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When Prime Depositors Run on the Banks: A Behavioral Approach

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Abstract

This study aims to observe the relationship between withdrawal decisions and individual psychological aspects, namely time and risk preferences. Our sample is a pool of prime depositors in Indonesia, mainly due to the country's deposit market being heavily concentrated on such depositors. We describe the elicited risk preferences of the aforementioned depositors, along with their preferences on how long they would keep their money deposited. We discuss relationships between their withdrawal decision, which in excessive amount could cause bank run situations, with risk and time preferences under idiosyncratic economic shocks. A cascade effect simulation is also included in our analysis.

JEL Classification: D81; G02; G21

Keywords

Withdrawal Decision — Time Preference — Risk Preference — Bank Run — Prime Depositor

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1. INTRODUCTION

While previous studies on bank run and financial insolvency is primarily based on macroeconomic and theoretical approaches, the behavior of economic agents regarding risk and time preferences has not been much explored. On the individual level, however, the role of the two behavioral aspects are very prominent during decision-making situations. People with different risk preferences make different decisions under uncertainty, and individuals with various time preferences make different decisions weighing up future benefits.

We argue that decisions on whether to withdraw money from respective banks under financial shocks yield similar tradeoffs for depositors. They would judge whether the situation is too risky or not, and also how much future benefit would withdrawing now or later yields. With that in mind, depositors would in turn aggregately determine the insolvency situation in idiosyncratic cases.

In our case, Indonesia depicts a rather interesting case regarding depositors. The banking system, which is heavily relied upon by the whole financial system, has its four biggest banks own 44% of all the fund, with only 11 other banks competing with the four, although on a smaller scale. The customer level is the most concentrated, with a staggering 70.6% of these fund being owned by a mere 0.57% of all depositors – the prime depositors, which are individuals with Rp500 Million (around \$37,500) in savings and more, being the fund owner.

Given the facts as mentioned earlier, we argue that it is imperative for policymakers and researcher in Indonesia to give more attention to the behavior of the prime depositors, who are empirically the major fund owner of the banking system. Under the proposition, this study would focus on

Table 1. Deposit Market Concentration in Indonesia, December 2015

Nominal (in Rupiah)	Number of Accounts	Percentage	Amount of Saving (in Trillion Rupiah)	Percentage
Up to 100 Million	171,486,517	97.71	668.16	14.93
> 100 M s/d 200 M	1,809,429	1.03	253.98	5.68
> 200 M s/d 500 M*	1,221,578	0.70	393.94	8.81
> 500 M s/d 1 Billion	500,738	0.29	369.85	8.27
> 1 B s/d 2 B**	252,082	0.14	359.36	8.03
> 2 B s/d 5 B	150,446	0.09	467.87	10.46
> 5 B	81,126	0.05	1,960.64	43.83
	175,501,916	100	4,473.77	100

Note: * 500 Million Rupiah is the threshold for prime depositor classification

** 2 Billion Rupiah is the maximum insured deposit amount

Source: Indonesia Deposit Insurance Company (LPS)

eliciting time and risk preferences endowed by the prime depositors in Indonesia, along with their relationships with withdrawal decisions under financial shocks. By eliciting the two aspects, a better picture of how prone Indonesia is towards bank run cases would be gathered.

An educated guess would state that if a risk-averse nature is found among the prime depositors, a little shock in the economy would more often than not make these majority fund owner make withdrawals. Even without shocks, prime depositors with different time preferences might make different withdrawals as well. These kind of individual decisions are exactly the making of bank run cases, especially if done in numbers by this sort of depositors. This study would test such hypotheses among a pool of prime depositors that was gathered.

The importance of this issue can't be taken lightly. Empirically, a bank could be predicted as doomed and insolvent, as early as two years before their insolvency. [1] pointed out in his work that when uninsured depositors start to cash out, in average two years before bank's insolvency, then the bank would start to crumble. This is problematic, as a big portion of money in Indonesia is held by the prime depositors, while the limit of deposit insurance is 'only' 2 billion Rupiah (around US\$150,000). What about those who holds, for instance, 5 billion Rupiah (around US\$375,000) in their accounts? These sort of depositors are hardly ever touched by any research, despite the fact that their behavior might decide the sustainability and solvency of commercial banks in Indonesia.

