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Experimental Bank Runs

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Abstract

This chapter on experimental bank runs first covers the different sources of bank runs studied in the laboratory: fundamental problems, coordination issues, and panic behavior. We assess which individual characteristics (especially risk and loss aversion, gender and cognitive abilities) shape the willingness to withdraw. We also discuss depositors' behavior when there is more than one bank. The different policies suggested in the literature to prevent bank runs are reviewed as well. Finally, we point out relevant issues that have not been studied yet and deserve further investigation.

Keywords: bank run, experiment, observability, panic, withdrawal decision

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1 Introduction

1.1 Why are bank runs important?

In the classic movie "It's a wonderful life" (Capra, 1946), a crowd of depositors shouts enraged at the door of their bank: *"Where is our money? We want our money back!"*. This can be seen as a bank-run episode because depositors rush to withdraw their funds massively from their bank. The financial crisis that started in 2007 has shown that bank runs matter. According to the Federal Deposit Insurance Corporation (FDIC), more than 300 banks failed in the US in 2007-2009. This is in sharp contrast with the 22 banks that failed between 2001-2006. In many instances, the immediate cause of the failure was a bank run. Such events did not only happen in the US, but also occurred worldwide in developed and developing countries. Run-like phenomena have also occurred in the repo market (Gorton and Metrick, 2012) and bank lending (Ivashina and Scharfstein, 2010).

Banking crises have important economic and political consequences.[1] Such crises are often defined by significant financial distress like bank runs (Laeven and Valencia, 2013), and bank runs are often cited as a factor behind bank insolvency (Caprio and Klingebiel, 1996). Bernanke (1983) argues that bank runs directly caused much economic loss during the Great Depression. Importantly, these events do not only affect economic outcomes, but also influence individuals' well-being (Montagnoli and Moro, 2018).

1.2 Why do we need experiments?

In real-life, massive withdrawals can be observed and quantified. What eludes us is the reason why depositors withdraw their funds. Do they withdraw because they have adverse information about the bank, or do they withdraw because they see that others do so and fear that if too many other depositors withdraw, then there will be no money left in the bank? And what if depositors simply need their money? Undeniably, these are relevant questions that need to be addressed empirically.

Unfortunately, we cannot always rely on individual-level data to find out the causes of withdrawal decisions. Moreover, the empirical papers that use micro-econometric data either examine bank-run episodes that occurred in the distant past (Kelly and O Grada, 2000; Gráda and White, 2003), or study massive withdrawals from small banks in developing countries (Starr and Yilmaz, 2007; Iyer and Puri, 2012; Iyer et al., 2016). The experimental methodology can serve to collect data to understand the behavior of depositors. One of the main advantages of laboratory experiments is the ability to control the environment in which depositors decide. By varying the availability of information (e.g., about the fundamentals of the bank or other participants' choice), researchers can understand how these factors influence depositors' behavior; i.e., we can use the experimental approach to disentangle the motives behind withdrawal decisions. In experiments, we can also elicit a set of individual characteristics (e.g., gender, cognitive abilities, or risk aversion) that can be used as controls in the analysis. These variables are not always observable in reality, but can be relevant from a policy perspective. An additional advantage of experiments is that we can examine the efficiency of different policy measures to prevent bank runs. While there are policy recommendations based on theoretical studies, experiments are the ideal toolkit to test them to inform policymakers on factors that should be considered when designing policy. Hence, understanding bank runs to find the right policy responses is of first-order importance.

