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Panic bank runs

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Abstract

We provide experimental evidence that *panic* bank runs occur in the absence of problems with fundamentals and coordination failures among depositors, the two main culprits identified in the literature. Depositors withdraw when they observe that others do so, even when theoretically they should not. Our findings suggest that panic also manifests itself in the beliefs of depositors, who overestimate the probability that a bank run is underway. Loss-aversion has a predictive power on panic behavior, while risk or ambiguity aversion do not.

JEL classification: C7; C9; D8; G2

Keywords: bank runs, beliefs, panic, coordination, observability, loss aversion.

Pánikszerű bankrohamok

Kiss Hubert János – Ismael Rodriguez-Lara – Alfonso Rosa-Garcia

Összefoglaló

Tanulmányunkban kísérleti eredményeket mutatunk be arra vonatkozóan, hogy pánikszerű bankrohamok bekövetkezhetnek akkor is, ha a bank nem szembesül fundamentális problémákkal és a betétesek között sem lép fel koordinációs kudarc. A betétesek kiveszik a pénzüket, ha azt látják, hogy mások is így tesznek, még akkor is, ha elméletileg nem ezt várjuk. A pánik a betétesek vélekedésében is megjelenik, ugyanis korábbi betétkivétel megfigyelésekor túlbecsülik annak a valószínűségét, hogy már bankroham van. A veszteségkerülés magyarázó erővel bír a pánikviselkedés előrejelzésében, a kockázat- és bizonytalanságkerülés azonban nem.

Tárgyszavak: bankrohamok, vélekedések, pánik, koordináció, megfigyelhetőség, veszteségkerülés.

JEL kódok: C7; C9; D8; G2

Panic bank runs

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We provide experimental evidence that *panic* bank runs occur in the absence of problems with fundamentals and coordination failures among depositors, the two main culprits identified in the literature. Depositors withdraw when they observe that others do so, even when theoretically they should not. Our findings suggest that panic also manifests itself in the beliefs of depositors, who overestimate the probability that a bank run is underway. Loss-aversion has a predictive power on panic behavior, while risk or ambiguity aversion do not.

Keywords: *bank runs, beliefs, panic, coordination, observability, loss aversion.*
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1. Introduction

A major trigger of the last crisis were bank runs, which have been frequently associated to problems with the fundamentals of the bank or a coordination failure among depositors.[4] In this paper, we consider a sequential version of the coordination problem embedded in Diamond and Dybvig (1983) and provide experimental evidence that bank runs emerge even in the absence of these two problems.

We show experimentally that depositors withdraw when observing that other depositors withdraw, even when they should rationally wait (that is, keep the money deposited). We refer to these runs that occur because of the observability of actions as *panic* bank runs. By eliciting beliefs, we also find that depositors have unreasonable beliefs about the behavior of others when they observe a withdrawal, a further signal of panic.

Our paper complements empirical (e.g. Iyer and Puri, 2012; Starr and Yilmaz, 2007) and experimental (e.g. Brown et al., 2016; Chakravarty et al., 2014; Garratt and Keister, 2009; Schotter and Yorulmazer, 2009; Davis and Reilly, 2016) studies that highlight that observing other depositors' decisions affect withdrawal choices.[5] Our contribution is to show that panic behavior can be regarded as a new source of bank runs and that observing withdrawals distorts the depositors' beliefs. Besides providing clean evidence on the *existence* of panic bank runs, we find that loss-averse subjects are more likely to withdraw their deposits when they observe others who withdraw.

2. Model

Consider a modified version of the bank-run experiment in Kiss et al. (2014), where three depositors are endowed with 60 ECUs.

- At $t = 0$, depositors invest part of their endowment (40 ECUs) in a common bank.

[4] See, among others, Calomiris and Mason (2003) for the former and Diamond and Dybvig (1983) for the latter.
[5] For a recent revisión of the experimental literatura see Dufwenberg (2015) and Kiss et al. (2015).