Interestingly, very few to none research has been done on this matter. Domestic policies made in response to shocks in financial and banking markets have mainly been following the conventional algorithm of dealing, while considerations of these prime customer's – the primary fund holder in the country – preferences might be pivotal but unnoticed. We acknowledge the difficulty for statistical bureau and policymakers to reach these prime depositors, not to mention eliciting the behavioral aspects of these very group of depositors. This very condition is one argument the writers use to conduct this experiment, hoping to pave ways for other researchers and policymakers.

2. LITERATURE REVIEW

2.1 On Bank Run

A financially stable country is a country with the ability to still provide financial services under duress or shocks in its

economy. One of the shocks probable to hit its economy, being the cases of bank runs.

A bank run is a situation in an economy where a high number of withdrawal is made from the commercial bank(s), either caused by a large number of people withdrawing or the enormous amount of withdrawal itself, significant enough to make one bank collapse. The withdrawals itself are due to the widespread concern of the related bank's performance or the whole economic condition in the country. As one bank collapses, the possibility of contagion emerges, paving the way for another financial crisis in the country ([2]).

[3] defined bank run as one of the almost ever-present phenomena in the history of monetary crisis around the world. They highlighted that as depositors rush to withdraw their money, banks alike would then find themselves in a 'bank panic' position, where they might be forced to fund the return of these deposits by selling their assets, notably for a much lower amount compared to the market price. The 1939 Great Depression in the United States is one example of crises dominantly caused by this phenomenon.

Regarding this matter, [4] stressed the importance of an adequate relationship between depositors and bank, with which to avoid bank runs from happening, a bank can make anticipations by keeping the good relationship with its depositors. This is one of the policies or regulations that the writer argues should be done with more considerations of the time and risk preferences of the depositors, as depositors in banks would have their nature in the two aspects, allowing the banks actually to make a better relationship by paying attention to them.

The argument was amplified by [5], with the addition of the significance of household-level switching banks' cost as a factor in which a customer decides whether to make withdrawals. In their work, it was found out that there is a high propensity for a household to make withdrawals when their bank is under distress, although the two factors above turned out as significant mitigation.

[4] also explained that empirically, only a moderate amount of depositors would come back and redeposit their money into their respective banks after the cases of bank runs, implicating that bank run cases are not a short-term problem, but indeed a long-term one with many adverse side effects that could follow.

It is widely accepted that bank runs are associated with the adverse information in the banking system, as suggested by [6]. Despite that, the argument that the bank runs are

also caused by panic among the depositor is also a popular one ([7]). In large-scale bank runs, depositors don't care on whether their money is kept in a 'good' or 'bad' banks, they simply withdraw all their money.

Some policies are then proposed to counter the state. Deposit insurance, for example, was proven to be an effective strategy to hold depositors from cashing out their money, as highlighted in the experimental work by [8]. It was an alarming result for Indonesia, though, because the deposit market concentration in Indonesia is highly concentrated on the prime depositors. These fund owners have higher than 500 million Rupiah in their accounts, while only savings up to 2 billion Rupiah would be insured by Indonesia's Deposit Insurance Committee (*Lembaga Penjamin Simpanan*). Those with higher than 2 billion Rupiah, should they conform to the results of the work, would more likely cash out faster than those insured.

In the relations to deposit insurances, [9] studied whether a better awareness of this deposit insurance would significantly affect the behavior on withdrawals by households. Their finding was that the increased awareness would have virtually no effect on these households behavior.

[8] also tested another policy in their work, namely giving better information to depositors on the condition of the banking system. It was found that a more symmetric information would more likely make depositors not make a rash decision, basically withholding them from cashing out so fast. Those without information as symmetric as the former, however, would also tend to wait for the first movers to draw their money, then simultaneously withdraw their money. It is also alarming for Indonesia, because a big portion of Indonesians is not so financially literate, showing that their information on this matter would be virtually symmetric.

