THESIS SYNOPSIS

Katalin Kallóné Csaba

Deposit Insurance and Moral Hazard in Hungary

Ph.D. dissertation

Supervisors:

Edina Berlinger, Ph.D   **Helena Naffa, Ph.D**

professor   adjunct

Budapest, 2008

Faculty of Investments and Corporate Finance

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TARTALOMJEGYZÉK

1. RESEARCH BACKGROUND AND OBJECTIVES

Deposit insurance is the insurance intended to protect depositors and provide for their reimbursement to a certain extent in the event of the liquidation of a financial institution. The explicit form of deposit insurance is created by the legal rule determining what kinds of deposits of which institutions are covered by the insurance and up to what amount. The number of countries which have institutionalised deposit insurance has multiplied in the last four decades: there are more than 100 countries with such institutions today (IADI, 2017) in contrast to only 12 countries in 1974. The institution of deposit insurance was introduced worldwide in order to improve the trust of depositors in the banking system and thus enhance financial stability. At the same time, deposit insurance encourages banks to accept more risks, which jeopardizes financial stability.

With deposit insurance getting more and more wide-spread, research into the correlations between deposit insurance and financial stability is of particular importance. According to the basic theoretical model of deposit insurance (Diamond and Dybvig, 1983), deposit insurance improves the stability of the financial system by strengthening the trust in the banking system and preventing bank runs. However, empirical researchers assessing the correlations between deposit insurance and the risk in the banking system based on the examination of various markets and periods arrived at different results: some of them found these correlations to be positive, whereas others found them to e negative.

The basic theoretical model of deposit insurance (Diamond and Dybvig, 1983) explains that deposit insurance prevents the so-called inefficient bank runs, when depositors do not run on the bank because of the inadequacy of the fundaments of banks, but only because other depositors do the same and they don't want to lose their money because of the panic. There may be two possible equilibriums in this game theory model (Nash equilibrium), one of which is a desirable state and the other one is the bank run. Which one of the two occurs depends on the depositors' supposition, which in turn is influenced by a random factor. The presence of deposit insurance can prevent the adverse equilibrium and thus create added value for the society, as banks do not have to sell their illiquid assets in a short time under the market price.

However, deposit insurance also has a negative effect: the encouragement of banks and depositors to assume more risks. Deposit insurance encourages depositors to keep their money, up to the deposit insurance limit, in the banks promising the highest rate of interest, regardless

of how risky the given bank is. Banks offering riskier credits can thus get financing more easily, as they can promise higher interests on the deposits, the demand for which will be increased by the insurance. These phenomena are called "moral hazard" in deposit insurance, which may mutually give rise to the development of a relatively riskier banking system.

The authors investigating the subject of deposit insurance agree that the major advantage of deposit insurance, i.e. the prevention of inefficient bank runs may only be achieved at the expense of costs related to moral hazard. However, the majority of the empirical studies arrive at the conclusion that the negative impact of moral hazard are so high with deposit insurance systems of a high coverage ratio that they offset the beneficial effects of deposit insurance and increase the risk of the banking system on the whole (Table 1).

Risk decreases	Risk increases	Mixed finding
Gropp és Vesala (2004)	*White (1995)*	*Garcia (2000)*
Chernykh és Cole (2011)	*Grossman (1992)*	*Laeven (2002)*
	Wheelok (1992)	*Cull és szerzőtársai (2004)*
	Thies és Gerlowski (1989)	*Anginer és szerzőtársai (2014)*
	Demirgüç-Kunt és Detragiache (1998)	**No correlation**
	Demirgüç-Kunt és Detragiache (2002)	*Wheelock és Wilson (1994)*
	Hovakimian és szerzőtársai (2003)	*Alston és szerzőtársai (1994)*
		Karels és McClatchey (1999)

Table 1: The direction of the correlation between deposit insurance and the risk in the banking system according to empirical studies. Source: Prepared by myself.