- At $t = 1$, depositors realize their liquidity needs. There is one *impatient* depositor who needs the money urgently (this depositor is forced to withdraw), while two *patient* depositors can choose whether to wait or to withdraw.[6]
- At $t = 2$, depositors choose simultaneously how much of the remaining endowment (20 ECUs) they want to bid. The bids determine their position in the line. Depositors keep the amount they do not use to bid.
- At $t = 3$, depositors contact the bank according to the order determined by their bids and decide in sequence whether to wait or to withdraw. Choices (but not types) are observable; i.e., if a withdrawal is observed, it can be due to the impatient or the other patient depositor.

Payoffs (see Table 1) depend on the depositors' decision and the position in the line. A depositor who withdraws receives 50 ECUs if the bank has enough funds. Thus, the depositor 3 gets 50 ECUs if at least one previous depositor has waited, but she earns 20 ECUs if she withdraws after two withdrawals.

Table 1. Payoffs in the bank-run game

		Wait	
Position	**Withdraw**	**Accompanied**	**Alone**
1	50		
2	50	70	30
3	50 or 20		

Our payoffs resemble the coordination problem in Diamond and Dybvig (1983). Patient depositors get the maximum payoff (70 ECUs) if they coordinate and wait, but waiting alone results in 30 ECUs, thus a patient depositor might have incentives to withdraw. If choices are observable, however, sequential rationality guarantees that patient depositors will wait in equilibrium, regardless of their position and what they observe; i.e., the coordination problem disappears.[7] This is because any patient depositor in position 2 or 3 should wait if she observes a waiting. In response, any patient depositor in position 1

[6] There is no aggregate uncertainty about the number of patient and impatient depositors, as in Diamond and Dybvig (1983).
[7] Kiss et al. (2014) characterize the equilibrium when depositors have partial information; i.e., not all the choices are observed. As in their model, patient depositors have a dominant strategy (waiting) in position 3. They do not allow subjects to bid, though; i.e., positions are exogenously determined.

should wait. Therefore, the equilibrium beliefs of depositor 2 are such that withdrawals in position 1 should be associated to the impatient depositor. Note also that there are no fundamental problems in the bank as there is no uncertainty about the payoffs and all depositors will benefit from investing if only the impatient depositor (who has liquidity needs) decides to withdraw.

3. Experimental Design

We recruited a total of 156 subjects. All sessions were run in Spain using the z-tree software (Fischbacher, 2007).[8]

We used the strategy method. Subjects submitted bids as patient and as impatient depositors and were asked to choose whether they would wait or withdraw as patient depositors in position 1, in position 2 after observing a waiting and a withdrawal, and in position 3 after observing a waiting from depositor 1 and a withdrawal from depositor 2, a withdrawal from depositor 1 and a waiting from depositor 2, and two withdrawals. When decisions were made, we asked participants whether they believed that a withdrawal in position 1 was more likely due to the impatient, the patient depositor or to any of the types with the same probability.[9]

All sessions ended with a questionnaire to elicit risk preferences (Crosetto and Filippin, 2013), loss aversion (Gachter et al., 2007) and ambiguity aversion (Halevy, 2007). We also collected information on gender, age, annual income and cognitive abilities. Personality traits were measured using the Big Five and the Social Value Orientation.

At the end of the experiment, roles (patient or impatient) were randomly assigned and subjects were paid according to their choices. The experiment lasted around 1 hour. The average earnings were 10.5 Euros.

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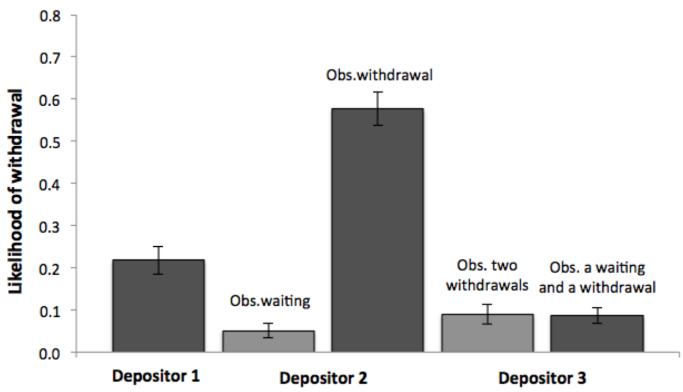
[8] Three sessions with 24 subjects each were run at LaTEX (Universidad de Alicante) and two sessions with 42 subjects each at LINEEX (Universidad de Valencia). Having detected no significant differences across locations, we pooled the results.