In other previous works using macroeconomic models, like those done by [10] or [11], there was a discussion on what economic or monetary policies are adequate to counter the state of crisis. However, pointed out by [12], the model assumed the household as an aggregation, implicating the same being done their behavior, restricting the flexibility in our model.

[12] stressed in their work that more microeconomic scale works are needed to tackle the possibility of crises, as an assumption of all population acting the same as assumed by the macroeconomic models would hardly describe people's behavior in a situation of panic. Richer results, hence meaning many distinct and more applicable for every country including Indonesia, might as well be gained by flexing our macroeconomic model assumption and incorporating the human side into the model. The two incorporated time and risk preferences of their respondents, giving common ground to our work on the arguably pastures new of financial crises research – bank runs being our focus in this work.

This, along with the aforementioned fact that Indonesia's deposit market concentration is not exactly healthy, gives us a foundation to make extrapolation that prime depositors' behavior is vital in seeking Indonesia's susceptibility towards bank runs. The highly concentrated banking industry, amplified by the highly concentrated 0.57% of depositors called prime savers holding a large 70.6% of all money available, makes the time and risk preferences

of these depositors a significant proxy of the susceptibility itself.

2.2 Psychological Factor – Risk and Time Preferences

As stressed by the works by [12], macroeconomic models tend to aggregate, hence overgeneralize the psychological factors of depositors, including those of the banking industry. Risk and time preferences, the two they also insisted as influential on withdrawal decisions related to bank run possibilities, being no exceptions.

In this study, we define risk preferences as the tendencies of how individuals would opt to choose when faced with choices of different riskiness. Meanwhile, time preferences would refer as preferences on how people make decisions involving whether they take gains (or losses) now or at some point(s) later.

Theoretically, a person's risk preferences could be classified as risk averse, risk neutral, and risk loving. The three classifies people into categories in which each type enjoys their utility when faced with the different riskiness of choices. The risk averse people tends to have the similar utility when faced with a safe decision with that of the risk loving people faced with riskier decisions. Inversely, risk-averse people would more often than not opt to avoid more dangerous decisions as their utility would be lower.

Time preferences, on the other hand, mainly cover classifications of people into the patient and the impatient individuals. Impatient people would more likely choose decisions yielding more instant results, in the form of gains or sometimes losses, compared to those selected by patient people, as the latter would prefer longer interval decisions yielding their individual results. The decisions taken were explained by different individual discount factors such individuals endow.

Although the two seemed to be intertwined, the two are not that exact copy of each other, as shown by the work by [13]. In other works, it has been demonstrated that the two factors do have a significant negative correlation between the two ([14]). Inevitably, longer time yields higher uncertainty, hence higher risk, showing the inverse relationship between the two.

Regarding this matter, we would like to develop further the works above by [12]. We are looking to investigate financial crises, especially the bank run cases, and its relation to the household-level factors rather than those that aggregative macroeconomic models use, namely time and risk preferences with the deposit-withdraw decision, yielding a picture of how the prime depositors would act with their money. A better idea on how fragile Indonesia's banking system would be gathered from such conduct.

2.3 Economic Framework

Our study takes on the theoretical frameworks based on the [3] work, commonly shortened by D&D model, and uses modified version of some models used by [15] incorporated with the one used by [12]. To get a better look of the model, let us evaluate the frameworks and models from the basics.

We assume that there are three periods in the economy, being denoted as $t = 0, 1, \text{ and } 2$. The period of time 0 ($t = 0$) is the time in where all bank customers chooses which bank would be their respective endowments, period 1 ($t = 1$) is

the time in near future and period 2 ($t = 2$) would be the time in a longer horizon of future or distant future. In this work, we would assume that we currently exist at period 0.