1.3 This chapter

A growing literature on experimental bank runs has developed since the initial experiments by Madies (2006), Garratt and Keister (2009), and Schotter and Yorulmazer (2009). We discuss how this literature has contributed to a better understanding of bank runs and point out some interesting open questions. Our chapter complements other surveys on bank runs in the lab. The interested reader can consult Duffy (2016), Arifovic and Duffy (2018), Dufwenberg (2015), Kiss et al. (2016a), or Hanedar (2020), that have covered bank runs either directly or indirectly, to broaden her knowledge in the subject. We focus on papers that directly deal with experimental bank runs. However, many of the insights presented in this chapter apply to other problems that share a similar structure: runs on investment and pension funds, the repo market, or interbank loans.[2]

2 Causes of bank runs

In this section, we discuss three different explanations for the occurrence of bank runs. First, running to the bank to withdraw the funds may occur because depositors know (or believe) that the bank does not function well; e.g., because of bad management or macro conditions. A bank run observed in such circumstances is due to fundamental problems (Gorton, 1988; Schumacher, 2000; Calomiris and Mason, 2003). While there is evidence that weaker fundamentals increase the chance of bank runs, empirical work (Davison and Ramirez, 2014; De Graeve and Karas, 2014) suggests that bank runs do not necessarily occur because of bad fundamentals. A second explanation for the occurrence of bank runs concerns the possibility of a coordination failure among depositors. In particular, Diamond and Dybvig (1983) propose to model withdrawal decisions as a simultaneous-move game among depositors with two equilibria, one of which involves a bank run. Finally, the experimental literature on bank runs has recently suggested that – even in the absence of fundamental and coordination problems – depositors might panic and withdraw when they observe that others do so as well; thus, bank runs occur because of the observability of actions. This idea of panic bank runs is supported by empirical studies showing that the observation of withdrawals fosters withdrawals (Atmaca et al., 2017; Kelly and O Grada, 2000; Starr and Yilmaz, 2007; Iyer and Puri, 2012).

2.1 Fundamental problems

Several experimental studies feature fundamental uncertainty about the bank's quality in their design. Schotter and Yorulmazer (2009) introduce fundamental uncertainty by assuming five types of banks with different rates of return on their investment. In the 'symmetric information' treatment, subjects do not receive any information about the bank's quality, each bank type being equiprobable. Subjects then decide whether to withdraw their deposit or not. In some cases, subjects can observe other depositors' choice, while in others, they cannot. When the bank offers higher rates of return (good fundamentals), there are fewer early withdrawals than in the case with lower returns (bad fundamentals).[3] Interestingly, the rate of withdrawals does not change with the information about other participants' decisions when the bank has bad fundamentals. However, in the case of good fundamentals, when subjects can observe other subjects' decisions, the rate of early withdrawals is lower than when they cannot.

A different, more indirect way to include fundamental uncertainty in experiments is to vary how many withdrawals the bank can absorb without defaulting on its obligations to the rest of the depositors. Fundamentally good banks may service more early withdrawals than bad banks before the payment to depositors who keep their funds deposited becomes lower than the payment corresponding to immediate withdrawal. Garratt and Keister (2009) illustrate such an experimental design, including one situation in which the bank does not have enough funds to pay to all depositors with urgent liquidity needs. In line with Schotter and Yorulmazer (2009) and the empirical literature, Garratt and Keister (2009) find that withdrawal rates are substantially lower when the bank can absorb more withdrawals. Shakina and Angerer (2018) also find that the economic conditions can influence withdrawal decisions, but they find that fundamentals are not the main source of bank runs.

Fundamental uncertainty can also be modeled using global games (Carlsson and Van Damme, 1993; Morris and Shin, 2000). In the case of bank runs, depositors would receive a noisy private signal about the quality of the bank, and decide whether or not to withdraw. In such a framework, Goldstein and Pauzner (2005) show theoretically that a bank run occurs if the fundamentals are below a threshold. An essential feature of the model is that it is not the fundamentals *per se* that determine depositors' action but also their beliefs about other depositors' actions; in fact, (signals about the) fundamentals act as coordination devices that guide depositors' beliefs. The only experimental paper to use a global-games setup that we are aware of is Klos and Sträter (2013), who find that higher payment to early withdrawing depositors increases the likelihood of bank runs.[4]

