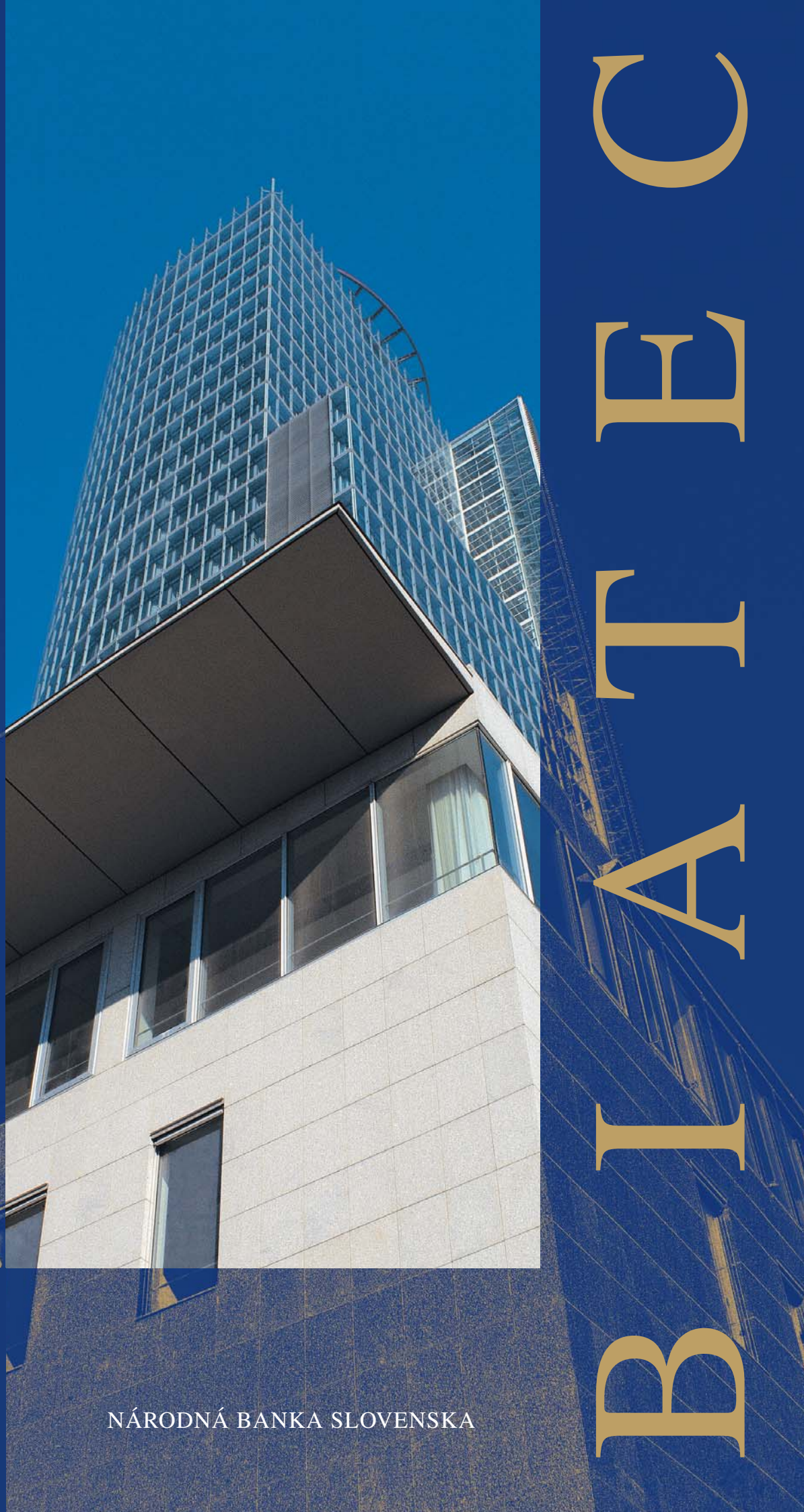


9

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# C E T A I B



NÁRODNÁ BANKA SLOVENSKA





# Generation €

In this pilot project, comprehensive school students presented their views on currency policy.

