bank runs, both in the long term and short term. This fact shows that the greater percentage of NPLs means more and more bad loans, resulting in less liquidity available due to the large number of retained DPKs. This condition will increase bank susceptibility to bank runs. The results of this test are consistent with Mccandless et al. [8] and Simorangkir [3].

Inflation has an insignificant negative effect on bank runs, both in the long run and short term. Negative influence is as expected, but it does not significantly affect the occurrence of bank runs. This is because customers do not pay attention to inflation rate, although the impact of inflation can still be felt by the customers. These findings provide implications that customers will not make a large withdrawal of funds if inflation happens. The results of this test are consistent with Simorangkir [4].

The second macroeconomic variable in this study is the interest rate that has a significant positive effect on bank runs, both in the long term and short term. This suggests that an increase in interest rates will result in increased interest in saving, thereby reducing the bank's vulnerability to bank runs. Interest rates are the second largest variable that contributes to the occurrence or absence of bank runs in both the long and short term. This condition implies that to minimize the occurrence of bank runs, the goverment should keep interest rate stable. These test results are consistent with the research of Mccandless et al. [8].

This research found that the main cause of bank runs in both short and long term is the amount of bad credit owned by bank. This happens, because when the bad credits increase, the liquidity of the bank gets worse, so the bank has difficulty in fulfilling its obligations to the customers. This condition will reduce the customers' trust to the bank. So, to secure their funds, the customers will withdraw their funds from the banks that have difficulty in liquidity.

Interest rates is the second largest contributor to bank runs, both in the long run and short term. These findings are very rational. When interest rates are high, banks are easier to obtain funds from customers and vice versa. Customers will get more profit when interest rates are high. On the contrary, when the interest rate falls, the customers feel no more benefits from their existing funds, which will cause the funds to be invested in other sectors or used for other activities. So when interest rate is low, banks have difficulty obtaining funds.

Another interesting finding in this study is that the third largest contributor in the long run that can lead to bank runs is self-fulfilling. This fact can be explained because customers in the long term will tend to perform imitative behavior due to some customers who withdraw funds. This behavior arises as a result of asymmetric information.

In the short term, the third largest contributor in encouraging the occurrence of bank runs is the amount of loans disbursed by banks. This finding explains that in the short term, bank runs will occur when banks disburse high credits, causing banks not to have enough funds to meet its obligations when customers need them. This condition will reduce the customer's confidence, so the customers will try to withdraw their funds.

VI. CONCLUSIONS

This study found some important things related to the occurrence of bank runs, namely, (1). Self-fulfilling has negative and significant influence on the occurrence of bank runs, (2). Distribution of credit has a negative and significant effect on the occurrence

of bank runs, (3). Non-current loans have a negative and significant effect on the occurrence of bank runs, (4). Inflation has a negative and insignificant effect on the occurrence of bank runs, (5). Interest rates have a positive and significant effect on the occurrence of bank runs, (6). Bank runs that occurred in Indonesia in 2007-2016 is more due to the fundamental factors of banks, namely lending, bad loans owned by banks and from the aspect of economic fundamentals, it is dominated by interest rate.

Based on the research conducted, the following are suggestions that can be given, (1) Researchers can use longer than 115 months reseach period and may consider using other fundamental bank variables, such as the capital adequacy ratio (CA) and the ratio of earnings to total assets (ROA), and other economic fundamentals, such as growth economic and exchange rates, in order to obtain maximum results, (2) For banks in Indonesia to improve their performance, especially in lending, they can be more careful in distributing credits and giving priority to the distribution of working capital credit such as MSME sector, so as to prevent the occurrence of non-performing loans and minimize the occurrence of bank runs, and (3) The government, in this case the Central Bank, needs to consider to maintain the stability of interest rates, so that customers and banks get certainty in managing customer funds.

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