[9] Beliefs were only elicited at LINEEX (N = 84 participants)

4. Results

Figure 1 displays the likelihood of withdrawal in each position.[10] Contrary to the theoretical prediction, depositor 2 is more likely to withdraw when withdrawal is observed (57.7% *vs* 5.1%, $p < 0.001$, Wilcoxon signed-rank test).

Figure 1. Likelihood of withdrawal in each possible information setting (N=156)



In the unique equilibrium, depositor 2 should believe that withdrawals in position 1 are due to the impatient depositor. However, only 34.52% of subjects have such belief (see Table 2).[11] Panic appears also when we compare the beliefs with the experimental data. First, we can form all the possible groups and use the bids to determine the order decisions. In this case, 73.13% of the withdrawals in position 1 would be due to impatient depositors. Second, we can assume that all subjects believe that others will follow their strategy: i.e., they will make the same bids and decisions in each information set. In this case, 89.75% of withdrawals would be due to impatient depositors. In both cases, we find that depositors overestimate the likelihood that patient depositors withdraw ($p < 0.001$, test of proportion).[12]

[10] In the case of depositor 3 there is no difference in the likelihood of withdrawal when observing that depositor 1 withdraws and depositor 2 waits or the other way around (0.090 vs 0.083, $p = 0.808$), thus we pool the results ("Obs. a waiting and a withdrawal").

[11] Depositors are less likely to withdraw when they believe that the withdrawal was due to the impatient depositor, but differences across groups are not statistically significant according to the Wilcoxon rank-sum test ($p > 0.129$).

[12] The result holds also if we split those who replied that "the withdrawal was due to any of the two types with the same probability" (47.68%) into two groups and update the likelihood that the withdrawal is due to the impatient depositor to be 58.36% (34.52 + 47.68/2) ($p = 0.019$).

Table 2. Beliefs of Depositor 2 when Depositor 1 withdraws

			Experimental data	
	Rational	**Beliefs**	**All possible groups**	**Others follow my strategy**
The withdrawal was due to the…				
… impatient depositor	100%	34.52%	73.13%	89.75%
… patient depositor	0 %	17.86%	26.87%	10.25%
… any of the two types with the same probability	0%	47.68%		

Note. N=84 for beliefs. N=156 for the rest.

While there are no fundamental problems and depositors should coordinate their actions in our setting, we find that *i*) depositors withdraw upon observing that others do, and *ii*) they overestimate the likelihood that other patient depositors withdraw, compared with the theoretical prediction and the experimental data. Next, we use a probit specification and find that more loss averse / younger subjects are more likely to withdraw when they observe withdrawals, *ceteris paribus* (see Table 3).[13]

[13] The standard errors in parentheses are clustered at the session level.

Table 3. Marginal effects for withdrawal decisions upon observing a withdrawal in position 2: probit regression

VARIABLES	(1)	(2)
Risk aversion	-0.115	-0.132
	(0.079)	(0.094)
Loss aversion	0.200**	0.199**
	(0.091)	(0.091)
Ambiguity aversion	0.0002	0.00002
	(0.002)	(0.002)
Age	-0.005***	-0.014***
	(0.003)	(0.004)
Female	-0.004	0.020
	(0.110)	(0.127)
Cognitive abilities	0.033	0.028
	(0.041)	(0.048)
Income (=1 if above median)	0.051	0.048
	(0.076)	(0.067)
Social Value Orientation	No	Yes
Personality (Big 5)	No	Yes
Obs. Probability	0.577	0.583
Observations	144	143

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5. Conclusion

While traditional explanations for the occurrence of bank runs are based on fundamentals and coordination problems, we highlight that *panic* bank runs may occur as well. Policies devised to avoid bank runs, such as the deposit insurance or suspension of convertibility, must take into account this possibility.

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