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SURVEYS

CROATIAN NATIONAL BANK

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Summary

This paper examines the potential benefits that the financial system of the Republic of Croatia would derive from introducing risk-based rates of deposit insurance premia for different banks, proportionate to the expected loss to the insurer with respect to an individual bank, the so-called fair premia. In this context, the paper provides a survey of contemporary theory and the world-wide practice of applying risk-based deposit insurance premia. On the basis of the survey of the worldwide practice it is concluded that Croatia has probably not yet attained the level of financial and institutional development that would enable it to obtain the greatest possible benefits of introducing fair premia into the existing deposit insurance system. Furthermore, a simple application of financial theory with a view to introducing a sophisticated fair premium system is impossible in Croatia, as well as in most other countries in the world, due to the lack of necessary market information and unreliability of alternative private information required to accurately determine fair premia. Finally, economic theory warns us that the fair premium is not necessarily also a socially optimal premium, and in certain conditions it is even inferior to the most common alternative - a flat premium rate for all banks. Hence, prior to the introduction of the fair premium it is necessary to examine the potential benefits this change would bring to the specific environment of the Republic of Croatia.

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1 Introduction

Croatian legislation provides for the possibility of charging a different (risk-based) deposit insurance premium to each bank. In accordance with Article 5, paragraph 2 of the Act on the State Agency for Deposit Insurance and Bank Rehabilitation (official gazette *Narodne novine,* No. 44/1994), the premium amount and payment schedule are set by the Agency on the basis of criteria approved by the Croatian National Bank in consultation with the Finance Minister, taking into account the degree of risk to which the Agency is exposed in an individual bank or savings bank. Also, in accordance with Article 10, paragraph 2 of the Regulation on Deposit Insurance (official gazette *Narodne novine*, Nos. 65/1997 and 105/1998), the method for determining the risk of banks and savings banks is set on the basis of criteria approved by the Croatian National Bank. However, risk-based deposit insurance premia have not yet been introduced in Croatia, despite frequent announcements of such a change, which could be heard for the first time as early as 1999.

There are at least three good reasons why the Republic of Croatia has not rushed into introducing risk-based premia. First, for many years there was no objective and comprehensive method in Croatia that could have been used to set risk-based premia for banks in accordance with the assessed degree of their riskiness. Second, since the end of 1999, the Croatian deposit insurance system has acted on the *de facto ex post* principle according to which the remaining banks still pay for the damage created by failed banks, which most often prevents the fair and rational determination of risk-based premia. Third, a high quality introduction of this sophisticated change into a deposit insurance system requires considerable additional resources, which could be deemed irrational taking into account that the existing Croatian deposit insurance system is already one of the most expensive in Europe.

However, although 1999 and subsequent years were definitely not an ideal time for this endeavour, the year 2004, with a safe time distance from that unstable period in the Croatian banking system development, is ideal for a new analysis of the potential benefits of introducing risk-based premia. This is the main goal of this short survey of theory and practice of risk-based deposit insurance schemes with application to the Republic of Croatia. More specifically, this paper hints at a possible final answer of the profession to the question: "Does Croatia need risk-based deposit insurance premia (at all)?"

The rest of this paper is divided into seven, roughly equally large sections. The introduction is followed by the description of the history of attempts to introduce risk-based premia in the Croatian deposit insurance system and a simplified economic argument in favour of applying risk-based premia. The fourth section surveys the present stage in the development of economic theory of risk-based premia, and the fifth section provides a survey of financial theory in the same area. The sixth section analyses empirical research that compared the systems with flat premia and the systems with risk-based premia. The worldwide practice of applying risk-based premia is presented in the seventh section, whereas the eighth section concludes the discussion.

2 History of the Flat-Rate Deposit Insurance Premium in the Republic of Croatia

In 1997, the CNB Council discussed the possibilities of applying risk-based premia according to key indicators, such as interest rate indicators, without making a decision on this criterion. In the meantime, experience has shown that problems in individual banks may be well foreseen *ex post* on the basis of interest rate and short-term liquidity indicators. Also, it has been shown that the development of the CAMELS methodology is a very complex task that would not be finished for a long time (CNB, 2002). The CNB started to assign a reduced version of the CAMELS rating, the so-called CAMEL, to Croatian banks only in 1999 and a reduced objective version of the CAMELS, the so-called CAEL, as late as the beginning of 2002.

In line with the above stated, and in order to enable the State Agency for Deposit Insurance and Bank Rehabilitation (DAB) to introduce risk-based premia prior to the full affirmation of the young CAMELS system, the CNB Council authorised the DAB in September 1999 to temporarily use the criteria of short-term liquidity and interest rates to introduce risk-based deposit insurance premia. To assess bank risk on the basis of these criteria the DAB was recommended to use liquidity and interest rate indicators, which stood out positively in *ex post* forecasts (based on the 1997 data) of bank exits from the market in 1998 and in the first three quarters of 1999. The DAB was also recommended a model for transforming the values of these two indicators into an assessed degree of bank risk and provided with the proposed starting values of the model parameters, which was to enable the easiest possible transition from the existing flat-rate premium system to a system with risk-based deposit insurance premia.