A betétbiztosítással felmerülő er The moral hazard inherent in deposit insurance has been examined in the empirical studies so far only based on the correlations between national deposit insurance regulations and the risk indicators of the banking system. My own empirical study wishes to expend the literature on the matter with a different approach, by comparing the data available on credit institutions liquidated or existing in the period of 2014-2015 in Hungary and by analysing the composition of Hungarian depositors.

2.   DATABASE

The part of my research concerning Hungarian depositors is based on the database containing the depositors of the credit institutions liquidated in 2014 or 2015 in Hungary, which was analysed for the first time for a scientific purpose. The database of the depositors rescued by the National Deposit Insurance Fund (hereinafter: "NDIF") includes deposit amounts (up to the reimbursement limit), the date of birth of depositors and the post code of their domicile. I supplemented the database with the Regional Statistics of the Hungarian Central Statistical Office (*KSH*, 2014) so that the domicile, which is a significant dimension in terms of the moral hazard, could also be analysed in a unique database in addition to the distribution of deposit amounts and the age of the depositors.

I compared the combined databases of the depositors reimbursed by the NDIF with three different databases in respect of three variables:

a)   in the dimension of the deposit amount, with the cumulated internal database kept by NCIF of existing credit institutions;

b)   in the dimension of age, with the demographic statistics of the Hungarian Central Statistical Office (*KSH*, 2015);

c)   in the dimension of the settlement type, with the findings of the Household Monitor survey of the savings of Hungarian households by TÁRKI Social Research Institute (*TÁRKI*, 2015).

I used the database of Magyar Nemzeti Bank subject to limited access to analyse the deposit rates of Hungarian credit institutions. The distribution of the deposit amounts was analysed based on the questionnaire survey conducted by the European Central Bank (ECB) in twenty Member States of the EU (*HFCS*, 2014). The analysis of NDIF, MNB, TÁRKI and ECB databases is subject to individual licence, which I obtained based on my research proposal.

3.   HYPOTHESES AND RESEARCH METHOD

The purpose of my research is to explore if there are any signs of moral hazard in the case of credit institutions liquidated in Hungary and I am looking for a solution in my dissertation which could prevent inefficient bank runs but encourage depositors to be cautious at the same time. As shown in Figure 1, I investigated the topic from four different perspectives, based on nine hypotheses.
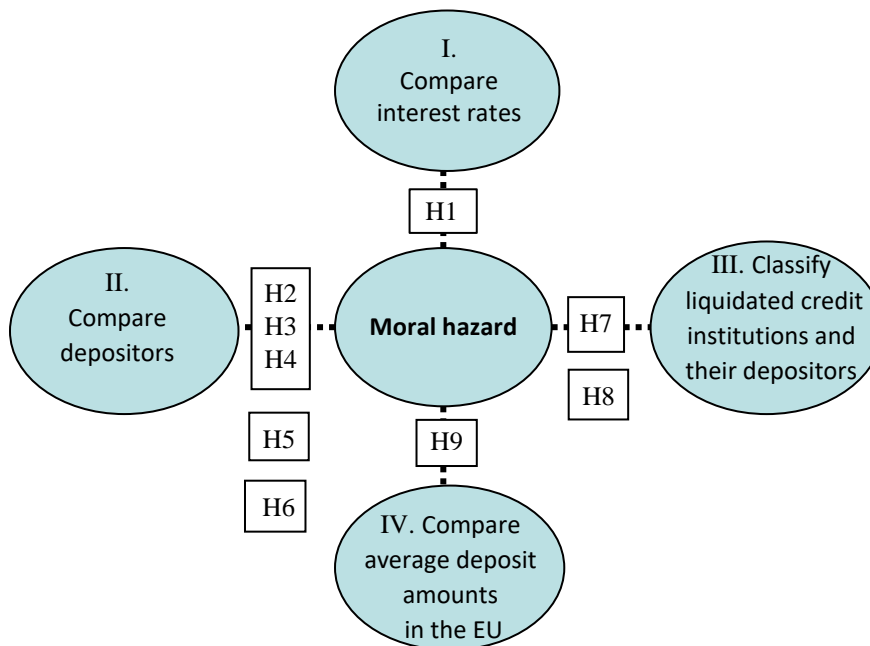

Figure 1: Empirical research on the signs of moral hazard from four perspectives. Source: Own edition.

