

# Depositors' Behaviour in Times of Mass Deposit Withdrawals\*

*Hubert János Kiss*

*Based on empirical and experimental data, the study provides an overview of the literature on the behaviour of depositors. On this basis, it establishes that depositors' decisions and thus the phenomenon of mass deposit withdrawals can be explained by fundamental problems as well as coordination among depositors. It points out that depositors' heterogeneity matters, and the impact of individual characteristics depends on the existence of fundamental problems. Characteristics (such as education, financial sophistication, wealth, bank experience and connections) that make it likely that a depositor collects information on the bank reduce the chance of mass deposit withdrawal in the absence of fundamental problems, but increase the chance of mass deposit withdrawal in the case of such problems. The effect of social networks (and of the information flowing through such) also matters. Deposit insurance reduces the probability of bank runs, but is unable to eliminate them completely. Experimental findings are also in line with empirical experiences.*

**Journal of Economic Literature (JEL) codes:** C91, D8, G4, G21,

**Keywords:** bank run, depositor's decision, empirical data, experiment, panic

## 1. Introduction

In 1907, exactly 100 years before the most recent major economic crisis, another financial crisis shook the US economy. It was mainly felt in New York, where the stock exchange fell by nearly 50 per cent compared to the previous year, and depositors withdrew their money from banks and other financial institutions *en masse*. At that time, the institutional system responsible for financial stability was not yet in place (the Federal Reserve System, i.e. the central bank of the United States, was established as a response to the crisis), and thus the banker J.P. Morgan and his circle strived to stop the crisis. Within the framework of the rescue operation,

---

\* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

*Hubert János Kiss is a senior researcher at the Institute of Economics of the Research Centre for Economic and Regional Studies of the Hungarian Academy of Sciences and an assistant professor of the Department of Economics of the Faculty of Social Sciences of the Eötvös Loránd University.  
E-mail: kiss.hubert.janos@rtk.mta.hu*

This study was prepared with the support of the Bolyai János Research Scholarship.

The Hungarian manuscript was received on 6 September 2018.

DOI: <http://doi.org/10.25201/FER.17.4.95111>

Morgan told journalists that ‘If the people would only leave their money in the banks ...everything would work out all right.’<sup>1</sup> In the meantime, his men visited all the priests, clergymen and rabbis of the city, and asked them to convince their followers not to withdraw their money from banks.<sup>2</sup> The rescue operation was successful, as the crisis subsided in a couple of weeks and life returned to normal. This is a story with a moral, as it was understandable amid the economic turmoil that depositors were worried about their savings and many started to withdraw their money from banks because of the uncertainty. Seeing this, others did the same, causing a bank panic. The opinion of credible people was needed to reverse this process and restore confidence in financial institutions. In 1933, an attempt was made to institutionalise confidence by establishing the Federal Deposit Insurance Corporation, and since 1934 a fund insures the deposits placed in banks up to a certain limit.

Following that, national deposit insurance systems were set up along similar principles in several countries. These systems basically worked well, as there were no bank runs in the developed countries for decades. However, the economic crisis known as the Great Recession started with the run on Northern Rock bank in Great Britain in the autumn of 2007. The withdrawal of deposits was surprising because the last bank run had taken place in 1866, the deposits were (partially) insured, and the Bank of England – the central bank of the United Kingdom – also declared that it would provide the necessary support to the bank to continue its operation (*Shin 2009*). The massive deposit withdrawals observed in the case of Northern Rock then recurred in other developed countries as well: for example, there were runs by depositors on Hong-Kong’s Bank of East Asia, the Dutch DSB Bank and the US Indymac Bank, in spite of the fact that deposits were insured in these countries as well. These developments call attention to the fact that understanding depositors’ decisions is still a question of current concern.

On the basis of the literature, this study attempts to summarise what is known about depositors’ decisions. This issue is not a simple one. The mere fact that a depositor withdraws his money from a bank does not reveal much about the reason for his action. Did he need his money? Did he see others doing so and follow them? Or perhaps he learnt something bad about the bank? Two types of data sources may help to provide a more precise answer to the question of who withdraws money and why. Firstly, individual-level data may provide a comprehensive picture of the depositor, also including what information he had. Thus, it is easier to understand why he made the decision. As we will see, such detailed individual data are only rarely available. Secondly, with the help of experimental economics, depositors’ decisions can be examined in a controlled environment, which facilitates the

---

<sup>1</sup> J. P. Morgan in ‘Bankers Calm; Sky Clearing.’ New York Times, 26 October 1907.

<sup>2</sup> The book by *Bruner and Carr (2008)* provides an excellent description of the crisis.

understanding of the driving forces behind them. Of course, the question may arise as to how relevant decisions taken in a computerised laboratory are in the real world. Accordingly, empirical results and results of experiments may jointly draw an overall picture that may contribute to a better understanding of depositors' behaviour.

In the next part, the main findings of empirical analyses are presented by answering some basic questions, followed by drawing conclusions from the experiments.