Free parameters of the recommended model of risk-based premia included: tolerance thresholds for individual values of indicators beyond which the probability of an insured case rapidly increases, the minimum and the maximum premium rate, a weight of the liquidity indicator and a weight of the interest rate indicator, the length of the period for which the average values of indicators would be calculated, and the most suitable date to start applying the new premium calculation scheme. Recommendations were also given regarding corrections of other

elements of the existing deposit insurance system that were considered to be the necessary preconditions for the optimal impact of risk-based premia on bank behaviour. Furthermore, in this context, recommendations were given regarding corrections of the entire existing domestic safety net, which includes monetary and prudential measures of the central bank, as well as political interference in the financial system.

This summarised description of the proposed method of applying risk-based premia shows that it was rather complex for practical uses and that it included untypical indicators of bank risk.[1] It is also evident that, regardless of the accepted methodology, the efficiency of applying risk-based premia would be questionable due to specific circumstances of the Croatian banking system at the end of 1999 and the beginning of 2000. This primarily refers to the mentioned functioning of the deposit insurance system on the *de facto ex post* principle according to which present-day banks still pay for the damage the DAB as an insurer suffered with respect to the banks that exited the market between 1999 and 2001. Due to these two reasons and despite the fact that technical, formal and legal conditions for the application of criteria on risk-based deposit insurance premia, which had been approved by the CNB, had been met, in early 2004 the DAB still applies a flat premium rate of 0.8 percent a year on the amount of insured deposits (more precisely, a quarterly rate of 0.2 percent).

3 Should Premia be Risk-Based and Why?

Although 2000 was not an ideal year for the introduction of risk-based deposit insurance premia for different banks, the year 2004, which follows stabilisation of the Croatian banking system and a period of its dynamic development, is actually a perfect year to review the potential benefits of applying risk-based premia. A general question that arises first within this analysis and demands a comprehensive answer based on theoretical arguments and empirical evidence is: should deposit insurance premia be risk-based at all (and why)?

At the theoretical level, we may search for a simple answer to this question by relying on the basic principles of financial theory.[2] Let us assume that we have a banking system in which all banks can be roughly divided into two groups: less risky banks and banks with higher risk. In such a system, if the market is efficient, riskier banks pay higher deposit rates than less risky banks. Furthermore, let us

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1   A more detailed description of typical methods and indicators for applying risk-based deposit insurance premia is provided in the sixth section of this analysis. For example, in the US each bank is categorised into one of nine groups according to standard prudential indicators - its capital adequacy and CAMELS rating. The proposed changes in the American system of risk-based premia also rely on the combination of CAMELS ratings and a somewhat broader group of standard financial ratios (FDIC, 2001).
2   Papers dealing with a theoretical comparison of systems with a flat premium rate and systems with risk-based premium rates usually require a high level knowledge of financial economics and financial mathematics. The comparison provided in this section mostly relies on a simplified model of a deposit insurance system that is analysed in Prescott (2002).

assume that credible implicit or explicit complete coverage of all deposits is introduced in such a system, for which banks regularly set aside a flat-rate premium expressed as a percentage of insured deposits. If all banks transfer the cost of the insurance premium to depositors by reducing their deposit rates, absolute differences between their deposit rates will at first remain unchanged, whereas their relative differences will grow.

However, following the introduction of such insurance, deposits become less sensitive to risk and move from less risky banks to riskier banks, i.e. moral hazard arises on the part of depositors and at the expense of an insurer because a share of deposits in banks accounting for a larger insured risk increases, without a parallel increase in the collected premium of such insurance. Moreover, in order to maintain their deposit base, less risky banks are forced to increase their deposit rates and bring them closer to those of riskier banks. If banks cannot reduce their profit margins and operating expenses, they have to increase their lending rates, which results in adverse selection of risks at such banks. After less risky banks have been forced to increase their deposit rates, they are induced to increase their lending rates as well, even if they do not need to. This is because the increase will directly improve their profit since depositors will not punish them for increased risk of adverse selection by seeking higher deposit rates owing to the fact that their deposits are fully insured. Hence, full and credible deposit insurance encourages less risky banks to riskier operations, i.e. encourages moral hazard.

On the basis of the described model it may be concluded that the final result of introducing credible full insurance of all deposits at a flat premium rate is levelling out of deposit rates and transfer of all less risky banks into a group of riskier banks. The banking system is in non-optimal equilibrium, which is maintained by moral hazard on the part of depositors and banks, at the expense of the insurer, and all banks belong to a group of riskier banks.