*Project Generation € is a euro area comprehensive school competition held under the auspices of the European Central Bank and other national central banks. The National Bank of Slovakia participated in the pilot project together with Belgian, Italian and German central banks. It is not only a comprehensive school competition, most of all, it is an event which helps to financially educate the young generation. Its first part places emphasis on raising awareness of the ECB and Eurosystem by means of explaining the tasks and activities of these institutions.*



*Students from four Bratislava comprehensive schools took part in the pilot project.*

The competition targets teams of 16 – 19 year old students from euro area countries (5 students + 1 teacher). As part of the pilot project and the competition itself, students had the opportunity to take their very first look inside ECB Governing Council negotiations, and to learn about the principles and rules governing decision-making regarding interest rates.

The winning national team will take part in a workshop at the ECB, where the winners' view of the euro's impact on their future will be discussed. The winners will be awarded a 'Eurowinner' prize by the president of the European Central Bank. They will also take home valuable prizes from the National Bank of Slovakia and the European Central Bank.

## THE PILOT NBS PROJECT FINALS

The comprehensive school competition pilot project finals - 'Generation €' - were held at the National Bank of Slovakia in November.

Students from four Slovak comprehensive schools could verify in practice which factors need to be considered when formulating currency policies.

The final round was preceded by essays justifying decisions about the development of interest rates in the euro area, which were assessed by NBS experts. The following comprehensive schools took part in the competition: Gymnázium J. Papánka, Bratislava; Gymnázium Jura Hronca, Bratislava; Obchodná akadémia Račianska and Obchodná akadémia Nevädzová, Bratislava.

*(continued on page 32)*



*The committee (from the right) – Renáta Konečná, General Director of the Monetary Policy Department, Martin Šuster, Director of the Research Department, and Jana Kováčová, Head of the Press and Editorial Section – watched each team's presentation very carefully.*

The winners of the pilot project was Obchodná akadémia Račianska, who presented and justified their decision concerning the development of interest rates in the euro area in the most credible way and at the highest level of expertise as they saw it prior to the ECB Governing Council meeting.

The runner-up team was Gymnázium Jura Hronca. Third place went to Obchodná akadémia Nevädzová, and fourth to Gymnázium J. Papánka.

The winners were awarded prizes and diplomas by committee members Renáta Konečná, General Director of the Monetary Policy Department, Martin Šuster, Director of the Research Department, and Jana Kováčová, Head of the Press and Editorial Section.

The goal of the pilot project was to polish details before launching it officially in the next academic year, autumn 2011.

### **THE COMPETITION WILL HAVE THREE ROUNDS**

Generation € competition comprises three parts, the first of which being an online quiz with three levels of difficulty concerning the ECB and Euro-system, the role of money, the stability of prices, and currency policies. The best students will form teams and proceed to the second round, which consists of a written essay predicting and justifying the ECB Governing Council's decisions about interest rates. Only the first five teams qualify for the final round.

The finals will consist of the presentation and justification of the decision regarding interest rates. In defending their position, students will also have to actively participate in the discussion. The committee will assess the presented decisions about currency policies, the argumentation, the concept, presentation time limit observance, the level and quality of presentation, communication abilities and cooperation, and the activity of all team members.



*The winning team of the Generation € pilot project competition – students from Obchodná akadémia Račianska in Bratislava.*

*Photo: Igor Plávka*



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### Publisher:

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### Editorial Board:

doc. Ing. Jozef Makúch, PhD. (Chairman)

Ing. Viliam Ostrožlík, MBA

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PhDr. Jana Kováčová

Mgr. Martin Šuster, PhD.