An interesting finding in the experimental literature on global games that studies general coordination problems is that the precision of the signal and whether or not the signal is public information affect subjects' choice (Anctil et al., 2004; Banerjee and Maier, 2016). These findings are in line with Schotter and Yorulmazer (2009), where some participants (in the role of 'insiders') receive information on the quality of the bank. The presence of insiders affects the emergence of bank runs; e.g., insiders are less likely to withdraw if the bank is fundamentally good. In addition, uninformed depositors react to the presence of insiders; e.g., their withdrawal rate increases when they observe withdrawals compared with the symmetric setting, because uninformed depositors believe that the observed withdrawals are more likely to reveal information about the quality of the bank.

2.2 Coordination problems

The seminal work of Diamond and Dybvig (1983) considers two types of depositors: impatient depositors (with urgent liquidity needs) and patient depositors (who do not need their funds immediately). In their model, bank runs occur due to coordination failure among patient depositors in a simultaneous-move game. There are two equilibria, one where patient depositors keep their funds deposited, and one involving a bank run in equilibrium because all patient depositors withdraw their funds. Several experimental studies investigate which factors facilitate successful coordination in simultaneous and sequential environments.

The most comprehensive test of coordination difficulty in the laboratory has been carried out by Arifovic et al. (2013). Ten depositors form a bank that has no fundamental problems.[5] Payments related to early withdrawals vary so that it may be enough if 1 of the depositors keeps her funds deposited so that this choice yields a higher payment. At the other extreme, 9 out of 10 depositors have to keep their funds deposited to make this choice pay off, and all the other values between these extremes are analyzed as well. Let $\eta \in [1, 9]$ denote the number of depositors required to keep the funds deposited to make it a better choice. When the coordination requirement is low ($\eta \leq 5$), participants tend to converge to the no-run equilibrium. When the requirement is high ($\eta \geq 8$), then experimental banks converge to the run equilibrium. In-between ($5 < \eta < 8$), banks either converge to the run or to the no-run equilibrium, so the outcome is rather indeterminate in this region. In a related study, Arifovic and Jiang (2019) investigate if extrinsic signals (a randomly generated forecast about the number of withdrawals) facilitate coordination. When the coordination requirement is low or high, the power of the extrinsic signal is weak. However, in the intermediate case where the outcome is indeterminate, the extrinsic signal serves as a coordination device as depositors switch between the two equilibria according to the announcement.

Garratt and Keister (2009) investigate the effect of two factors on coordination-based bank runs. On the one hand, they explore how single vs. multiple withdrawal opportunities influence decision-making. On the other hand, they introduce forced withdrawals to resemble the macroeconomic conditions (in bad times more depositors being hit by a liquidity shock in the spirit of Diamond and Dybvig (1983)). Without forced withdrawals, bank runs are rare, independently of the number of withdrawal opportunities. In the presence of forced withdrawals, bank runs are more likely to arise in the environment with multiple withdrawal opportunities.

2.3 Panic bank runs

While the problems with the fundamentals and the coordination issue among depositors have been usually identified as the two main culprits of bank runs, they can occur even in the absence of these two problems. Kiss et al. (2014a) develop a theoretical model á la Diamond and Dybvig (1983) in which under some conditions bank runs should occur neither due to bad fundamentals nor because of coordination failure. They consider an environment in which depositors do not choose simultaneously, but decisions are made sequentially. Depositors may or may not observe the decision of others who have acted before them; the information is transmitted through a social network that connects depositors. The observability of actions leads to a unique equilibrium without bank runs, because patient depositors (if rational) should attribute any observed withdrawal to the impatient depositors who are forced to withdraw.[6] Kiss et al. (2014a) show that the observability of actions influences depositors' behavior but (contrary to their theoretical prediction) it matters what is observed. Depositors keep their funds deposited if they observe that others have done so, but tend to withdraw upon observing withdrawals. This behavior has been pointed out in other papers as well (Schotter and Yorulmazer, 2009; Garratt and Keister, 2009; Davis and Reilly, 2016; Shakina and Angerer, 2018), where the observability of withdrawals foster coordination on the (bad) equilibrium outcome with bank runs. The contribution of Kiss et al. (2014a) is to show that this *panic* behavior arises in a setting where observability should prevent the occurrence of banks by facilitating the coordination on the (unique) equilibrium with no bank runs. This, in turn, highlights that it is possible to observe *behavioral bank runs* that cannot be explained by problems with the fundamentals, nor are they an equilibrium outcome.