Let us assume that in such an environment an insurer decides to introduce the payment of an insurance premium at a fair rate for each individual bank. A fair price of an investment in assets is usually considered a price that corresponds to the expected return on these assets, with neutrality as regards risk. Therefore, a fair insurance premium rate is the one at which expected profit is equal for less risky banks and riskier banks. Alternatively, a fair insurance premium rate for a bank is the rate that corresponds to the expected rate of loss an insurer would suffer due to payment of deposits insured in that bank (after adding operating expenses). On the basis of these definitions, it is easily discernible that the beginning of the application of a fair premium system will have a considerable immediate effect on our model of the banking system. By definition, since the application of the fair premium will enable banks to reduce their operating risks without simultaneously decreasing their expected profit, they will do it. Hence, the result of introducing the fair deposit insurance premium is reduced expected loss to the insurer, which is now adequately covered by the collected insurance premia. In this situation, deposit rates remain the same, whereas lending rates are reduced - optimal equilibrium is achieved.

4 Economic Theory of Premia[3]

If the argument of economic logic in the previous section were immediately applicable in practice, it would also provide a complete answer to the question posed at the section's beginning: should deposit insurance premia be risk-based in order to prevent moral hazard at the expense of an insurer and encourage riskier banks to reduce the riskiness of their operations? However, economic logic is not directly applicable in analysing existing deposit insurance systems since the majority of its underlying assumptions are most often not grounded in practice. First, interest rates will level out only if all deposits are fully covered, whereas it is a worldwide practice to cover only certain deposits up to a certain amount. Furthermore, if a deposit insurance system includes a coinsurance clause, this clause reduces incentives to moral hazard on the part of depositors, and unlimited moral hazard is the basis of non-optimal equilibrium in the context of a flat deposit insurance premium rate. Third, the credibility of arguments of economic logic also depends on the credibility of the deposit insurance system, whose lack is a common phenomenon in weak institutional environments. And fourth, in all banking systems, even the most developed, there is always a problem of asymmetric information on bank risk that impairs market efficiency, which is another key precondition for validity of the presented model.

In view of the above-stated, any theoretical analysis of a deposit insurance system that is aimed at being practically applicable must rely on models with a much richer structure, which will include all essential characteristics of existing and potential deposit insurance systems in the world. A simple economic logic that relies on basic financial theory principles – market efficiency, neutrality toward risk and reasonable endeavours of economic subjects to maximise expected profit – certainly does not meet this precondition. On the other hand, the development of contemporary theory of risk-based insurance premia that has started less than 30 years ago, despite application of the most complex economic and financial models, has not yet provided an answer neither to a theoretical question of social benefit nor to a practical question of technical feasibility of applying risk-based premia. Instead, it has only initiated a discussion on this issue, which is very important for stability of the banking system and the financial system in general.

The remaining part of this section sets out the present state of the discussion on social benefits of applying risk-based premia, which has mostly been instigated by the mismatch of results of microeconomic and macroeconomic analysis of risk-based deposit insurance premia. It is perfectly clear that from a microeconomic point of view, total premia collected in a certain period should correspond to *ex ante* expected total insurer's outlays in that period. At the same time, the insurer must have available and reasonable financing in periods of volatile losses (when there are no reserves and outlays exceed expectations) in order to remain

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[3]   The presentation in this section is mostly based on a survey of contemporary theory of deposit insurance systems given in Carisano (1992).

solvent and liquid. In principle, an appropriate amount of premia may be collected in a way that each bank pays an equal amount, or pays at the flat rate relative to a certain calculation base, or at different rates on a certain calculation base, depending on insurer's wishes. However, Flannery (1982) showed that, theoretically speaking, the collection of premia at the flat rate on the insured base encourages less risky banks to moral hazard in the subsequent period, which *ex post* results in larger than expected losses to the insurer. Thereby, he opened a path to a 20-year theoretical and empirical review of undesirable consequences stemming from a system with a flat-rate insurance premium.

Approximately at the same time, Goodman (1983) showed that the only way for an insurer to collect total premia equal to *ex ante* expected losses and simultaneously insure that *ex post* losses do not surpass their *ex ante* expectations is to precisely predict a future degree of riskiness of the insurer's portfolio and, on the basis of this prediction, set a fair insurance premium for each bank. However, Goodman and Santomero (1986) proved that the collection of such fair premia does not bring the greatest possible social benefit since the reduction in social costs of bank failure in the transition from a flat-rate system to the system with the fair rate of premium insurance is less than the increase in social costs of real sector rehabilitation that would result from this change. Hence, from a macroeconomic standpoint, introduction of the fair deposit insurance premium is not optimal, whereas from a microeconomic standpoint (in theory) only the fair premium is optimal!