## **2. Empirical experiences**

The main question concerning depositors' behaviour is whether they make a run on the bank(s), i.e. whether they withdraw their money *en masse*, in spite of the fact that at that particular moment they do not need liquidity. The most common underlying reason for such a mass withdrawal of deposits is that depositors do not believe that their money is at the right place in banks. It is important to note that it is an absolutely rational decision of a depositor to withdraw his money if he knows that the bank is not functioning well. If a bank run is observed in such a case, it can be considered efficient and a manifestation of market discipline.

### **2.1. Bank runs and fundamental problems, i.e. do depositors run on bad banks only?**

First, let us examine the basic question of what kinds of banks depositors run on. If they run only on banks that fundamentally do not work well, they discipline financial intermediaries, and the regulatory authority does not have to interfere. However, if well-functioning banks also fall victim, regulation may be justified, as unwarranted interruption of financial intermediation may entail high macroeconomic costs (*Caprio – Klingebiel 1996; Valencia – Laeven 2012*). It is not easy to clearly tell whether there is a fundamental reason behind the mass deposit withdrawals or only unwarranted panic. *Chari and Jagannathan (1988)*, for example, set up an interesting theoretical model to present this difficulty. They assume, *inter alia*, that depositors do not know how many people will need money in the coming period, and also that a group of depositors, the well-informed, know whether the bank is operating well or not. If in the next period a not well-informed depositor sees that many people are queuing up outside the bank, he will not be able to discern whether it is because many people were exposed to a liquidity shock and this is the reason why they are withdrawing their money, or whether well-informed depositors have heard some bad news about the bank, and there is a bank run. It is not worth running in the first case, but it is worth running in the second case. Deposit insurance was introduced because there was too much unwarranted panic, and deposit insurance created a safe asset that calmed depositors (*Gorton 2017*).

Many researchers are of the opinion that behind bank runs there are fundamental reasons, reasons of macroeconomic origin and/or ones that concern the bank. *Gorton (1988)* examines the example of the United States between 1863 and 1914 with the help of empirical data, and finds that each bank panic was preceded by significant deterioration in a key economic indicator. Accordingly, bank panics are systematically related to business cycles, and they are not mysterious events during which depositors start to withdraw their money from banks for inexplicable reasons.<sup>3</sup> The explanation for the latter was drawn up by *Diamond – Dybvig (1983)* in their influential study. In this, depositors decide whether to withdraw their money from a bank that is known to work well. They do not know one another's decisions, and thus their belief about others' decisions determines whether it is worth withdrawing the money. If a depositor thinks that the others will also withdraw their money and there will be a bank run, the best he can also do is to run to the bank. Accordingly, the bank run becomes a self-fulfilling prophecy. This is the bank run equilibrium. However, if the depositor thinks that there will be no bank run, it is worth leaving the savings in the bank. Then, a good equilibrium will materialise and there will be no bank run. In this model, depositors' behaviour may be influenced by anything, including things that are not related to the economy or the operation of the bank at all. The authors mention sunspots as an example. It is to be noted that it is possible to set up a model (e.g. *Goldstein – Pauzner 2005*) where the equilibria are not as undefined as in the Diamond–Dybvig model, but bank fundamentals determine which of the two equilibria will materialise. Following a similar train of thought, according to *Ennis (2003)* it is also possible that the economic situation determines the mood of depositors, who will be more inclined to have a negative opinion of the others' decision when hearing bad news, which may result in a bank run.

Not only *Gorton (1988)*, but other authors also found strong correlation between macroeconomic/bank fundamentals and the probability of bank runs.<sup>4</sup> *Calomiris – Mason (2003)* find that between 1930 and 1933 the fundamentals (e.g. the assets and liabilities of the bank as well as the macroeconomic indicators of the given state) explain well which banks were run on in the United States. However, they also add that at the end of the period the number of bank runs increases, which cannot be captured with these variables. Examining US banks in the 1920s, *Davison – Ramirez (2014)* also come to similar conclusions: weaker economic fundamentals increase the chance of bank runs. They also examine what proportion of the banks that were run on is reopened, which suggests that banks basically functioned well and that depositors' panic was behind the withdrawals of deposits. They find that there is such panic in 40 per cent of the cases. They also emphasise that many

---

<sup>3</sup> *Allen – Gale (1998)* and *Jacklin – Bhattacharya (1988)* showed that fundamental bank runs can be captured with theoretical models as well.

<sup>4</sup> *Ennis (2003)*, however, observes that in the period under review there were times when there were no bank runs in spite of bad economic fundamentals, and it also happened that mass deposit withdrawals took place while economic fundamentals were good.

panic-like runs may be attributable to asymmetrical information, i.e. depositors were unable to decide which banks actually had fundamental problems, and they ran not only on bad banks in the given region, but on good ones as well.

The aforementioned studies rely on older data, but studies using newer data also come to similar conclusions. *Schumacher (2000)*, for example, analysing the effects of the 1994 tequila crisis that reached Argentina, notes that the chance of bank runs was higher in the case of banks with weaker fundamentals. Using Russian data between 2002 and 2007, the article by *De Graeve – Karas (2014)* examines to what extent the fundamentals and depositors' panic-like behaviour contributed to mass deposit withdrawals. They find arguments for both explanations. They observed higher deposit withdrawals in the case of worse banks than in the case of good ones, but the latter also often suffered from mass deposit withdrawals. On the whole, the authors find that the impact of panic-like behaviour is greater than that of decisions explained by fundamentals.