The results of Kiss et al. (2014a) have been validated by the authors in subsequent experiments (Kiss et al. 2014b, 2016, 2018). Shakina and Angerer (2018) also provide experimental evidence about panic bank runs.[7] Kiss et al. (2018) find that a cause of panic bank runs is that depositors hold distorted beliefs about other depositors' behavior. In particular, patient depositors tend to attribute (observed) withdrawals to other patient depositors, instead of thinking that the withdrawals are due to the impatient depositors. This, in turn, may create incentives for patient depositors to signal their types in sequential environments even if signaling is useless in theory. Kinateder et al. (2020) conduct an experiment in which patient depositors can pay to show their actions to subsequent depositors. The mere availability of announcements (and not its use) should serve as a coordination device to prevent bank runs, hence no patient depositor should pay to make her action observable. However, patient depositors do pay to show that they keep their funds deposited and facilitate coordination on the equilibrium without bank runs.

3 Heterogeneity, individual characteristics, and history of bank runs.

One of the virtues of lab experiments is that it allows researchers to elicit participants' individual characteristics that can be used as controls to explain behavior in the bank-run game.[8]

One relevant question concerns the predictive power of risk aversion. In many countries, regulation requires banks to draw a risk profile of the customers (e.g., the Markets in Financial Instruments Directive (MiFID) in the EU). Experimental evidence suggests that risk aversion does not predict choices in the bank-run game (Kiss et al. (2014b), Kiss et al. (2018)). There is, however, evidence that loss aversion affects depositors in that loss-averse depositors are more likely to panic when they observe a withdrawal (Kiss et al. (2018), Kiss et al. (2020)). These findings are in line with evidence from experimental finance (Haigh and List, 2005; Trautmann and Vlahu, 2013; Rau, 2014; Huber et al., 2017) and suggest that loss aversion should be incorporated into theoretical models .

Another relevant factor is the gender of the participant. As argued by Christine Lagarde, male domination in the banking industry could have contributed to the global financial crisis in 2007-2008: *"... if it had been Lehman Sisters rather than Lehman Brothers, the world might well look a lot different today."* This idea is supported by recent experimental evidence from asset market experiments suggesting that price bubbles are mainly due to men (Eckel and Füllbrunn, 2015). But do men and women behave differently as depositors? The evidence of gender differences during bank runs is not clear-cut. Kiss et al. (2014b) find that men and women do not react differently to information about previous decisions (see also Kiss et al. (2018)). Shakina (2019) also finds similar withdrawal behavior for men and women, in line with empirical studies (Kelly and O Grada, 2000; Gráda and White, 2003). However, Dijk (2017) finds differences when fear is induced before the withdrawal decision as women tend to withdraw relatively more. Shakina and Angerer (2018) report that women withdraw more often than men but do so in smaller amounts.