Similarly to other empirical models in the relevant literature, my individual approaches of research only allowed me to draw indirect conclusions regarding the presence of moral hazard as the phenomenon cannot be observed directly. I expect from the combination of the findings of my analyses taking a new approach that we can learn more about the typical behaviour of depositors and banks in awareness of the deposit insurance based on the Hungarian example.

I.   Comparing interest rates of the liquidated and operating credit institutions

According to the majority of empirical researches, moral hazard inherent in deposit insurance increases the risk in the banking system, which in turn generates in increase of interest rates. On the one hand, this is because banks with a riskier portfolio get financing more easily, because up to the deposit insurance limit, the demand for higher interest rates is not moderated by the possibility of losing the deposit. And, on the other hand, banks can assume a relatively higher level of risk when extending loans, because the depositor's claims are to be satisfied by the

deposit insurer rather than the banks themselves in the event of the dissolution of the banks and they typically charge higher interest rates on credits of a higher rate of risk. I supposed therefore based on the available literature and the Hungarian data available that

H1: the credit institutions liquidated offered their depositors higher interests on their deposits compared to existing credit institutions on the average.

I highlighted that liquidated credit institutions used to offer in Hungary higher interest rates on the average than existing credit institutions for any maturity, although the difference was only significant in the case of short-term deposits (H1), as I have established with a paired sone-tailed t-test in case of a normal distribution of the interest rates and with Welch's t-test for all other cases.

II.   **Comparing liquidated and existing credit institutions from three aspects (deposit amount, age, settlement type)**

   a) **Deposit amount**

One of the reasons for a difference between the depositors of liquidated and existing credit institutions in respect of the marginal distribution of the three variables (deposit amount, age, settlement type), if any, might be that the depositors of a certain financial standing (H3 and H4), age (H5) or place of residence (H6) may have been effected by moral hazard to a smaller extent.

Before the comparative analysis, I tested the distribution of the deposit amounts in the liquidated credit institutions.

H2: The reimbursement amounts display an extreme value distribution.

Kallóné Csaba and *Vajai* (2017) established based on the examination of the matching of the various distributions (lognormal, gamma and Poission) that the reimbursement amounts paid follow an extreme distribution (H2) and, more specifically, the Weibull distribution the most (the distribution is strongly skewed to the left). Accordingly, I compared the distribution of the deposit amounts with non-parametrical tests.

There is no information in the relevant literature as to the higher inclination of small, medium or large depositors to deposit their savings with credit institutions offering higher interest in awareness of deposit insurance, therefore my initial hypothesis is as follows:

H3: There is no significant difference in the distribution of the amounts of deposits deposited in liquidated and existing credit institutions.

The result of the analysis was that depositors with deposits larger than 1 million HUF were more inclined to deposit their savings with institutions offering higher interests and subsequently liquidated than small depositors, which may imply that they were more affected by moral hazard. Based on the Wilcoxon rank sum test, this difference in behaviour gave rise to a significant difference in the distribution of the deposit amounts in existing and liquidated credit institutions (H3).

Starting from the fact that the liquidated credit institutions cannot properly represent existing credit institutions in terms of their size (there is no large or medium credit institution among them), I also made the comparison in respect of a group of existing banks which only included small and medium credit institutions. Because of the absence of any previous literature on the subject, I expected no significant difference in this case, either.

H4: There is no significant difference in the distribution of the amounts of deposits deposited in liquidated credit institutions and the existing smaller credit institutions.

The difference is also significant in the case of comparison with institutions of a size similar to the liquidated institutions (H4), i.e. it cannot be explained by difference in the size of the institutions.

Financing the reimbursement of deposits of higher amounts cost a lot to the Hungarian banking system: if the proportion of the amounts deposited with failed credit institutions had corresponded to the distribution of the total population, reimbursing the depositors of institutions liquidated in 2014 and 2015 would have cost HUF 94.5 billion less.

b) Age

The investigation of the difference between liquidated and existing credit institutions according to depositor age was intended to reveal if there was a stratum of clients which typically needed to be reimbursed. As there is no reference in literature to age influencing the affectedness by moral hazard, my initial hypothesis was as follows:

H5: the distribution of depositors according to age is the same in liquidated and existing credit institutions.