### Editorial staff:

Ing. Alica Polónyiová

tel.: +421/2/5787 2153

alica.polonyiova@nbs.sk

PhDr. Dagmar Krištofičová

tel.: +421/2/5787 2150

dagmar.kristoficova@nbs.sk

### Address:

NBS, Editorial Office BIATEC

Imricha Karvaša 1, 813 25 Bratislava

e-mail: biatec@nbs.sk

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# Monetary policy operations of the European Central Bank and its impact on the money market of the euro area<sup>1</sup>

Ing. Roman Kostelný  
Národná banka Slovenska

*The current tension on the global financial markets has necessitated the intervention of individual central banks. Their procedures for financial crisis impact alleviation with the aim of supporting the operation of banking systems has varied, especially based on the fact as to whether they operated directly or indirectly. For central banks, direct impacts meant accepting such measures that their interventions contributed to the removal of the causes of the financial crisis. For this reason, the most frequent measures focused on support for the recovery of business activity on the securities market by means of programmes determined for the direct purchase of assets that had become non-liquid. In addition to market support, the purchase of assets provided their owners with access to funds. On the other hand, some financial markets were impacted secondarily from other financial markets. In this instance the adopted measures focused on the alleviation of indirect impacts by means of the framework of monetary policy operations, namely by providing liquidity to the banking sector.*

<sup>1</sup> The document focuses on the assessment of the period limited by the maturity of the first one-year LTRO, i.e. July 2010.

## **1. PERFORMANCE OF THE ECB MONETARY POLICY OPERATIONS AND TRADING ACTIVITY ON THE MONEY MARKET DURING PRE-CRISIS PERIOD**

### **The position, tasks and objectives of the ECB**

The Eurosystem consists of the European Central Bank and the national central banks of the euro area Member States. The objectives of the Eurosystem monetary policy are mainly focused on supporting the general economic policies in the European Community while preserving the principle of an open market economy with free competition and efficient allocation of resources. However, pursuing its objectives, cannot be contrary to the primary objective of monetary policy that maintain price stability defined as the inflation rate of below, but close to 2 % over the medium term. This objective is fulfilled by means of a set of monetary policy instruments, namely open market operations, standing facilities, and minimum reserves. The ECB bodies have decision-making powers for determining monetary policy and also empowering for its execution. However, monetary policy instruments are executed on decentralised manner, at the level of national central banks of the euro area.

The performance of ECB monetary policy is transferred to the non-price and price level. In the

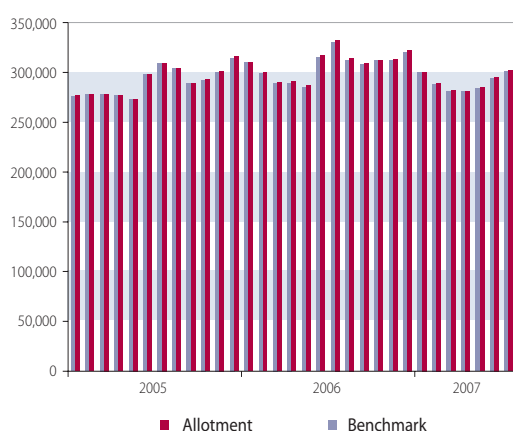
case of non-price level by means of changes in the setting of key interest rates or on the monetary basis, such may influence conditions on the money market, operation of the real economy (output), and the availability of loans for non-financial entities. On the other hand, the impact on price level represents its primary objective. The transmission mechanism serves for the transfer of monetary policy performance. From several markets within the interbank market, the ECB has chosen only the money market because by means of this it can most efficiently manage and fulfil monetary policy objectives. The key role of the money market is represented by its ability to distribute and re-distribute the funds among market participants. If failing in the fulfilment of its tasks, the ECB could possibly intensify its intermediation role.

### **Trading activity on the euro area money market**

Under standard conditions, trading activity on the money market of the euro area took place among numerous counterparties. However, among these a special role was played by the biggest banks that assisted its efficient functioning by ensuring the duty of an intermediary among other market participants. For smaller entities, access to funds was ensured mainly within a banking group, for some also outside it. It depended mostly on the



**Chart 1 Average values of the benchmark against average amount allotted in MROs (in EUR million)**



Source: ECB data.

way in which fund distribution was selected in consideration of the specific features of individual banking groups. Under standard conditions, there was also a smaller group of banks on the money market with which the other entities limited transactions to lower amounts and shorter-term maturities.