Regarding economic agents, there would be two agents involved, namely the bank customers and the banks itself, and every bank are assumed to be in an autarkic condition, meaning that each bank would be independent of each other. Banks are assumed to offer risk sharing; that is, a demand-deposit contracts and the longer-term loans altogether, contracts for its customers, and the former act as the liquid liabilities while the latter act as the illiquid asset. This puts the bank into a condition in which they would have to pay the withdrawals of demand-deposit contract anytime the customers want to, without the ability to ask for the loans' payments as they have longer time due and that their loans customers might not have the ability to repay the loans immediately. This, in normal circumstances, however, would not be a problem as the withdrawals made are stochastic and relatively insignificant compared to the ready-to-use reserves the banks hold. Such argument would be a crucial consideration in our model as we go on.

As for our second economic agent, we have our bank customers (demand-depositors) classified into two types of customers, the patient customers, and the impatient customers. The impatient customers are the customers faced with liquidity shocks, forcing them to withdraw their money from the banks on the next period, which is the short future ($t = 1$). On the contrary, the patient customers are those that have the preferences to wait until full maturity of their deposits, hence opting to withdraw in the distant future ($t = 2$). Despite that, given some changes in the fundamentals, the patient customers could also withdraw at $t = 1$, that would be explained as we go on into our model. We would denote the proportion of the impatient customers out of all customers as λ , and making the proportion of the patient customers ($1 - \lambda$). For easier reference and intuition, we would call the patient customer's proportion as ρ so that we would have:

$$\lambda + \rho = 1 \quad (1)$$

Demand-deposit customers always have the choice to withdraw their money anytime. As our time frame here is $t = 0$, then customers would have $t = 1$ and $t = 2$ to choose from as their time of withdrawal. As the withdrawals are made, they are then assumed to be used or consumed, hence giving utility to the consumers. Impatient customers would consume one unit in period 1, while the patient ones would wait out until period 2 to consume R units. The utility function of the whole population would then be:

$$u_{total} = \lambda u(c_1) + \rho u\left(\frac{1 - \lambda c_1}{1 - \lambda} R\right) E_{\theta}[p(\theta)] \quad (2)$$

The equation above shows that the total welfare of the society would be equal to the utility gained by the impatient customers, added by the utility of the patient customers by consuming $\frac{1 - \lambda c_1}{1 - \lambda} R$ in the second period with the probability of θ , standing for the possibility of economy not failing, hence, bank runs implied, or the state of the economy. We can also conclude that the complementary probability, being $p^c(\theta) = 1 - p(\theta)$ as the probability of bank runs, as it is

the inverse of the probability of the economy for not failing. Economy failing, then, would imply the cases of bank runs in it, and the inability for banks to pay R to the patient customers. This, however, is a difficult task to compute, as in economies, the real $p(\theta)$ are hardly known. Instead, those revealed to the customers would likely be the more inaccurate parameters that would be further discussed in our model.

After understanding the framework of the economy, we would make a modification on the equation used by [15]. Recall that Equation (2) is resembling the total welfare of the country in terms of inter-temporal withdrawals. This equation still has the sequential nature, as results might be gathered by computing the total welfare in the two periods. In this work, though, we would like to focus on the first period. This is caused by the fact that, as mentioned above, a result of whether a bank would suffer bank run or not might be caused by the withdrawals by their patient customers in the period in which they shouldn't be withdrawing their money, the period being the first period.

Making the equation into a simultaneous one (only period one), then we would get:

$$u_1 = \lambda u(c_1) \quad (3)$$

As we take no account on the utility of the customers in the second period. The equation, though, needs to be modified to accommodate the patient customers withdrawing in the first period (recall the threshold to perceived comparison), into:

$$u_1 = (\lambda + (n(\theta^*, \theta') - \lambda)) \cdot u(c_1) \quad (4)$$

Showing that there is $n - \lambda$ proportion that was originally the patient customers (ρ) but consumes at period 1, with n standing for the actual proportion of people withdrawing. Assuming that both perception level and threshold level are exogenous (recall the virtual difficulty of actually finding out the θ level), the equation could be rewritten as follows.

$$u_1 = nu(c_1) \quad (5)$$

It is imperative to note that Equation (5) have some crucial modifications from its original form. It eliminates the intertemporal aspect of the equation (making it simultaneous), and it also modifies the proportion of people withdrawing in period 1. In the original form, as shown in Equation (2), the proportion of withdrawers in period 1 is λ (impatient customers only), while this modified version replaces λ with n , indicating that the proportion of withdrawers might be bigger than merely the impatient customers (added by the patient customers).