Generalising the findings of Goodman and Santomero in a more recent theoretical model, Freixas and Rochet (1998) conclude that a socially optimal premium is always lower than the fair premium. Moreover, in a paper published earlier, Nagarajan and Sealey (1995), analysing a theoretical model that includes a complex interdependency of regulatory policy regarding exclusion of banks from the market, minimum capital adequacy standards and the method for determining insurance premia, warn that good coordination of these elements of bank regulation may yield a precisely set flat premium rate that would also be a socially optimal premium rate.

Finally, as the extremity in conditional rehabilitation of a flat-rate premium system stands out a more recent theoretical paper by Boyd, Chang and Smith (2000). They analyse a complex realistic model of general equilibrium accompanied by inflation and reserve requirements in which an explicit system covers the deposits in two bank groups, risky and non-risky. They conclude that in such a system, there is a complex structure of multiple equilibrium that is very sensitive to different choices of the model parameters (e.g. rate of reserve requirements and the level of insurance premia). In practice, this means that neither does moral hazard resulting from a flat premium have to be socially harmful nor does a fair premium necessarily curtail that moral hazard.

Hence, at a theoretical level, the question of the socially optimal choice of the method for calculating deposit insurance premium rates has not yet been completely solved.

5 Financial Theory of Premia[4]

It is interesting that the first financial theoreticians that addressed the issue of risk-based deposit insurance premia *a priori* assumed that the determination of the fair premium is desirable since the discussion depicted in the previous section had not yet become heated at the time. Hence, they limited their work on finding "the right method" to set such a premium and eliminating the deficiencies that had made first theoretical models inapplicable in financial practice. The first known theoretical model for the fair premium determination is the Merton (1977) model. He uses the Black-Scholes formula (1973) to determine an insurance premium as the price of a call option on bank's assets. Advanced versions of this model, such as the Merton unlimited-term model (1978), the Ronn and Verma model (1986), which predicts the possibility of regulatory forbearance regarding closure of failed banks and the Duan model (1994), which corrects certain theoretical inconsistencies of the Ronn and Verma model, enclose the core of this group of models.[5]

Although these option models were pioneering in the area of determining the fair deposit insurance premium, they have not been further developed in the recent past due to two basic reasons. First, although relatively complex, they still fail to encompass the typical features of actual deposit insurance systems, such as the representation problem, and the problem of error in assessing bank risks. Second, their practical application is narrowly limited to banks whose shares are quoted on the stock exchange and/or banks that issued subordinated instruments on the open market. However, a theoretical price of such instruments cannot be confirmed in practice since there is no, nor can there be an option market for such banks' assets.

The second group of models for the fair premium determination encompasses the expected loss models. They are based on a much simpler principle (than the principle on which option models are based) according to which each bank should pay a premium in the amount commensurate to its expected marginal contribution to the loss the insurer expects at the level of the entire portfolio of insured banks. The expected marginal contribution of an individual bank to the total expected loss to the insurer is obtained by a linear transformation of the expected loss to the insurer with respect to that bank. Finally, the expected loss to the insurer with respect to a certain bank may be expressed as a product of multiplying the probability of bank failure by the expected insurer's exposure toward the bank at the moment of failure, reduced by the expected insurer's collection from the liquidation or bankruptcy estate.

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4   The presentation in this section is mostly based on surveys of contemporary economic and financial theory of deposit insurance given in Carisano (1992) and Laeven (2002).

5   Laeven (2002) cites some other interesting modifications of option models, such as inclusion of dividends in the Saunders and Wilson model (1995), a valuable call provision retained by the regulator or insurer in the Allen and Saunders model (1993), and the adjustment of the Ronn and Verma model that Cooperstein, Pennacchi and Redburn (1995) made for banks whose equity and debt securities are not publicly traded.

In the expected loss models, the factors yielding the expected loss to the insurer with respect to an individual bank are most often estimated on the basis of historical experience, i.e. by transforming fundamental (CAMELS, balance sheet ratios), market (share value, interest rates) or classification (international rating) indicators into the probability of bank failure and the expected loss in case of bank failure.[6] A correlation matrix that transforms expected losses with respect to individual banks into their marginal contributions to the total expected loss to the insurer is also estimated on the basis of historical experience.

The choice of a historical period that is long enough to provide a stable estimate of the factors within the model, but still short enough to leave out irrelevant past is the greatest challenge in expected loss modelling. Hence, as option models for the fair premium determination are limited to banks whose shares or bonds are publicly traded, so are expected loss models limited to banks and banking systems for which there exists a sufficiently long time series of data on cases of bank failure, which include exposure at the moment of failure and the subsequent collection by the insurer in the process of addressing difficulties in such banks.