The effect of the assistance provided by the state is also worth mentioning. *Shin (2009)* presents that in the case of Northern Rock the depositors' run was triggered by the fact that the Bank of England provided liquidity assistance to the bank, and depositors considered this as a stigma, which shook confidence in the bank (*Hauser 2014*). With the help of a theoretical model, *Wang (2013)* came to the plausible conclusion that the existence of state assistance hampers the development of bank runs, because it calms depositors. However, as soon as it is announced that the given bank receives state assistance, it reveals that the government is aware of bad fundamentals, which may launch a run on the given bank. Examining the effects of the introduction of the Troubled Asset Relief Program (TARP), i.e. the US government's programme that helped banks, the author finds convincing empirical evidence to verify the above theory. During the examination of two Swiss banks, *Guin et al. (2015)* also find that in the case of the bank that had recourse to state assistance the magnitude of deposit withdrawal was significantly greater.

The message outlined on the basis of the above examples is that the chance of a run by depositors on worse banks is greater, but well-functioning banks may also face mass deposit withdrawals.

## **2.2. What happens in a bank run? Who runs and why?**

The next question we seek an answer to is what happens during a bank run. What do we know about the depositors who run on the bank? Do they have easy-to-specify characteristic features? Do we know anything about their motives?

As mentioned above, there are not many bank runs for which detailed individual-level data are available. Various studies (*Kelly – Ó Gráda 2000, Ó Gráda – White 2003*) deal with the Emigrant Industrial Savings Bank (EISB), New York, which was

run on by depositors in 1854 and 1857 as well. The main reason for the first run was that news spread about another bank that it had long-term solvency problems, and although other banks did not have bad fundamentals, they were still run on, i.e. contagion took place. This bank run, which is independent of fundamentals, and in which the coordination of depositors leads to a bad equilibrium, corresponds to the assumptions of the Diamond–Dybvig model. As there was no fundamental problem with the bank, and it was able to pay, the run faded away. Mainly less wealthy depositors with shorter bank experience who did not have information on the fundamentals of the bank participated in this run. Typically, they were depositors with low levels of education. Much fewer educated, well-to-do clients with longer bank experience participated in this run. In the second case, in 1857, the bank run was the result of a shock that affected the financial system as a whole, and in the case of the EISB, wealthier, more experienced and more educated depositors who worked in skilled jobs started to withdraw their deposits. These depositors saw that the value of banks' investments was declining in general. It is not clear what depositors could know about developments in EISB's portfolio, but it is a fact that the portfolio also lost some of its value. Then the decisions of these depositors were followed by other depositors as well. This means that in this case the panic was attributable to asymmetrical information. As the whole banking sector was affected by the panic, total collapse could only be prevented by the suspension of convertibility. According to the data, depositors' gender or the number of their children did not affect their behaviour during any of the panics. Interestingly, New York papers wrote unfavourably of the depositors who withdraw their money in 1854 from the fundamentally well-functioning banks, calling the run senseless and needless. At the time of the 1857 mass deposit withdrawal, similarly to the later crisis described in the introduction, Catholic priests calmed people and assured followers that they do not withdraw their money from the bank either.

An interesting study in connection with wealth and the size of deposit is the one by *Starr – Yilmaz (2007)*, which analyses a bank run that took place in Turkey in 2001, when depositors ran on an Islamic bank that was not covered by deposit insurance. The trigger was the closure of another large Islamic bank. According to the authors, in the case of the bank they examined there were no signs of fundamental problems. The bank in question was able to meet its payment obligations, and the run was over in about two months, as then already net deposit inflows were observed. The authors analyse the deposit withdrawal in the light of the sizes of deposits. This is essential because while the majority (90 per cent) of deposit withdrawals were small and carried out by small depositors, large depositors were responsible for 2 per cent of all deposit withdrawals, but in terms of the withdrawn amount they accounted for 62 per cent. The authors find that small depositors reacted to other small and medium depositors in a sensitive manner. Namely, if they saw long queues outside the bank, they tended to join. However, no similar reaction to

large depositors' deposit withdrawals was experienced. According to the authors' explanation, they probably could not be observed. The findings are similar in the case of medium depositors, i.e. they also strongly reacted when many small and medium depositors withdrew their money, but they did not panic when large depositors did so. Nevertheless, large depositors did not react to small depositors' mass deposit withdrawals at all, and reacted only moderately to the decisions of medium depositors, but immediate and significant deposit withdrawals by them were observed when large depositors withdrew their money. It is difficult to establish the effect of exactly what other characteristics is represented by the size of the deposit; the authors themselves also made a guess only. However, it seems rather convincing that the heterogeneity according to the size of the deposit (and the related characteristics) entails differences in behaviour.