Many experimental papers examine the role of cognitive abilities in financial decisions (Corgnet et al. 2015; Bosch-Rosa et al. 2018). Related to bank runs, Klos and Sträter (2013) find that a level-k model reasonably explains their experimental evidence, so departure from perfect rationality may play a role in bank runs. Kiss et al. (2016b) find that cognitive abilities (measured by the cognitive reflection test, see Frederick (2005)) are positively associated with withdrawals when there is strategic uncertainty. Kiss et al. (2018) report that cognitive abilities do not influence the likelihood of panicking behavior after observing a withdrawal.[9]

While previous papers allow for individual characteristics to affect withdrawal behavior, some papers directly test differences in subjects' behavior depending on the treatment conditions. Shakina and Angerer (2018) conduct their experiment in two different locations (Russia and Germany) to study the effect of the culture. Russians tend to withdraw larger amounts but less frequently than Germans. Dijk (2017) is probably the most innovative paper in this literature. He manipulates the participants' psychological state across different conditions by inducing fear, sadness or happiness (no emotion is induced in the baseline treatment). Fear triggers withdrawals, while sadness or happiness do not affect choices in a subsequent bank-run game. In the fear treatment, depositors tend to believe that withdrawals will be more frequent than in the rest of the treatments, suggesting that fear correlates with panic behavior.

The history of decisions is also relevant to explain participants' choices in repeated games (Garratt and Keister, 2009; Kiss et al., 2014a; Bayona and Peia, 2020). In particular, experiencing bank runs in previous rounds fosters withdrawals in future rounds. This can lead to coordination on the bad equilibrium (involving bank runs) or to panic bank runs. Davis et al. (2020) show that the history of decisions can be important to explain the effectiveness of policy interventions, see Section 5.

4 The connected economy

The Great Recession has shown the importance of connections in the financial system, exemplified by the bankruptcy of Lehman Brothers, that provoked a funding run and the rescue of the insurance company AIG, to prevent the contagion to other key financial institutions. These events stimulated a growing interest in the relevance of links among financial agents. Since then, many studies aim to study whether connections help or are detrimental to financial stability (see Glasserman and Young (2016) for a recent review).

Experimental evidence shows that investors relocate their portfolios across different markets when negative shocks occur in one of the markets (Cipriani et al., 2013). Bayona and Peia (2020) show that runs in one market affect investors' wealth, which can lead to contagion problems, even if fundamentals of assets in the different markets are uncorrelated. In the model of Trevino (2020), agents learn about the behavior of others in a different market. She shows that social learning is an important source of contagion that reduces the relevance of information transmission about fundamentals. This finding suggests that contagion in financial markets is likely to occur even when fundamentals of both markets are only weakly or even not related at all.

Chakravarty et al. (2014) and Brown et al. (2016) are the first experimental papers that explore if bank runs are contagious. Depositors play a bank-run game after observing what has occurred in a different bank, whose fundamentals (weak or strong) are unknown. In one treatment, the fundamentals of the banks are connected, while in another treatment they are not. Importantly, both studies differ in their definition of weak and strong banks. Chakravarty et al. (2014) consider a coordination problem with 5 (patient) depositors. If the bank has weak (strong) fundamentals, it is optimal for a patient depositor to withdraw when 1 (3) out of 4 patient depositors withdraw, respectively. In Brown et al. (2016), there are 2 patient depositors in the bank-run game. The payoff they obtain if they successfully coordinate and keep their funds deposited depends on whether the bank has weak or strong fundamentals. Both studies find that observing a bank run in a different bank increases the likelihood of bank runs when the fundamentals are related. However, they find opposite results regarding the case in which the fundamentals of the banks are independent. While Chakravarty et al. (2014) find that bank runs are contagious in that case, Brown et al. (2016) find no evidence of contagion (see König-Kersting et al. (2017) for related evidence). Interestingly, Brown et al. (2016) elicit depositors' beliefs and find that upon observing a bank run from an unconnected bank, they tend to believe that more other patient depositors will run. If a weak bank means that fewer patient depositors running is enough to produce a bankruptcy (which is not present in the Brown et al. (2016) design), then observing a weak bank will increase the likelihood of bank runs.