In addition to the stated fact (which eliminates both groups) that economic theory indicates that fair premium calculation is not socially optimal, both groups of models for the fair premium determination may be objected from a theoretical standpoint for at least one other major deficiency as regards their application. Briefly stated, the objection is as follows: due to asymmetric information, manifested in the fact that the insurer has no comprehensive insight into risks inherent in bank's specific business activities in real time, an *ex ante* prediction of risks inherent in such bank activities in the subsequent period is by itself very challenging (Horvitz, 1983). Moreover, this problem adds to the insurer's inability, even when the insurer has accurate information on the present risk taking of a bank, to predict beforehand future opportunities for bank growth that will influence its net worth (Herring and Vankudre, 1987). Finally, the problem of *ex ante* predictions of risky business activities also increases the possibility that the fair premium is not accurately determined, which can provide an unpredictable incentive to banks to pursue exactly such activities (Chan and Mak, 1985). Hence, we are dealing with a closed circle in which the unpredictable dynamics of relations between the insurer and banks *de facto* undermines the ability to predict how the introduction of a fair premium system would affect bank behaviour.

6 Empirical Evidence on the Application of Risk-Based Premia

The theoretical discussion in the preceding two sections clearly shows that both a flat premium and a risk-based premium may produce undesirable and sometimes

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6   See FDIC (2001) for an example of the existing model and a proposed new model in the US that includes fundamental indicators. See Maccario (2003) for an example of a proposed modern model that applies the VaR methodology on market and balance-sheet indicators of Italian banks.

unpredictable effects. Hence, with good reason one may ask whether any deposit insurance system should be introduced at all. However, prior to taking the final position on this issue, one should review empirical evidence that confirms or disputes adverse effects that theoreticians unambiguously associate with all types of explicit deposit insurance systems.

The first known empirical evidence that confirmed the hypothesis that the introduction of an explicit deposit insurance system with a flat-rate premium encourages moral hazard was presented by Hovakimian and Kane (1996). They show that a flat-rate insurance premium applied in the 1985-1994 period was the reason why US banks "shifted" a part of their own risk to the insurer (the FDIC) and find that undercapitalised banks shifted risk "more effectively" than other sample banks.

On the other hand, similar analyses for some other countries brought completely different results. For example, Gueyie and Lai (2001) failed to detect the presence of moral hazard in the Canadian banking industry following the introduction of an explicit flat-rate deposit insurance system in 1967. Also, Bartholdy, Boyle and Stover (2001) find that the 1987 initiation of such deposit insurance in Denmark decreased the risk in small and riskier banks and slightly increased the risk in other banks. Finally, in a more recent study of the ECB, Gropp and Vesala (2001) show that the establishment of explicit flat-rate deposit insurance schemes in EU countries has significantly reduced the riskiness of banks. They explain this phenomenon by implicit deposit insurance that existed in analysed banking systems prior to the introduction of explicit deposit insurance. This implicit insurance operated through the reasonable expectation of public intervention in distressed banks, which thereby provided full protection to all depositors and creditors.

Despite such contradictory theoretical and empirical results, it seems that the debate on desirability of an explicit deposit insurance system has lately been coming to a close. Faced with apparently inexplicable differences in empirical findings regarding the presence of moral hazard in different deposit insurance systems, contemporary researchers have initiated empirical testing of the hypothesis that the efficiency of a deposit insurance system depends on specific features of the institutional environment in which the system operates. First of these researches have been rather successful and their results indicate that the design of a deposit insurance system is equally important for social benefits of deposit insurance as are the characteristics of its environment.

Among empirical researches that have recently dealt with the efficiency of a deposit insurance system we should point out the study by Demirgüç-Kunt and Detragiache (2000), which uses a large matrix of data by countries over a long period and shows that explicit deposit insurance schemes tend to increase the likelihood of a banking crisis in countries with a weak institutional environment. Also, on the basis of a similar analysis, Hovakimian, Kane and Laeven (2003) conclude that moral hazard on the part of banks is much more common in environments that are low in political and economic freedom and high in corruption. Both studies conclude that a developed institutional environment with a carefully designed insurance system reduces moral hazard, i.e. the likelihood of a banking crisis, to

the least possible measure. The first study also finds a weak positive correlation between risk-based premia and absence of a banking crisis. However, since the number of systems with risk-based premia contained in the sample is rather small, this result cannot be accepted without hesitation. Still, the latter study confirms this finding on a larger sample and concludes that moral hazard on the part of banks is reduced in deposit insurance systems with low coverage limits, coinsurance and risk-sensitive premia.

In the end, the researches that confirmed the assumption that environmental differences are the main reason for the mismatch between the 1990s empirical evidence and the 1980s theoretical papers have initiated the transformation process of the deposit insurance economic theory itself. This process could finally result in a more realistic theoretical assessment of existing and potential deposit insurance schemes worldwide. Several important directions of this process that have already achieved a certain progress are the analysis of the influence of banking system features[7], analysis of the influence of prudential regulations[8] and analysis of the influence of political interference[9] on the efficiency of explicit deposit insurance systems.