It is important to note that initially, the proportion λ and ρ (or $1 - \lambda$) are sorted by the time preferences of the customers. Despite that, as aforementioned on the earlier proceedings, the amount of withdrawer in the first period might not always be simply λ of the population but also added by the patient customers that have enough incentive to withdraw in the first period. Incentives may vary, such as the signals (along with the noise of the signal), the threshold level and perceived level of θ that they compare, and

the actions of the other customers, as the literature might suggest.

To understand the phenomenon, let's assume the simplest case – customers withdrawing money simply because of the sight of others also withdrawing. In the [3] model, they showed that there would be a case of multiple equilibria in this case. There would be the 'good' and 'bad' equilibriums. First, we discuss the 'good' equilibrium, in which only the impatient customers, those faced with liquidity shocks, withdraw in the first period. This way, there would be only a λ proportion of withdrawers in the first period. The result is good for the economy because this is exactly what a 'normal circumstances' as mentioned previously is about, that only the stochastic and insignificant withdrawals are made, and banks are accompanied with enough reserves to cope with it. No patient customers withdraw in this case.

The 'bad' counterpart, though, is the other extreme for the economy. In this case, the patient customers also withdraw in the first period. As we assume that customers might withdraw by noticing others doing so, the other patient customers would take notice. Unlike its predecessor, in this case, the patient customers don't only watch as the impatient customers withdraw, but somehow also their patient fellows. This sparks the sense of panic within the patient customers, and in the equilibrium, every other patient customer also withdraws, leaving no money in the banks (notice that the impatient ones are sure to withdraw). This leaves the proportion of withdrawers to the whole population as 1, as we recall that $\lambda + \rho$ equals 1.

The two aforementioned equilibriums are then broken down as two extremes ([15]; [16]), as it was pointed out that there is a possibility of a unique equilibrium to be found somewhere between the two extremes, by introducing an enrichment to the model, being the likes of threshold level of θ and perceived level of θ by each customer, denoted as θ^* and θ^l .

The threshold level and perceived level (or called the signal) are what determines whether a patient customer withdraws or not. We start off by assuming that it is really difficult to find out the real θ level so that every customer would have their perception of θ depending on the noise or error they receive, distancing their perception from the original θ . Despite that, this perceived level is what the customer knows, so they decide on withdrawing or not by comparing their perceived level to the threshold level, meaning any level lower than threshold level would cause the customer to withdraw. This finding would result in a unique equilibrium, as many different customers have their own perceived level, so those who perceive lower would withdraw and those who perceive higher would not withdraw. Recall that we are talking about the patient customers only here, as the impatient ones are already sure to withdraw, confirming the possibility that the proportion of withdrawers not equaling the proportion of impatient customers.

Previous studies did suggest that this perceived level is virtually possible to be calculated or predicted. We argue in this study that the difficulty was due to the macroeconomic assumption of previous models. By analyzing the depositors in a more behavioral approach, we could, in turn, gather better understanding on the withdrawal decisions done by these depositors. Risk and time preferences they hold, for

instance, are the characteristics of interest we use in the study. Further discussions on this matter are surely needed, but we argue that risk and time preferences are the prominent endowments influencing the depositors regardless of what signal they receive.

3. DATA AND METHODOLOGY

3.1 Respondents

In this study, we interviewed a pool of prime depositor ($N = 33$). All interviewed respondents are holding more than Rp500 Million in their bank accounts. We managed to gather the primary information on their individual microeconomic aspects, such as withdrawal decisions under certain scenarios, risk preference, time preference, and their plans of withdrawing deposit in near or distant future, along with demographic control variables.