The stability of the banking system as a whole has been the main interest of Davis et al. (2019b) and Davis et al. (2020). The authors leave aside the bank-run problem to focus on the stability of the interbank market, through a design where each experimental subject acts as a banker. They find that financial instability may be due to coordination failures among banks and a limited ability of liquidity regulations to prevent bankruptcies. Shakina (2019) studies the behavior of depositors when there are two banks, and it is possible to reallocate deposits from one bank to another. Bank runs are less likely (in the system as a whole) when depositors can relocate (compared with the case in which banks are isolated), thus connections foster financial stability. In Duffy et al. (2019), there are 4 (interconnected) banks. In each bank, depositors play a bank-run problem, and the risk-sharing network varies across treatments: the interbank system is either fully connected with each bank having deposits in the other three banks, or banks are connected in a circle with each bank having deposits in one of its neighbors. As predicted by the theory, with low fundamentals the complete network is more stable than the partially connected (circle) one. However, withdrawals are also very frequent in such a case, revealing that the complete network only provides limited stability to the system. When fundamentals are high, the complete network does not provide additional protection with respect to the circle network.

5 How to prevent bank runs?

During financial crises, governments aim to restore confidence in the financial sector, e.g., by increasing the deposit insurance coverage or bailing out failing banks. Through experiments, we can test in a controlled environment whether different measures help to prevent or stop the propagation of bank runs. The work in this area includes the study of deposit insurance, suspension of convertibility, information disclosure or liquidity level requirements.

The first experimental paper on bank runs, Madies (2006), already tests the effectiveness of deposit insurance and finds that the higher the deposit insurance, the lower the likelihood of bank runs. However, partial deposit insurance (e.g., covering up to 75 % of losses) does not stop bank runs. The finding that the insurance level has to be high enough to make a difference is also present in Schotter and Yorulmazer (2009), who consider three deposit insurance levels (0%, 20%, and 50%). Although withdrawal rates decrease with the insurance level, the difference between the 0% and the 20% insurance level is only marginally significant, while the 50% insurance significantly decreases withdrawal rates. Kiss et al. (2012) study the effects of three different deposit insurance levels and show that the effectiveness of the deposit insurance depends on whether or not depositors can observe the choice of others; their findings suggest that observability and deposit insurance might be substitutes. Finally, Peia and Vranceanu (2019) use global games to test the effect of two types of uncertainty about deposit insurance: uncertainty about the size of the deposit insurance fund and uncertainty about the number of depositors who will be covered by the insurance (and which therefore determines if all demands can be met). Bank runs are rare when there is only uncertainty about the size of the deposit insurance fund. However, bank runs are more frequent when the payments from the deposit insurance fund depend on the total number of requirements it receives.

The effects of suspension of convertibility and renegotiation of the contract conditions have been explored in Madies (2006) and Davis and Reilly (2016). Madies (2006) finds that short suspensions are an effective tool in reducing bank runs, while long suspensions lead to a situation where bank runs become very frequent. The design in Davis and Reilly (2016) is the first to allow a bank to restructure the payments to depositors if a bank run occurs, and in this way, it tests one of the most usual mechanisms of the real world. Their treatments represent situations in which, after the bank run, payoffs protect either depositors who withdraw or depositors who keep the money deposited. Renegotiating the conditions is highly effective only when they are designed to protect depositors who do not withdraw early.

The role of liquidity level regulations is studied in Davis et al. (2019a), investigating the consequences of liquidity requirements on banks that favor their ability to cover excess withdrawals at the cost of reducing profitability (because the banks have less long-run investments). They find support for the use of this measure, because the high liquidity requirements reduce bank runs. Moreover, it is more efficient because the losses associated with bank runs are higher than the losses generated by the lower profitability due to the liquidity requirements.