Hypothesis five could not be tested in the absence of appropriate data[1]. The preparation of a questionnaire survey which may provide a reliable basis for estimating the age distribution of the depositors of existing credit institutions may be subject to additional research. Therefore, we don't know if any age group of the depositors of liquidated credit institutions was more affected by moral hazard, nevertheless, it is important to keep the age variable for the analysis as a whole, because I classified the reimbursed depositors presuming that elder people tend to choose banks in their neighbourhood as they are less flexible in respect of travelling.

c) Settlement type

The differences between the types of settlements where the depositors of the credit institutions liquidated and those still existing came from may reveal if those who had to be reimbursed typically live in smaller or bigger settlements. People living in small settlements could only chose from a few credit institutions within their neighbourhood, therefore they can be "accused" less of taking advantage consciously of the protection offered by deposit insurance. As there is no reference in literature to the settlement influencing the affectedness by moral hazard, my initial hypothesis was as follows:

H6: there is no significant difference in the distribution of the number of depositors in liquidated and existing credit institutions according to settlement types.

The comparison revealed that the proportion of people from Budapest keeping any deposit or account with the liquidated credit institutions was much smaller than their proportion within the population. At the same time, people living in villages were overrepresented in the institutions liquidated. This difference may be explained in part by the fact that a significant portion of the credit institutions liquidated used to operate in small settlements in the country and served a local clientele. Another possible cause of the difference is that there may have been more people living in villages who made use of the advantage of deposit insurance and deposited their money with riskier institutions in the hope of higher interest rates. I applied both parametrical and non-parametrical tests to assess the significance of the difference, both of which established that the difference between the two populations in respect of the settlement type was not significant.

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[1] I presented my efforts aimed at testing to keep the logical unity of my dissertation.

III. Classification of the credit institutions liquidated and their depositors according to deposit amount, age and settlement type.

a) Classification of depositors

When clustering reimbursed depositors, I expect to find that the various clusters will imply the different levels of moral hazard.

H7: The depositors of liquidated credit institutions can be listed to distinct groups based on the reimbursement amount, age and settlement size.

Based on the information available regarding reimbursed depositors (deposit amount, age, place of residence), I examined their typical groups: four clusters could be distinguished significantly and objectively (H7) by means of McQueen's k-means clustering. I used the multi-dimensional scaling/alternating least-squares scaling (MDS ALSCAL) to determine the optimum number of clusters.

In my opinion, moral hazard could arise with a higher probability within two clusters, i.e. among the elderly depositors in the clusters "Millionaires" and "Savers", living in large cities and better-off than the average, than in the other two clusters. This is because these depositors decided to deposit their savings in institutions which failed subsequently, although they could have choosen from the offers of many institutions in their neighbourhood. It seems probable at the same time that some of the depositors in both groups would have kept their money in the credit institutions that failed subsequently without a deposit insurance, too, because they trusted the given institution for some reason. The majority (91%) of the depositors fall in the cluster of "Stayers" or "Poor", who hold much smaller amounts in deposit than the reimbursed total population on the average. "Stayers" probably chose a credit institution close to their place of residence necessarily, with regard to their advanced age, i.e. they may be "accused" less of having made a conscious use of the protection provided by deposit insurance The group of the "Poor" includes the youngest depositors living in the smallest settlements, who were probably forced to select a credit institution from the narrower choice available in their neighbourhood in order to be able to access their savings of small amounts on a daily basis. The more than 42 thousand, most needy depositors in the cluster of the "Poor" could avoid serious liquidity or livelihood problems thanks to the reimbursement by the NDIF. I published the detailed methodology and the findings of the classification of depositors in my study titled

"Betétbiztosítás és erkölcsi kockázat Magyarországon" (Deposit insurance and moral hazard in Hungary) (*Kallóné Csaba*, 2018).

b) Distinguishing between credit institutions

Distinguishing between the credit institutions liquidated based on their depositors, one may be able to identify a credit institution with a clientele who displayed moral hazard to a higher or lower extent compared to the others.