Iyer et al. (*Iyer – Puri 2012, Iyer et al. 2016*) scrutinised Indian cooperative banks in several articles. The bank discussed in the first study suffered a run in 2001, after another cooperative bank in the same town had failed. The bank did not have any relations with the one that went bankrupt and also functioned well fundamentally, so in this case as well contagion was in the background. The bank was able to pay to its clients who withdrew their deposits, who calmed down after some time, and the bank run stopped. The authors find that the depositors whose savings exceeded the insured indemnity limit were more inclined to withdraw their money. However, the deposit insurance provided only partial protection against the panic, as the examination of fully insured deposits shows that in the case of larger deposits the chance of withdrawal was higher. All of this can be explained by the fact that in spite of the deposit insurance there are transaction costs for the depositor to access his money, and he might consider them too high. Another important finding is that the duration and depth of the relationship between the depositor and the bank mattered, which was in line with what is called bank experience on the basis of *Kelly – Ó Gráda (2000)*. The longer time a depositor had an account with the bank, the less likely it was that he would panic. If one also borrowed from the bank, it further reduced the probability of deposit withdrawal. There is a correlation between deposit insurance and credit as well. Namely, those who had savings exceeding the insured amount but did not borrow from the bank withdrew their money, while large depositors with a loan did not withdraw it. Longer and deeper experience may contribute to a depositor's having more information on the bank, so he will not run on it without a reason, and it also strengthens confidence. The authors also present the role of social networks. Firstly, they examine where the depositor lives, and how other depositors in his neighbourhood behave. They also study the introducer network, as somebody who already had an account had to recommend the given person to enable him to open an account. The role of these social networks is significant because they are important channels of the information that reaches the depositor. The authors observe that these networks capture not only the

common social and economic characteristics of their participants. Excluding these effects, it is seen that social networks were very important. The higher the ratio of acquaintances in the social network who acted similarly, the higher the chance that depositors withdrew their money. The authors also claim that social networks like this could even double the probability of a depositor withdrawing his money from the bank. Interestingly, the authors find that in the case of this bank run, educational level, age, wealth and stock ownership (which is a possible measure of financial sophistication) did not influence who withdrew their money or who did not. It is also interesting that the authors, using a questionnaire, specifically asked what determined the depositors' decision, and almost everybody mentioned confidence in the bank as an influencing factor.<sup>5</sup>

Another bank was run on by depositors in 2009, but that bank had fundamental problems. Due to its bad loans, the value of the bank was negative according to the central bank's analysis, and this bad news was revealed. The central bank partially suspended payments. More specifically, time deposits could not be withdrawn before maturity, but initially the money on the account was not subject to this limitation. The authors found that after the negative information became known, depositors reacted very differently, depending on their characteristic features. Compared to those who did not withdraw their money, the ones who withdrew their money after hearing the news typically had more money on their respective current accounts (and thus at the same time it was also more likely that their savings exceeded the amount covered by the deposit insurance), were more active bank clients in the year preceding the run, became clients of the bank about one year later on average and that it was more likely that they had a loan or were the employees of the bank. In terms of individual characteristics it was found that older depositors, ones with higher level of education or working in more skilled jobs preferred to withdraw their money. The impact of reading newspapers and financial literacy was also significant: depositors who were active in collecting information and who processed it better were more prone to withdraw their money. It is also an important question who withdrew their money prior to the central bank's announcement. The authors find that the longer someone had an account with the bank, the lower the probability of his withdrawing his money (before the announcement) was. However, a bank loan or being an employee of the bank increased the chance of deposit withdrawal. The social network effects presented above were also observed. Namely, if in someone's social network somebody withdrew his money, it considerably increased the probability that the given person would also do so. Interestingly, this bank suffered a bank run in 2001 as well, but then there were no fundamental problems. Comparing the two runs it is seen that the age of the bank account and the impact of the bank activity measured with

---

<sup>5</sup> The studies by *Osili – Paulson (2014)* and *Knell – Stix (2015)* also corroborate the not-surprising assertion that confidence in banks is a determinant of depositors' decisions.



the number of transactions (those with younger accounts and the more active depositors were more inclined to panic) are similar in the case of fundamental troubles and in their absence as well. However, if a depositor had a loan or was the bank's employee, the behaviour was different: they tended to run on the bank in the case of fundamental problems, while if there were no fundamental problems, they were less inclined to withdraw their money than other depositors. The probability of panic of those who had uninsured deposits was higher in both cases compared to insured depositors, but the likelihood of panic was much higher when there was a fundamental trouble than in the opposite case. These differences indicate that depositors react to the information related to the basic operation of the bank, and thus their behaviour is different if there are fundamental problems with the bank. However, the lack of difference in behaviour (in the case of the age of the bank account and the bank activity) shows that the explanation is not simple, as these indicators may also have a correlation with the depositor's knowledge, but they do not result in different decisions depending on the fundamentals. The findings also point out that older and insured deposits were the ones that proved to be really stable in the case under review.

In connection with the previous studies, examining two large Swiss banks, *Guin et al. (2015)* find that a strong bank–depositor relationship reduced the probability of deposit withdrawal. They also present that an increase in the cost of changing banks has a similar effect. Contrary to what was seen before, the findings were not affected by wealth, financial sophistication or interest in the financial crisis.

Finally, the effect of the social network is also discussed in brief. *Kelly – Ó Gráda (2000)* attach great importance to the role of the social network, which had an impact on the behaviour of depositors in the evolution of the bank runs on the Emigrant Industrial Savings Bank in 1854 and 1857, as many of the bank's depositors were immigrants from Ireland, who were bound together by their origin and the neighbourhood they lived in New York. In line with the above, *Iyer – Puri (2012)* and *Iyer et al. (2016)* also attach great importance to the role of social networks.