On the amount of deposit owned by the respondents, we found the number of customers holding 1 billion Rupiah up to 2 billion Rupiah, the threshold for *Lembaga Penjamin Simpanan's* coverage, to be dominant; at a figure of two-thirds of the whole respondents. The customers holding 500 million Rupiah, the threshold for the premium depositor classification, up to 1 billion Rupiah stands at 24.24%, while a modest 9.09% customers with more than 2 billion Rupiah rounds up the whole sample.

Table 2. Amount of Savings Distribution between Respondents

Amount of Savings	N	Percentage
500 million Rupiah to 1 billion Rupiah	8	24,24%
1 billion Rupiah to 2 billion Rupiah	22	66,67%
More than 2 billion Rupiah	3	9,09%

3.2 Economic Model

We use the model of the probability of withdrawal similar to [12] to evaluate the relationship between the dependent variable, which is the withdrawal decision, with aspects of our interest. We use a logistic regression model with the equation as follows:

$$P_k = b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_nX_n \quad (6)$$

Where p_k would denote the probability of an individual to withdraw their money from the bank under different scenarios (denoted as k), and X_n denotes the included microeconomic factors of our likelihood of bank run model.

3.3 Time and Risk Preferences Elicitation

To elicit both time and risk preferences of the prime depositors, our respondents were interviewed with questions adapted from previous studies. The variable used for time preferences in our model is the respondents' choice when asked to choose between an X , smaller payoff in nearer future and Y , the bigger payoff in a more distant future. Every respondents' individual discount factors are then computed by dividing X/Y of their switching points between the near and distant future choices. Such method is adapted from a study by [17]. Similar to the study, we elicited three individual discount factors from different time ranges. We averaged these of each prime depositors.

For risk preferences, we used the method developed by [18] by asking our respondents to choose between six different low-high payoff choices. Each choice would suggest their risk preferences nature, and would also imply a CRRA range ([19]). We would take the average between the lowest and highest implied CRRA range of each prime depositors as our risk preferences variable.

We also used alternative measures, one of them being comparing respondents' answers when given investment opportunities under different chance of succeeding. For this study, we chose their response under 10% winning probability.

3.4 First Analysis: Testing Risk and Time Preferences Significance under Different Scenarios

A regression analysis based on this [12] model of every customer with their preferences, including risk and time preferences, were conducted. In turn, we would also see whether the coefficients of significance for risk and time preferences in our [12] model yields significant results statistically.

We would run the test in many various scenarios that were asked to our respondents, as can be seen in our questionnaire. In this study, however, we would discuss further only certain cases among them, (1) Rupiah weakening, (2) Big bank failing, (3) Own bank failing, and (4) A massive capital outflow from the country. These cases depict the computation when an actual economic shock happens, whereas the former represents an external shock and the latter represents the within industry shock. All the cases mentioned above were included in the interviews with our respondents.

3.5 Second Analysis: Cascade effect under different Scenarios

It is known that people's behavior to withdraw is also affected by the peer's decision to withdraw. As more other people is seen making withdrawals, one might eventually choose to withdraw, and her decision might be seen by other individuals, provoking them also to withdraw.

In this study, we would also run a simulation of a 'cascade effect,' or peer withdrawal effect, that might occur during an economic shock situation leading into a possibility of the bank run. We would simulate several economic shocks, which is included during interviews, and see whether the economy survives.

In the interviews, respondents were asked whether or not to withdraw if they notice certain percentages of other depositors decide to withdraw. In the simulation, we took the percentage of respondents who answered they would withdraw in the very first signs of the economic shock (from first analysis). Then, we checked the threshold percentages of those claiming not to pull out under that shock, and compare the figure with the former. We did the simulations for any additional rounds necessary until it was evident whether all depositors eventually withdrew.

This might negate the prerequisite attribute that an individual holds. If a person was actually classified as type 2 customer (those preferring not to pull out in $t = 1$), she might eventually withdraw as an economic shock comes along. In our survey, we would elicit the threshold level

every individual has on how much percent of other people withdrawing that would make her make a withdrawal.

This analysis, we believe, would help policymakers counter the situation, that not only we could determine which economic shocks are more severe than others, we could also analyze how much time policymakers have to combat the situation reflected by the number of batches the contagion would last. More suitable countermeasures would then be able to be overseen by policymakers in each unique scenarios that are assessed.