7 Worldwide Practice of Applying Risk-Based Premia

The presentation in the preceding three sections unambiguously points to the potential advantages of risk-based deposit insurance premia over the flat-rate deposit insurance premia, but also to real and not insignificant difficulties in practical exploitation of these advantages. A long-lasting development of financial theory and practice that has enabled the understanding of all aspects of this latent conflict has considerably influenced the worldwide practice of applying risk-based deposit insurance premia. In the 1990s, without a firm theoretical or empirical background, a decision on the introduction of risk-based premia became more politically motivated and less based on professional expertise.

It may be stated with a great degree of certainty that the major contribution to the popularisation of risk-based deposit insurance premia after 1995 was (inadvertently?) provided by the International Monetary Fund (IMF). In the second half of the 1990s, a superficial interpretation of studies by Garcia (1996) and Folkerts-Landau (1998) spread around professional circles. According to this interpretation, the IMF unconditionally recommends the transition from a flat-rate

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7   Niinimaki (2000) shows that moral hazard grows with the introduction of an explicit deposit insurance system if and only if banks compete for deposits, whereas the competition on the loan market has no effect on moral hazard.

8   Pennacchi (2003) shows that it is possible to coordinate a method of premium determination with the minimum capital standard in such a way that they together provide an optimal regulatory mixture to smooth banks' credit cycle, without exerting a simultaneous (considerable) adverse effect on moral hazard on the part of banks.

9   Inspired by their own empirical evidence (Gropp and Vesala, 2001), Gropp and Vesala (2004) define and test a stylised theoretical model of the EU banking sector that is in conformity with the historical characteristics of EU banking, and show that under certain conditions the introduction of explicit deposit insurance in the EU banking sector tends to reduce moral hazard.

premium to risk-based premia in all explicit deposit insurance systems.[10] It is probably not unrealistic to speculate that such an interpretation was partly intentional, aimed at securing an alibi in case attempts to apply risk-based premia failed. It was also partly a product of negligence, lack of knowledge and experience on the part of those in charge for the application of deposit insurance systems.

Finally, an occasionally frivolous game of politics and profession regarding the method for determining deposit insurance premia has yielded results none of the mentioned theoreticians and empiricists could even foresee, let alone recommend. More precisely, a superficial interpretation of the IMF recommendations is the cause of the unselective inflation in the number of deposit insurance systems with risk-based premium schemes in the second half of the 1990s. The final result is that today most of these systems operate in countries with insufficiently developed financial systems and weak institutions, which are counter-indicated for the application of risk-based premia and even for the introduction of any explicit deposit insurance system. (Figure 1).

Figure 1 Level of Financial and Institutional Development[a] in Countries with a Risk-Based Premium Scheme
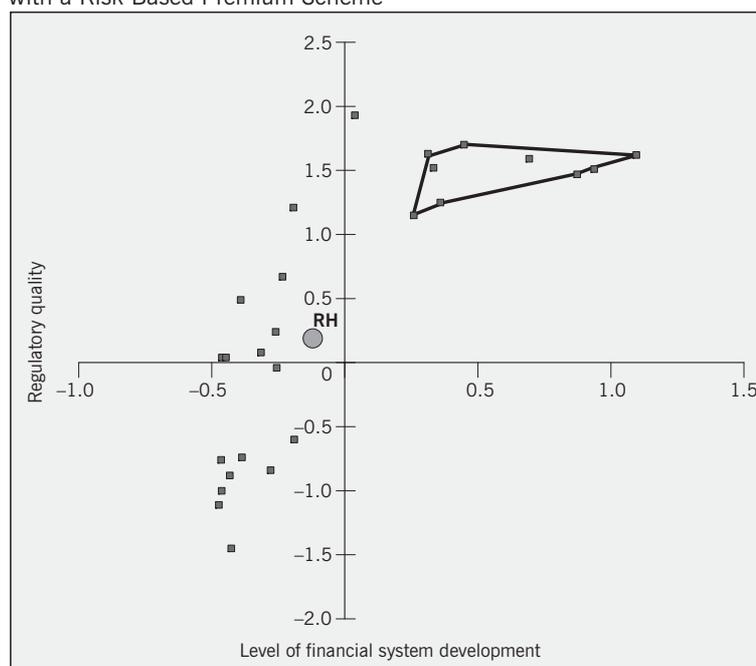
Sources: www.worldbank.org and author's calculation.