In relation to social networks, *Atmaca et al. (2017)* study a very similar phenomenon, but not deposit withdrawals. They examine whether one leaves the bank for good and whether one terminates his accounts. They have data on more than 300,000 depositors between 2005 and 2012, who were clients of a Belgian bank. With the help of the data they can quite precisely identify close or more distant family relations as well as neighbourhood relations. Unfortunately, they could not map other social network effects (e.g. friends, colleagues). It is also interesting about the data that in 2008 there was also a run on the bank by clients, and thus the effects of the (partial) social network can be examined prior to, during and after the crisis. The main finding is that when there was no crisis, only the decisions of close family members (spouse, parents, children, brothers and sisters) influenced the depositors:

if these close relatives left the bank, there was an increased chance that the given depositor would also do so. In a time of crisis, however, the decisions of more distant family members (e.g. the spouse's parents, uncle, aunt, cousin) also became important, and according to the analysis they were also taken into account by the depositors, and the impact of the decisions of closer family members was greater than before or after the crisis. All of this indicates that the role of information grows in a crisis situation, and then we strive to obtain relevant information from a wider circle. However, the impact of neighbours did not prove to be significant in this case either. This study also finds that the longer and deeper a client's relationship with the bank is, the less probable it is that he will leave the bank, and deposit insurance also has the expected effect, as the owners of fully insured deposits were much less likely to leave the bank than depositors whose savings were not completely protected.

What message takes shape on the basis of the above studies? The most basic one is perhaps that depositors did not behave the same way in the bank run, and their decisions were determined by their personal characteristics as well as bank/economic fundamentals. The effect of bank experience and relationship clearly influences depositors' decisions, but this effect also depends on whether the bank is struggling with fundamental problems. In absence of the latter, the above characteristics reduce the chance of deposit withdrawals, while in the case of fundamental problems they increase it. If there are no fundamental problems, less wealthy depositors with a low level of education tend to run, otherwise the wealthier depositors, ones with higher levels of education and better financial knowledge do so. This may be correlated with the fact that it is easier to imagine of the latter group that it is able to obtain and process relevant information about the fundamentals of the bank, so they only withdraw their money if it is fundamentally justified. The importance of the relationship between information and the fundamentals is shown by the fact that bank employees in the Indian case withdrew their money only when there was a fundamental problem. Information transmitted by the social network seems to be important, but we could see that the effects of the pieces of information from various networks are different, and the existence/lack of fundamental problems also affects the intensity of these effect. In line with expectations, deposit insurance has a bank run reducing effect, although it is important to see that the existence of deposit insurance alone is not sufficient to prevent mass deposit withdrawals. Obviously, it is not easy to draw the profile of depositors who run on the bank, and further research is needed for a better understanding of what factors and depositor's characteristics may lead to bank runs.

### 3. Experiments

Now let us talk about laboratory experiments. How to imagine an experiment like this? The participants of the experiment are sitting in a computer room, and using the information displayed on the screen (e.g. what decisions are taken by the others, how much money the participants will have depending on the decisions, etc.) they decide whether they will withdraw their money from the virtual bank or not. The experiment is meant to depict real life situations, so it is worth leaving the money in the bank if a sufficient number of depositors decide so, otherwise the early withdrawal (which leads to a bank panic) is the better solution. Experiments allow the examination of the effectiveness of regulatory instruments (suspension of convertibility and deposit insurance) as well. In the experiments, similarly to real life, there are depositors who need the money, so they withdraw it, and there are ones who do not have any prompt liquidity needs like that.<sup>6</sup> The presence of these two types is interesting because if someone sees that the depositor who made a decision prior to him withdrew his money, the former cannot know whether the latter did so because he needed the money or there is panic, and even those withdraw their money who do not need it. It is important to note that in economic experiments the participants' decisions are incentivized, i.e. at the end of the experiment they receive money depending on their own and the other participants' decisions.

As far as the depositors' personal characteristics are concerned, contrary to empirical analyses, the client–depositor relationship and the effect of bank experience cannot be analysed in laboratory experiments, because the time of the experiment (typically 1–2 hours) is not suitable for the evolution of such relations and experience. Nevertheless, it is possible to measure the impact of previous negative experiences, e.g. a survived financial crisis. Based on empirical data, *Osili – Paulson (2014)* find that if someone suffered the negative experiences of a financial crisis, he is less willing to put his money in the bank. It was found in experiments in several cases (*Garratt – Keister 2009; Kiss et al. 2014a*) that those who in previous rounds had been depositors of a bank where there was a bank run later were more inclined to withdraw their money. *Kiss et al. (2016 and 2014b)* also establish that cognitive abilities have an impact on depositors' decisions; more clever depositors make better decisions (when it can be clearly determined which decision is better), and they do not find any differences in terms of gender, i.e. women do not panic more than men. This is in line with the empirical results presented above. *Dijk (2017)* showed that fear induced in subjects led to more bank panic, which suggests that the impact of the wider environment on our feelings may also be important. The author finds that women are more inclined to withdraw their money from the bank as a result of incited fear.