The experimental literature on the effects of observability of previous decisions (Garratt and Keister (2009), Kiss et al. (2012), Kiss et al. (2014a), Kiss et al. (2018), Davis and Reilly (2016)) suggests that information about depositor's withdrawals may foster bank runs. Thus, institutions play an important role in enhancing or curbing bank runs by promoting or limiting the extent of information about what is occurring in banks. The role of information disclosure is analyzed explicitly in two recent working papers, focusing on the effect of different disclosure precision about the true fundamentals of banks. Chakravarty et al. (2020) find that full disclosure helps financial stability when banks are insolvent on average, but it is detrimental when banks are solvent. König-Kersting et al. (2017) find that higher levels of transparency help the stability of banks with high fundamentals and damages banks with low fundamentals.

6 Open questions

In this chapter, we have discussed recent advances in experimental bank runs. Here we briefly point out some open questions that deserve further attention and discuss some promising areas for future research.

The first experiments looking at depositors' behavior in the lab relied on complicated designs and aimed at addressing many different questions. We believe that there has been a tendency to simplify the setting by using simple games (coordination problems, prisoners' dilemma, or global games) in line with recent advances in the field of experimental economics. The current experiments are clever in their design, capturing the essence of the model to be tested by using a few depositors or rounds. However, it is a common critique that simple experiments relying on few players or stylized games do not help learn about depositors' behavior in complex environments. One relevant paper in this regard is Arifovic et al. (2020), who compare banks with 10 and 100 depositors and find that group size matters only if coordination is difficult, as in Arifovic et al. (2013). The results suggest that these changes affect the outcomes significantly in some cases (e.g., in the presence of strategic uncertainty). Further research is needed to assess how the experimental evidence is robust to these changes.

We have seen three major causes of bank runs: fundamental problems, coordination issues and panic behavior. Designs that allow to study them at once would be welcome to evaluate their relative significance. Global games provide a natural framework to include both fundamental and coordination problems. However, the experimental papers that are akin to bank run episodes (Anctil et al., 2004; Banerjee and Maier, 2016) do not feature some relevant elements; e.g., the existence of heterogeneous agents (patient and impatient depositors) or the possibility of observing the decisions of others are missing in these studies. The noisy signal that enables the coordination of agents in global games can capture the uncertainty about fundamentals or the number of impatient depositors. Beliefs elicitation is also crucial to understand depositor's choices, and starts to become general practice in experimental bank runs (Brown et al., 2016; Dijk, 2017; Kiss et al., 2018; Chakravarty et al., 2020; König-Kersting et al., 2017)).

Even with a design that allows the study of all potential causes of bank runs, it is an open question if it is enough to solely focus on the withdrawal decision. This decision is preceded by (at least) two other decisions: i) whether to deposit the funds in the bank (called the pre-deposit game), ii) when to contact the bank to make the withdrawal decision. Theoretically, Peck and Shell (2003) investigate the pre-deposit game, an issue that is being recently examined in laboratory experiments (de Jong, 2021). Regarding the question of when to contact the bank, Kiss et al. (2020) endogenize the order of decisions. Their main findings indicate that the decision to arrive early at the bank can be driven by the desire to signal the liquidity type (if actions can be observed) and by the depositors' level of rationality. Thus, withdrawal decisions should be investigated within a broader context. We also advocate for conducting experiments in which depositors decide in real-time, being offered multiple opportunities to withdraw or having imperfect information on what has happened in their bank. The assumption that all type of decisions (i.e., withdrawals and waitings) can be observed has been employed in theoretical models where depositors know their position in the line and can observe the action of others, but depositors can have a biased sample of previous choices; e.g., withdrawals can be more easily observed than waitings in reality. One challenge, therefore, concerns the study of bank runs when not all previous actions cannot be observed (Gu, 2011; Horváth and Kiss, 2016).

Regarding individual characteristics, the jury is still out on whether gender matters in withdrawal decisions. There are certainly other characteristics that may be relevant and deserve closer scrutiny, for instance, the degree of risk aversion or financial literacy (Campioni et al., 2017). In our view, it is relevant to know how these features affect the decision of depositors so as to design better policies.