H8: Liquidated credit institutions can be clearly distinguished in space based on their depositors.

I described the liquidated credit institutions with statistical means based on the characteristics of their depositors, then checked it with multi-dimensional scaling if they can be clearly distinguished in space based on their depositors.

The classification of the liquidated credit institutions based on the characteristics of their depositors reveals that Széchenyi Kereskedelmi Bank is clearly distinguished from other institutions by its customers with deposit amounts high above the average, most of whom live in the capital city. We can establish based on the principles applied to cluster depositors that the customers of Széchenyi Bank were more likely to face moral hazard compared to the poorer customers of ALBA Takarékszövetkezet and Dél-Dunántúli Takarék Bank (DDB), living in settlements smaller than the average.

IV.   Comparing the distribution of deposit amounts in the European Union

The deposit insurance limit is unified across the European Union to ensure competitive neutrality on an international scale. If there is a considerable difference between the average size of deposits in the individual Member States, that means that the coverage is too high compared to the average deposit size in certain countries, which in turn entails certain costs related to moral hazard.

H9: there are significant differences between the deposit amounts in the EU Member States subject to the examination.

I established by means of variance analysis (ANOVA) regarding 15 Member States of the European Union that there is a significant difference between average deposit amounts in the Member States examined, which may result in a relatively higher coverage ratio in countries with a smaller average deposit amount (e.g. Slovakia, Latvia, Estonia or Greece), which increases moral hazard on the side of the depositors and the banks alike. The analysis is

presented in detail in my study titled "Egységes betétbiztosítási értékhatár, különböző erkölcsi kockázat az Európai Unióban" (Uniform deposit insurance limit and differing moral hazard in the European Union), which will be published in Statisztikai Szemle in the first part of 2016.

4. SUMMARY AND RECOMMENDATIONS

In summary, my research supports to the findings of international empirical research by establishing that the signs of moral hazard can be identified with some of the Hungarian depositors, too. The positive impact made by deposit insurance on society through both the prevention of inefficient bank runs and the reimbursement of the group of depositors in need is at the same time beyond dispute. In light of the foregoing facts I believe that credit insurance is a desirable institution in Hungary from a social and economic perspective alike, nevertheless, the possible ways of mitigating moral hazard are worth considering. I make suggestions as to the mitigation of the moral hazard based on and in connection with the recommendations found in literature concerning own contribution and the monitoring of the market players.

I. Deposit insurance limit, own contribution

The introduction of an own contribution is usually an effective means of maintaining market discipline regarding insurances. According to *Pauly* (1968), moral hazard can be reduced if there is an amount which is to paid by the damaged party in the event of damage. In the case of explicit deposit insurance systems, this own contribution usually means the amount above the reimbursement limit, which is to be borne only by large depositors. *Demirgüç-Kunt* and *Detragiache* (2002, p. 1371) highlight that "the undesirable effects of deposit insurance on the stability of banks are stronger where the coverage of the deposit insurance is larger", i.e. in general, where the own contribution is smaller. *Garcia* (1999) then proves in connection with the foregoing that moral hazard may be reduced by the limitation of the coverage ratio of deposit insurance.

I present in my dissertation that there is a significant difference between average deposit amounts in 15 Member States of the European Union (H9), which may result in a relatively higher coverage rate in countries with smaller average deposit amounts. Nevertheless, I suggest that the unity of the deposit insurance limit should not be broken, because varied reimbursement limits may distort competition within the internal market of Europe. I would rather suggest that the Member States with a smaller average deposit amount could be compensated for the

potential loss which may be caused by the moral hazard brought about by the relatively higher coverage ratio. For example, the differentiation between the deposit insurance contributions of the individual Member States might be one of the possible ways of compensation.