---

<sup>6</sup> As the depositors of the first type will withdraw their money in any case, they do not make definitive decisions. Therefore, these depositors' decisions are usually simulated by a computer in the experiments.

The effect of the information available on other depositors' decisions was also researched in a number of experiments, corresponding to the findings of the investigations related to social networks. When there is no fundamental problem with the bank, the observation of other depositors' decisions has a considerable effect, and the effect depends on what we see. In accordance with the theoretical results (*Kinateder – Kiss 2014*), *Kiss et al. (2014a)* find that if the observed decisions show that others do not withdraw their money, this is reassuring compared to the situation when we do not know anything about how others decided. However, if the observations show that others withdrew their money, it increases the probability of deposit withdrawal compared to when we do not have information about others' decisions. *Kiss et al. (2018)* also point out that the panic-like deposit withdrawal following the observation of the deposit withdrawal is attributable to the fact that subjects consider it too likely that depositors who do not need their money were the ones who withdrew it. In other words, if they see that others withdraw their deposits, in the majority of cases they will think that there is a bank run, even if this is not the case. When the empirical results were discussed we could see that there may be contagion as well among banks, i.e. if a depositor sees that other banks are run on, he will also withdraw his money, even if there is no fundamental problem with his bank. *Chakravarty et al. (2014)* also demonstrated this in an experiment, while *Brown et al. (2016)* supplement this result with the finding that after the run on the other bank the depositor believes that there is an increased probability that his own bank's other depositors will withdraw their money, and this is why it is more likely that he will withdraw his own deposit.

*Schotter – Yorulmazer (2009)* also change the state of the economy during the experiment, and in line with the expectations they find that deposit withdrawal is faster if economic fundamentals are worse. They also examined the impact of deposit insurance, and in line with the empirical results they find that the existence of deposit insurance reduces the development of bank runs, although it does not preclude them completely. The findings of *Madies (2006)* and *Kiss et al. (2012)* were similar. *Davis – Reilly (2016)* present that the impact of the suspension of convertibility on the development of bank runs depends on how tough the bank is, i.e. how much money the depositors can withdraw if deposit withdrawal is limited due to a bank panic. When the banks were tough, fewer bank runs arose.<sup>7</sup> Interestingly, the observation of other depositors' decisions impaired this effect, but when the bank was lenient, the observability of other depositors' decisions reduced the development of a bank panic.

As shown, the results of experiments are mostly in line with the ones seen in empirical studies. Many of the listed results were observed in various experiments,

---

<sup>7</sup> *Ennis – Keister (2009)* present that it is not always simple to announce a tough suspension of convertibility system in the case of a bank panic and then to comply with it if a bank run really takes place.

on several occasions and with different participants, and thus we can be quite sure of the validity of these findings. Let us notice that in the case of the empirical results we cannot know for sure how environment-specific the observed decision is and to what extent it can be generalised. Experiments help the research in this field, as replicability is a fundamental requirement concerning experiments.

#### **4. Conclusions**

One of the main and at the same time most spectacular phenomena of economic and financial crises is the bank run, during which masses of depositors withdraw their money from the bank(s) in spite of the fact that at the given moment they do not need their savings. These bank runs may be efficient and may discipline credit institutions if the banks that suffer them really have functional problems. This study demonstrated that depositors run not only on bad banks, and it is desirable to avoid these unwarranted bank runs. However, this requires a better understanding of depositors' behaviour, for which empirical studies and experiments may provide help. Unfortunately, there are only a few empirical studies that examine depositors' decisions on the basis of individual-level data. Moreover, several of them examine bank runs that took place a long time ago, and some of the more recent ones can be considered special (to what extent can the behaviour observed in Indian cooperative banks be generalised and applied to the depositors of developed economies?). The controlled environment of the experiments helps to identify the mechanisms that are outlined on the basis of the empirical studies and descriptions, and as the experiments can be conducted at any time and at any place, after a sufficient number of examinations one can be sure that generalisation is possible.

The available empirical and experimental data draw the following picture: depositors are heterogeneous along various dimensions, and this heterogeneity has an impact on depositors' decisions. In connection with the characteristics it is worth examining the characteristics in relation to which we may think that the depositor obtains information on bank fundamentals and makes his decision based on that. It seems that education, financial sophistication, wealth as well as experience and relationship with the given bank are characteristics of this kind, i.e. if there are no fundamental problems, they reduce the probability of deposit withdrawal, while if fundamental problems exist, these characteristics add to the likelihood of withdrawals. There is also evidence from experiments that better cognitive abilities lead to better decisions. Confidence in banks reduces mass deposit withdrawals, whereas fear (especially in the case of women) increases them, which suggests that regulatory institutions and ones responsible for financial stability significantly affect depositors' expectations. In relation to that, we also saw that deposit insurance

and suspension of convertibility are effective in the sense that both empirically and in the experiments they reduce the probability of a bank run, although they are unable to preclude it completely, even if it is clear that the bank does not have any fundamental problems (as in the experiments where payoffs were certain) or if the central bank is sure to save the bank (see the case of Northern Rock). Based on empirical observations and experiments, the role of social networks and the observation of the decisions of other depositors are also important factors, as the more deposit withdrawals a depositor sees, the more inclined he will be to withdraw his money.