One of the major concerns when dealing with laboratory experiments is the external validity of the results. All of the papers we have presented recruit university students who may or may not be representative of the overall population. Bringing many subjects of different socio-demographic backgrounds to the lab may be infeasible, thus we propose to carry out survey experiments with representative samples in line with Graham and Harvey (2001), Guiso et al. (2008), or Guiso et al. (2018)). This would allow us to assess whether the observed behavior in the lab replicates in the general population. Several studies in experimental finance compare the behavior of students and professionals in financial markets and find no significant differences; e.g., in herding behavior (Cipriani and Guarino, 2005). We believe that this finding would hold for the study of bank runs. In this case, however, the relevant distinction is not between students and professionals, but between students and the general population.

Last, but not least, there should be more interaction between the theoretical and the experimental literature on bank runs. Theory has highlighted several important issues, and the laboratory is an ideal place to test theoretical predictions. For instance, it would be interesting to test if complex contracts (Green and Lin, 2003) or the implementation of alternative mechanisms (Andolfatto et al., 2017) are able to stop bank runs. In the opposite direction, experiments have identified some relevant aspects that affect withdrawal decisions; e.g., the evidence that loss aversion influences the behavior of depositors calls for theoretical models that incorporate this issue.

7 Conclusion

At first glance, it seems that experimental finance has little to contribute to the study of the banking system. However, the development of experimental bank runs has shown its validity to test theories and properly identify important aspects of behavior. In this regard, we have learned that the observability of actions is crucial for the occurrence of bank runs and panic behavior is a possible source of bank runs. There is also evidence that individual factors (e.g., loss aversion), policy measures (e.g., deposit insurance or suspension of convertibility) or links between banks are important elements to explain the behavior of depositors during bank runs.

We reviewed in this chapter the recent advances in the field of experimental bank runs and proposed some promising avenues for future research. We believe that the experimental methodology can help to study other areas of the banking sector through careful experimental design, including systemic problems. We hope that this chapter serves as a good starting point to spark further interest in these areas.

Notes

[1]Laeven and Valencia (2013) report that the median output loss per GDP is above 30% for advanced and emerging countries, maximum output loss surpassing 100% of GDP and maximum fiscal costs above 50% of GDP. Tooze (2018) claims that many political events like Brexit or Donald Trump's election are tightly related to the Great Recession that was heralded by the run on Northern Rock, a British bank (Shin, 2009).

[2]The interested reader in other run-like phenomena is referred to, among others, Bosch-Rosa (2018), Sadiraj and Schram (2018), Baeriswyl and Cornand (2014), or Magnani and Munro (2020).

[3]A decision stage consists of 4 periods, and subjects have to withdraw at most in the last period. Hence, early withdrawals (those carried out in periods 1 and 2) are interpreted as signs of bank runs.

[4]Peia and Vranceanu (2019) use global games to model the uncertainty about the size of the deposit insurance, see Section 5.

[5]Note that the difficulty of coordination may also depend on the fundamentals of the bank: better fundamentals can lead to fewer withdrawals and better coordination; e.g., see Banerjee and Maier (2016) for a similar idea.

[6]Kiss et al. (2014a) characterize the network structures that lead to a unique equilibrium without bank runs for the case of three depositors, one of them being impatient and two of them being patient. Kinateder and Kiss (2014) generalize this result.

[7]In their setting, subjects are allowed to withdraw in real-time. Communication is possible through a chat where subjects can reveal their intentions. The design also features macroeconomic conditions, a proxy for the fundamentals of the bank. Shakina and Angerer (2018) find that communication is important to prevent bank runs: negative (positive) messages trigger (reduce) withdrawals, respectively.

[8]For empirical studies that examine the effect of individual characteristics on the willingness to withdraw see, Gráda and White (2003) or Iyer et al. (2016).

[9]Kiss et al. (2019) show that besides cognitive abilities, the length of time to make an informed decision also influences the quality of the decision.

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