The idea of introducing own contribution for deposits in excess of HUF 1 million may arise in Hungary as a possible means to mitigate moral hazard (e.g. 10% as in the case of BEVA) as the probability of a conscious use of the advantages of insurance is higher above this limit. However, with this solution applied, depositors might have still sufficient motivation to run on the bank in the event of a bank panic on the one hand and the principle of competitive neutrality within the European Union would violated. Nevertheless, it would be necessary to introduce own contribution to mitigate moral hazard, but in a form which would not cause a bank run and could be applied universally. I recommend to consider in reliance on the current findings of behavioural finance, that depositors should be paid as reimbursement the amount of the invested capital or maybe the risk-free return on it (e.g. the base rate of the central bank), rather than the high rate of return originally announced and containing a risk premium, too. I propose to evaluate the effects of this solution and to introduce it uniformly within the European Union, depending on the results of further research.

II. Monitoring the market players

The empirical researchers of deposit insurance unanimously believe that deposit insurance systems have a better chance of being successful in countries with a better developed financial and economic environment and stronger market surveillance. I tried to formulate suggestions as to the improvement of the institutional system and market surveillance based on the lessons drawn from my own research.

a) The monitoring of banks: I have concluded based on the comparison of liquidated and existing credit institutions according to various aspects that it is worth continuously monitoring pricing deviating from the bank market average significantly (on the debit and credit side) and the distribution of the deposit amounts from a supervisory point of view.

b) The monitoring of depositors: The number of persons who chose credit institutions which offered higher interest rates but failed subsequently may have been higher among the Hungarian depositors with deposit amounts above the average, because they relied on the protection provided by deposit insurance, even though they were probably better prepared regarding finances and could have chosen from more banks in their densely populated neighbourhood. In light of the Hungarian example, it may be worth paying more attention

to, and maybe also analyse by questionnaires, the deposit creation habits of persons with deposit amounts above the average.

c) Countercyclical strategy: *Anginer* and co-authors (2014) found the negative impact of moral hazard related to deposit insurance to dominate in balanced periods and the stabilizing effect of deposit insurance to prevail in turbulent periods. I think that while the amount of moral hazard may be reduced by means of stricter regulation without increasing the risk of a bank run if the economic conditions are balanced, insurance coverage could be extended in critical times (just as we saw it during the financial crisis of 2008). I propose therefore the introduction of a countercyclical strategy in deposit insurance.

d) Bank run simulations: My research has been the first to examine the distribution of deposit amounts on an international scale. This information may be used as input data for the simulation of bank runs. The observation of the total Hungarian population of depositors is supplemented by the analysis of the distribution of deposit amounts in 15 Member States included in the *HFCS* database (*2014*), which confirms that the distribution of deposit amounts is strongly skewed to the left and extended long to the right. This also means in respect of the European Union that a minor change to the current deposit insurance limit of EUR 100,000 would change the number of the deposits insured only to a slight extent, while the insurance obligation would change considerably.

5. RELEVANT PUBLICATIONS OF THE AUTHOR

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1. Kallóné Csaba, K. – Vajai, B. (2017): Az Országos Betétbiztosítási Alap kártalanítási tapasztalatai a betétesek korösszetételéről és a betétösszegek eloszlásáról. Hitelintézeti Szemle. 16. évf. 2. sz. 28-39. old. DOI: https://doi.org/10.25201/hsz.16.2.2839

2. Kallóné Csaba, K. (2018): Betétbiztosítás és erkölcsi kockázat Magyarországon. Statisztikai Szemle, 96. évf. 2. sz. 137-163. old. DOI: https://doi.org/10.20311/stat2018.02.hu0137

3. Kallóné Csaba, K. : Egységes betétbiztosítási értékhatár, különböző erkölcsi kockázat az Európai Unióban. Statisztikai Szemle. (accepted, under publication)

4. Kallóné Csaba, K. – Katona, V. : Betétbiztosítás és pénzügyi stabilitás. Gazdaság és Pénzügy. (accepted, under publication)

Referred journal articles in English

5. Kallóné Csaba, K. – Vajai, B. (2017): Experiences of the National Deposit Insurance Fund on the Age Composition of Depositors and on the Distribution of Deposit Amounts. Financial and Economic Review. 16. évf. 2. sz. 28-39. old. DOI: https://doi.org/10.25201/fer.16.2.2839

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