The above findings suggest that we have rather precise knowledge of depositors' behaviour, although our knowledge is not complete at all, and answers also change as the world changes. We do not know exactly, for example, how social media affects depositors. In the case of several bank panics, information or rumours spreading with the help of social media have been mentioned as causes in recent years.<sup>8</sup> The Bank of England set up a system that strives to forecast bank runs with the help of Twitter messages.<sup>9</sup> The institutional environment is also changing: in Europe, for example, the banking union may bring a radical change. Depositors also change; generations X, Y and Z are provably different from previous generations, which may be reflected in their depositor decisions as well. We cannot lean back; we must continue our research of depositors' behaviour in this changing environment.

## References

- Allen, F. – Gale, D. (1998): *Optimal financial crises*. *Journal of Finance*, 53(4): 1245–1284. <https://doi.org/10.1111/0022-1082.00052>
- Atmaca, S. – Schoors, K. – Verschelde, M. (2017): *Bank Loyalty, Social Networks and Crisis*. *Journal of Banking & Finance*, under publication. <https://doi.org/10.1016/j.jbankfin.2017.12.007>
- Brown, M. – Trautmann, S.T. – Vlahu, R. (2016): *Understanding bank-run contagion*. *Management Science*, 63(7): 2272–2282. <https://doi.org/10.1287/mnsc.2015.2416>
- Bruner, R. F. – Carr, S.D. (2008): *The Panic of 1907: Lessons Learned from the Market's Perfect Storm*. John Wiley & Sons.

---

<sup>8</sup> For example, social media was mentioned as the main trigger of the bank panic in the case of the Kazakh Kaspi Bank and Centercredit Bank, the Alliance Bank, the Bulgarian Corporate Commercial Bank (KTB) and First Investment Bank (FIB or Fibank) in 2014, and in the case of the Kenyan Chase Bank in 2016.

<sup>9</sup> <https://bankunderground.co.uk/2015/08/18/tweets-runs-and-the-minnesota-vikings>. Downloaded: 5 September 2018.

- Calomiris, C. – Mason, J.R. (2003): *Fundamentals, Panics, and Bank Distress During the Depression*. *American Economic Review*, 93(5): 1615–1647. <https://doi.org/10.1257/000282803322655473>
- Caprio, G. – Klingebiel, D. (1996): *Bank insolvencies cross-country experience*. World Bank Publications.
- Chakravarty, S. – Fonseca, M.A. – Kaplan, T.R. (2014): *An experiment on the causes of bank run contagions*. *European Economic Review*, 72(November): 39–51. <https://doi.org/10.1016/j.eurocorev.2014.09.003>
- Chari, V. V. – Jagannathan, R. (1988): *Banking panics, information, and rational expectations equilibrium*. *The Journal of Finance*, 43(3): 749–761. <https://doi.org/10.1111/j.1540-6261.1988.tb04606.x>
- Davis, D. D. – Reilly, R.J. (2016): *On freezing depositor funds at financially distressed banks: An experimental analysis*. *Journal of Money, Credit and Banking*, 48(5): 989–1017. <https://doi.org/10.1111/jmcb.12324>
- Davison, L. K. – Ramirez, C.D. (2014): *Local banking panics of the 1920s: Identification and determinants*. *Journal of Monetary Economics*, 66(September): 164–177. <https://doi.org/10.1016/j.jmoneco.2014.05.001>
- De Graeve, F. – Karas, A. (2014): *Evaluating theories of bank runs with heterogeneity restrictions*. *Journal of the European Economic Association*, 12(4): 969–996. <https://doi.org/10.1111/jeea.12080>
- Diamond, D. W. – Dybvig, P.H. (1983): *Bank runs, deposit insurance, and liquidity*. *Journal of Political Economy*, 91(3): 401–419. <https://doi.org/10.1086/261155>
- Dijk, O. (2017): *Bank run psychology*. *Journal of Economic Behavior & Organization*, 144 (December): 87–96. <https://doi.org/10.1016/j.jebo.2017.08.005>
- Ennis, H.M. (2003): *Economic Fundamentals and Bank Runs*. Federal Reserve Bank of Richmond *Economic Quarterly*, 89(2): 55–71.
- Ennis, H.M. – Keister, T. (2009): *Bank runs and institutions: The perils of intervention*. *American Economic Review*, 99(4): 1588–1607. <https://doi.org/10.1257/aer.99.4.1588>
- Garratt, R. – Keister, T. (2009): *Bank runs as coordination failures: An experimental study*. *Journal of Economic Behavior & Organization*, 71(2): 300–317. <https://doi.org/10.1016/j.jebo.2009.03.009>
- Goldstein, I. – Pauzner, A. (2005): *Demand–deposit contracts and the probability of bank runs*. *Journal of Finance*, 60(3): 1293–1327. <https://doi.org/10.1111/j.1540-6261.2005.00762.x>