4. RESULTS AND DISCUSSION

4.1 Respondents' Risk and Withdrawal Preferences

Out of all the respondents that were interviewed, we found out that there are 9 out of 33 depositors classified as Type 1 (claiming to withdraw at near future $t = 1$). In this study, we set a time frame of one year or less as the threshold classifying either type. The other, meanwhile, claimed to be withdrawing in a longer time horizon ($t = 2$).

This implies a healthy proportion of depositors in Indonesia if this is reflective of the nation's condition, as the number of people claiming to withdraw in the shorter horizon is a relatively low proportion of 27.27%. Despite that, it is important to recall that these depositors we are assessing are the prime depositors, meaning that the amount of money they hold is massive compared to the whole nation. With that in mind, a 'mere' 27.27% of them withdrawing their money could have severe implications on bank's solvency balance in Indonesia.

Table 3. Respondent's Characteristics on Risk & Type of Depositors

		Type of Depositors		
		Type 1	Type 2	Total
Risk Preferences	Risk Averse	8	19	25
	Risk Neutral	0	4	4
	Risk Loving	1	1	2
Total		9	24	33

Source: Author's calculation

The alarming thing about the results above is that between all the depositors, most of them are classified as risk-averse depositors. This would depict a risky situation for the banking system, as risk-averse people would tend to avoid uncertainty. When faced with a certain idiosyncratic economic problem on the economy, these risk-averse people could eventually withdraw their money from the bank, as they would avoid the possibility of losing their money. Note that while 24 out of 33 are self-admittedly long-term depositors, the risk preferences might be concerning. Similar classifications sorted by the amount of deposit is depicted in the following table.

4.2 First Analysis: Testing Risk and Time Preferences Significance under Different Scenarios

We found interesting discoveries on the four cases as mentioned above that were tested statistically. In the big bank failing case (refer to Table 5), we found a notable relationship between withdrawal decisions of the depositors with their respective risk preferences ($z = 1.83; p = 0.067$). Such

Table 4. Amount of Deposit by Risk Preferences of Respondents

	Risk-averse	Risk neutral	Risk loving	Total
500 million Rupiah to 1 billion Rupiah	7	1	0	8
1 billion Rupiah to 2 billion Rupiah	18	2	2	22
More than 2 billion Rupiah	2	1	0	3
Total	27	4	2	33

Source: Author's calculation

Table 5. Estimated Coefficients under Different Circumstances

Withdrawal under Certain Circumstances	Extreme Weakening of Rupiah	One Big Bank Failure	Massive Capital Out-flow	50% Chance Own Bank Failing
Risk Preferences	1.444084**	12.76021*	1.132132***	-1.88203**
Time Preferences (Individual Discount Factor)	11.29054*	1.412441	1.528307**	0.5825
Log of Amount of Savings	1.249607	2.064997	7.238248***	38.84474*
Constant	-34.8414	-30.8166	-38.5502***	-28.9662

Note: * Significant under $\alpha = .1$ ** Significant under $\alpha = .05$ *** Significant under $\alpha = .01$

Source: Author's calculation

result would mean that a more risk averse prime depositor is more likely to withdraw under the case.

Similar results are shown in the extreme weakening of Rupiah scenario, as results show that both risk ($z = 2.18; p = 0.029$) and time preferences ($z = 1.72; p = 0.085$) are significant. In this case, not only the more risk-averse depositors are more likely to withdraw, but also the more patient prime depositors in terms of time preferences.

Under 50% chance of own bank failing, risk preferences ($z = -2.10; p = 0.036$) is found to be significant, along with depositors' amount of saving ($z = 1.78; p = 0.075$). The finding, in this case, is different with our other results, as the less risk-averse depositors are the ones more likely to withdraw. The amount of savings, however, is also significant, suggesting that prime depositors with more deposits are likelier to withdraw. This is logical as a higher amount of money is at stake under the scenario.