[a] In this figure, regulatory quality is presented by the synthetic index *Regulatory Quality* for selected countries for 2002 from the World Bank database *Governance Indicators for 1996-2002*. The level of financial system development is calculated as the difference between the indicator *Private credit of banks and others to GDP* in the World Bank base *Financial Development and Structure* and its 2001 average for all countries. This indicator is based on the 2001 data, together with the 2000 data for three countries for which there was no 2001 data available. Since the data on the level of financial development for additional three countries are not available in the mentioned source they have been left out from the presented figure. With regard to the construction of indicators, point (0.0) would represent a country of an average level of financial and institutional development. Hence, it is reasonable to speculate that among the countries that today apply risk-based premia only those represented in the figure by connected dots in the upper right quadrant fulfil the necessary preconditions to obtain social benefits of applying risk-based deposit insurance premia.

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10   A correct interpretation is that Garcia (1996) recommends the application of risk-based premia only in developed financial systems and concludes that even in such systems the application of risk-based premia presents a serious practical problem; whereas Folkerts-Landau (1998) recommends the application of risk-based premia only in environments where it is possible to precisely quantify the risks of insured banks.

According to the most recent available data from end-2000, Laeven (2002) finds 29 countries in the world that apply risk-based deposit insurance premia, i.e. approximately 40 percent of the total number of countries with explicit deposit insurance systems, compared with only 4 such countries at the end of 1995. The most prominent relative growth was recorded in Europe, in which a number of risk-based premium schemes increased from zero (!) at the end of 1995 to 13 at the end of 2000. Among these 13 countries, there are 8 developed Western European countries and five less developed Middle European and East European countries. In the group of countries with which Croatia is most often compared, risk-based premia are applied only in Hungary, Poland and Romania (Garcia, 1999, includes Bulgaria in this group as well).

Laeven (2002) finds only two countries in the world with a relatively sophisticated technology of applying risk-based premia, whereas no country uses option models or models relying on estimates of market or classification indicators (Illustration 1). Among indicators used for determining risk-based premia, the most often used are estimates by supervisory authorities (CAMELS and the like), risk-weighted assets, capital adequacy and non-performing assets. A premium is most often calculated as a percentage of insured deposits or total deposits, whereas other calculation bases mostly include risk-weighted assets and non-performing assets or a combination of these two items with one of the former two items.

According to Garcia (2000), banks are in most cases categorised into one of several groups according to the assessed degree of risk, and a rate of the premium paid by the banks within a group is set for each group. Rarely is a premium rate set by using a formula that includes relevant indicators of a bank's position. Finally, the usual range of risk-based premium rates cannot be precisely determined on the basis of data from these two sources. However, it seems that the highest premium rate in most developed European countries does not exceed 0.5 percent of the calculation base.

Hence, the worldwide practice of applying risk-based deposit insurance premia on average ignores all of the above-described theoretical and practical preconditions for obtaining social benefits of applying the risk-based premium itself! First, a large number of countries that have not fulfilled the necessary development preconditions apply risk-based premia and second, all countries that apply risk-based premia employ approximate and not exact methods for assessing the degree of risks in insured banks.

Illustration 1 Possibility of Using Market and Classification Indicators in the Republic of Croatia

On 31 March 2004, there was only one bank in the Republic of Croatia with an international rating (Zagrebačka banka), only one bank had a liquid share traded on the capital market (Privredna banka) and only one bank had a bond issued on the capital market for which there was a comparable (risk-free) government bond traded on the same capital market (Hypo Alpe-Adria-Bank). Hence, these are the only three banks for which it is possible to determine a fair price of a deposit insurance premium on the basis of publicly available data. In addition, the expected loss approach can be applied only to Zagrebačka banka and Hypo Alpe-Adria-Bank, i.e. only for these two banks is it possible to directly calculate the imputed probability of financial failure by using market and classification indicators.

Bank	Model	Parameters	Probability of financial failure within a year as at 31 March 2004
Zagrebačka banka	Historical probability of financial failure for the same international rating	Moody's rating: Ba1-stable	0.48%
Hypo Alpe-Adria-Bank	Imputed risk premium in the bond price relative to the price of a similar "risk-free" bond of the Republic of Croatia	Yields to maturity HYBA-O-086A and RHMF-O-085A	0.43%

Sources: CNB, ZSE, Moody's and author's calculation.

The table shows the calculation of imputed probabilities of financial failure by using the two models explicated in the fifth section. For Hypo Alpe-Adria-Bank we used the price of its bond and the price of a comparable risk-free bond of the Republic of Croatia, both of which are traded on the Zagreb Stock Exchange, in a market risk premium model assuming that financial failure in consecutive years is an independent random event. For Zagrebačka banka we used its international rating by Moody's in a model of historical empirical probability, i.e. for probability we chose an empirical probability of failure of financial institutions with the same rating according to Moody's statistics.

8 Conclusion: the Future of Risk-Based Deposit Insurance Premia in the Republic of Croatia

On the basis of this exhaustive survey of theory and the worldwide practice of applying risk-based deposit insurance premia it is possible to finally point to a desirable future direction of research that should answer the question implied at the beginning: Should deposit insurance premia be risk-based in the Republic of Croatia, if yes, when and how?