- Gorton, G. (1988): *Banking panics and business cycles*. Oxford Economic Papers, 40(4): 751–781. <https://doi.org/10.1093/oxfordjournals.oep.a041885>
- Gorton, G. (2017): *The history and economics of safe assets*. Annual Review of Economics, 9: 547–586. <https://doi.org/10.1146/annurev-economics-033017-125810>
- Guin, B. – Brown, M. – Morkötter, S. (2015): *Deposit Withdrawals from Distressed Commercial Banks*. Manuscript.
- Hauser, A. (2014): *Lender of last resort operations during the financial crisis: seven practical lessons from the United Kingdom*. BIS Papers, No 79, pp. 81–92.
- Iyer, R. – Puri, M. (2012): *Understanding Bank Runs: The Importance of Depositor-Bank Relationships and Networks*. American Economic Review, 102(4): 1414–1445. <https://doi.org/10.1257/aer.102.4.1414>
- Iyer, R. – Puri, M. – Ryan, N. (2016): *A tale of two runs: Depositor responses to bank solvency risk*. Journal of Finance, 71(6): 2687–2726. <https://doi.org/10.1111/jofi.12424>
- Jacklin, C.J. – Bhattacharya, S. (1988): *Distinguishing panics and information-based bank runs: Welfare and policy implications*. Journal of Political Economy, 96(3): 568–592. <https://doi.org/10.1086/261552>
- Kelly, M. – Ó Gráda, C. (2000): *Market Contagion: Evidence from the Panics of 1854 and 1857*. American Economic Review, 90(5): 1110–1124. <https://doi.org/10.1257/aer.90.5.1110>
- Kinateder, M. – Kiss, H.J. (2014): *Sequential decisions in the Diamond–Dybvig banking model*. Journal of Financial Stability, 15(December): 149–160. <https://doi.org/10.1016/j.jfs.2014.09.004>
- Kiss, H.J. – Rodriguez-Lara, I. – Rosa-García, A. (2012): *On the effects of deposit insurance and observability on bank runs: an experimental study*. Journal of Money, Credit and Banking, 44(8): 1651–1665. <https://doi.org/10.1111/j.1538-4616.2012.00548.x>
- Kiss, H.J. – Rodriguez-Lara, I. – Rosa-García, A. (2014a): *Do social networks prevent or promote bank runs?* Journal of Economic Behavior & Organization, 101(May): 87–99. <https://doi.org/10.1016/j.jebo.2014.01.019>
- Kiss, H.J. – Rodriguez-Lara, I. – Rosa-García, A. (2014b): *Do women panic more than men? An experimental study of financial decisions*. Journal of Behavioral and Experimental Economics, 52(October): 40–51. <https://doi.org/10.1016/j.socec.2014.06.003>
- Kiss, H. J. – Rodriguez-Lara, I. – Rosa-García, A. (2016): *Think twice before running! Bank runs and cognitive abilities*. Journal of Behavioral and Experimental Economics, 64(October): 12–19. <https://doi.org/10.1016/j.socec.2015.01.006>



- Kiss, H.J. – Rodriguez-Lara, I. – Rosa-Garcia, A. (2018): *Panic bank runs*. Economics Letters, 162(January): 146–149. <https://doi.org/10.1016/j.econlet.2017.11.014>
- Knell, M. – Stix, H. (2015): *Trust in banks during normal and crisis times—evidence from survey data*. *Economica*, 82(s1): 995–1020. <https://doi.org/10.1111/ecca.12162>
- Madies, P. (2006): *An Experimental Exploration of Self-Fulfilling Banking Panics: Their Occurrence, Persistence, and Prevention*. *Journal of Business*, 79(4): 1831–1866. <https://doi.org/10.1086/503650>
- Ó Gráda, C. – White, E. (2003): *The Panics of 1854 and 1857: A View from the Emigrants' Industrial Savings Bank*. *Journal of Economic History*, 63(1): 213–240. <https://doi.org/10.1017/S0022050703001785>
- Osili, U.O. – Paulson, A. (2014). *Crises and confidence: Systemic banking crises and depositor behavior*. *Journal of Financial Economics*, 111(3): 646–660. <https://doi.org/10.1016/j.jfineco.2013.11.002>
- Schotter, A. – Yorulmazer, T. (2009): *On the dynamics and severity of bank runs: An experimental study*. *Journal of Financial Intermediation*, 18(2): 217–241. <https://doi.org/10.1016/j.jfi.2008.06.002>
- Schumacher, L. (2000): *Bank runs and currency run in a system without a safety net: Argentina and the 'tequila' shock*. *Journal of Monetary Economics*, 46(1): 257–277. [https://doi.org/10.1016/S0304-3932\(00\)00022-2](https://doi.org/10.1016/S0304-3932(00)00022-2)
- Shin, H.S. (2009): *Reflections on Northern Rock: The bank run that heralded the global financial crisis*. *Journal of Economic Perspectives*, 23(1): 101–119. <https://doi.org/10.1257/jep.23.1.101>
- Starr, M.A. – Yilmaz, R. (2007): *Bank runs in emerging-market economies: evidence from Turkey's special finance houses*. *Southern Economic Journal*, 73(4): 1112–1132.
- Valencia, F. – Laeven, L. (2012): *Systemic Banking Crises Database: An Update*. IMF Working Paper.
- Wang, C. (2013): *Bailouts and bank runs: Theory and evidence from TARP*. *European Economic Review*, 64(November): 169–180. <https://doi.org/10.1016/j.eurocorev.2013.08.005>