In our last scenario, all our variables of interest were significant. Both risk ($z = 2.24; p = 0.025$) and time preferences ($z = 2.18; p = 0.030$), along with amount of savings ($z = 1.91; p = 0.056$), show strong relationships to withdrawal decisions. More risk averse and patient prime depositors are again found to be likelier to withdraw under the shock. Prime depositors with a higher amount of savings are also implied to make a similar decision.

4.3 Second Analysis: Cascade Effect under Different Scenarios

In our last part of analysis, we tried simulating cascade effect caused by certain economic cases that are part of our questionnaire. We could see the severity of each scenario on the table above, that one small bank failing and Rupiah exceeding Rp15,000/US\$ would have little to none cascade effect, meaning that the shock would not lead into bank run case according to our simulation. Despite that, in all other cases, bank runs are implied as cascade effect takes place in about three batches of withdrawals. This would be the implied time policymakers would have on countering these aforementioned situations.

5. LIMITATIONS, POLICY RECOMMENDATIONS, AND CONCLUDING REMARKS

In most of the previous studies made about bank runs, the analysis used were mainly macroeconomic. The macroeconomic analysis assumes the depositors as passively aggregated economic agents. This might not be true in real life situation because these depositors have their behavioral microeconomic aspects (i.e. risk and time preferences). In the bank run situation, is inevitably related to individual's decision on withdrawing or not withdrawing their deposit under certain circumstances. That aspect is endogenously driven by the respective individual's characteristics that could be elicited using microeconomic behavior analysis.

This study found that the characteristics of the prime depositors in Indonesia are mainly Type 2 Depositors, showing a relatively healthy proportion because such depositors claim to withdraw in a longer period. On the alarming side, however, most of the depositors are also risk-averse depositors, showing that under duress they are more likely to withdraw their money.

Furthermore, the analysis of withdrawal decision under idiosyncratic economic shocks reveals an interesting relationship between individual risk and time preference. We found out that risk and time preferences are mainly significant under four scenarios. However, if there is demonstration effect or information cascade, we found that bank run is more likely in most cases except when small bank fail and rupiah depreciates to Rp15,000/US\$. In particular, there are two to three batches of withdrawal as the proxy of time when bank run would prevail. The number, however, could increase or even alarmingly decrease depending on respective simulations.

The conclusions above, we believe, should be a consideration for policymakers, especially the central bank, to incorporate behavioral microeconomic aspects on future policy assessments. Apart from being statistically significant, it is an inevitable fact that regarding insolvency issues such as bank runs, depositors as economic agent hold a very pivotal role as they get to decide how they keep their

Table 6. Bank Run's Cascade Effect Simulation on Certain Idiosyncratic Cases

Case	Verdict	Percent of withdrawal	Time
1 Small Bank fails	No Run	6.06% withdrawal (at most)	-
1 Big Bank fails	Run	54.54%; 93.93 % ; 100%	3 round
1 BUMN Bank fails	Run	84.84%; 100%	2 round
Rupiah to Rp15,000/USD	No Run	18,18% withdrawal (at most)	-
Rupiah to Rp17,000/USD	Run	48.49%; 75.76%; 100%	3 round
Rupiah to Rp20,000/USD	Run	54.54% ; 87.88%; 100%	3 round

Source: Author's calculation

money. These decisions, arguably, are highly influenced by individual's unique behavior, unlike the passively assumed as constant in many previous studies.

We encourage the use of a similar or same model to ours in assessing susceptibility to bank runs, as we believe such method would prove to be a powerful tool in countering possible idiosyncratic economic shocks. By testing probability of withdrawal based on personal preferences and running simulation by idiosyncratic scenarios, or other models alike, we believe that future policies would be more spot on and have nudging effect on people, compared to the conventional algorithm of dealing.

We are also aware, though, of the limitations faced by our study. While most people would find the number of our sample to be quite small, we argue that the nature of the respondents would be an affliction for future researchers. Indonesia relies heavily on prime depositors, but in fact, such depositors would be virtually available to be interviewed, even by national scale surveys or institutional studies. We would strongly recommend more samples on the matter done by more highly-funded works in the future.

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