In view of the presented empirical results and the present level of Croatia's development it seems that risk-based deposit insurance premia should not yet be introduced, despite the fact that the Republic of Croatia is one of the more advanced countries within a group of countries without the prerequisites for obtaining the best possible benefits of applying risk-based premia. Figure 1 clearly shows that if Croatia introduced a risk-based premium system, it would probably join a large group of countries that have certainly not been prepared for obtaining the best possible social benefits of such a system. In addition, as it was mentioned in the beginning, the Croatian deposit insurance system now operates as a *de facto ex post* system, through which the insurer's losses from previous periods are paid. If an existing premium were to be increased by the component of expected future loss, it is certain that the system would become too costly for banks. Hence, even if the decision on the introduction of risk-based premia were to be made, its implementation would necessarily have to begin after 2005, during which previous insurer's losses are expected to be paid out. However, even then it would be necessary to first test the maturity of the financial system and institutions to deal with adverse aspects of a risk-based premium system.

After fulfilling the preconditions from the above section, it will be necessary to find an acceptable risk-based premium scheme, and this is the most difficult part of preparations for the application of risk-based premia. As Illustration 1 clearly shows it will be impossible to apply option models and market or classification indicators in the Republic of Croatia, as is the case in most other countries. One of transparent models already applied in practice, for example the former or present model of the FDIC, could always be used as a design of a model based on fundamental indicators.

However, every design should be tested on actual data to determine whether it measures with sufficient precision, at least *ex post* expected loss of the DAB. Moreover, for each proposed model it is necessary to determine how much other elements of the deposit insurance system or the financial system in general contribute to the volatility of predictions of future DAB losses. Environmental elements that most often increase the volatility of predictions of future losses to the insurer are political forbearance regarding the limit of the covered amount and the coinsurance clause,[11] the insurer's inability to curb the growth of the share of insured deposits in total deposits in a bank during its compulsory or voluntary exit from the market[12] and hesitation on the part of regulators to close a bank that is reasonably suspected of being insolvent.[13] Also, the shortness of the time series of

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11 An excellent example is provided by the policy of the Croatian government in summer 1998 when the deposit insurance coverage limit was raised to HRK 100,000, whereas the coinsurance clause was abolished. The most extreme example is provided by the policy of the governments of Turkey, Japan, Korea, Ecuador and Columbia that, under public pressure, eliminated the deposit insurance coverage ceiling during banking crises.

12 In 1999, the so-called deposit splitting occurred in the Republic of Croatia. This considerably increased the amount of insured deposits in financially distressed banks, which in the end led to an unexpected increase in losses the DAB suffered with respect to these banks.

13 Regulatory forbearance is often incorporated in standard models for the fair premium determination. However, the quantification of a parameter describing this forbearance is most often a very ungrateful task.

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data needed for the model assessment and unpredictability of monetary and prudential measures by monetary and supervisory authorities, all of which are typical characteristics even of advanced transition economies, additionally increase the volatility of the model parameters, and thus also the volatility of predictions concerning future losses to the insurer.

Finally, one should also analyse the proposed models within a complete (equilibrium) macroeconomic model to determine whether they establish socially optimal premium schemes. Still, it is impossible to test the social optimality of the model in a situation where the national accounts are unreliable, and where there is not even a basic macroeconomic model of the national economy, as is the present situation in Croatia. In this situation, it is necessary to *a priori* give up on the introduction of risk-based premia or accept that it is impossible to assess the component of social costs of risk-based premia. In the latter case, a fiscally optimal model should be chosen, i.e. a fair premium model (which is by definition socially non-optimal) that would reduce the costs of the insurer and of the government as the guarantor of the insurer's losses, to the least possible measure.

Therefore, if a feasibility study on the application of risk-based premia in Croatia were to be conducted in the near future, it would have to provide an answer to two important questions: 1) how to deter a threat to the success of the application of risk-based premia that is presented by low financial and institutional development; and 2) how to accurately and precisely estimate future losses of the DAB in view of the history of regulatory forbearance in dealing with bank troubles, lack of the coinsurance clause, and the DAB's inability to prevent the so-called deposit splitting? An alternative is to postpone such an analysis until a future time when some of the mentioned obstacles to smooth functioning of the risk-based premium system may already be removed if not in order to prepare the preconditions for the application of the risk-based premium itself, then because of the fact that their removal would additionally boost transparency and stability of the domestic safety net.

All of the above suggests that the optimal strategy for Croatia is to considerably intensify efforts to identify a system of risk-based deposit insurance premia that would be best for our country and focus on the satisfaction of certain basic preconditions for its successful introduction and subsequent application in the near future.

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Notes

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