## Open market operations

The efficient operation of the money market was not sufficient to ensure enough funds for financing the expected liquidity flows. The reason for this was the fact that the banking sector of the euro area had primary funds at its disposal by means of which it was not able to cover overall liquidity need. For this reason, the ECB accessed the money market to satisfy demand for insufficient funds by means of providing the funds. For this purpose, it had a set of operations of monetary policy at its disposal by means of which it supplied refinancing funds to the market.

Under standard conditions, the ECB conducts refinancing operations, the main (MROs) and

three-month longer-term refinancing operations (LTROs). The ECB's effort for the supply of funds into the banking sector of the euro area is creating more flexibility in steering of money market interest rates, managing liquidity situation and signalling the stance of monetary policy. Due to this, the most important part of liquidity need is satisfied by means of MROs with the share representing about 75%. The aggregate demand of counterparties in these operations was accepted up to the amount of the calculated allotment benchmark<sup>2</sup>. The ECB made allotments of shorter refinancing resources closely beyond the level of the summary liquidity needs, this contributed to the banking sector stabilisation within the euro area and maintained a balance, i.e. without any more significant fluctuations in the form of surplus or shortage of liquidity.

The remaining part of the liquidity not covered by the MROs was balanced by means of three-month longer-term operations – LTROs. The ECB satisfied demand for longer-term funds up to the amount of an intended volume published in advance that was much lower compared to the MROs. The reason was the nature of longer-term funds that only represented additional funds for the banking sector. That is also the reason why their share under standard conditions fluctuated around 25%.

In addition to the regularly executed refinancing operations in accordance with the published indicative calendar, they also initiated a fine-tuning operation (FTO) to smooth short-term liquidity fluctuations either by providing or absorbing. Its execution was conditioned by the extraordinary circumstances on the money market. Under standard circumstances they were used most frequently on the last day of the reserve maintenance periods either for absorbing the accumulated surplus of liquidity since the last MRO, or for covering the lack of liquidity.

## Standing facilities

Apart from the open market operations the banks also had standing facilities at their disposal. Unlike

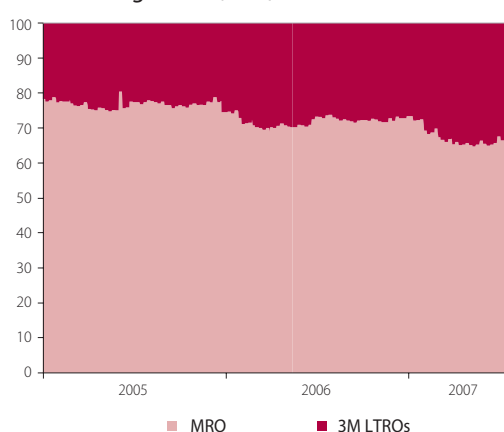
<sup>2</sup> Allotment benchmark represents the provision of the optimum amount of refinancing resources in the MROs for ensuring trouble-free fulfilment of the PMR up to the next MROs.

**Chart 2 Development of refinancing of the euro area banking sector (in EUR million)**



Source: ECB data.

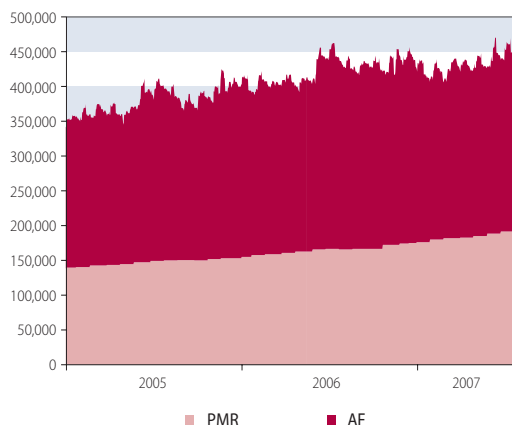
**Chart 3 Structure of refinancing funds of the euro area banking sector (in %)**



Source: ECB data.



**Chart 4 Development of liquidity need of the euro area banking sector (in EUR million)**



Source: ECB data.

<sup>3</sup> EONIA index (Euro OverNight Index Average) is calculated as a weighted average of O/N unsecured loans on the money market (where the weights are the sums of overnight deals) performed within the euro area by banks included in the group of reference bank on one business day.

the open market operations execution based on the ECB's decision, the standing facilities were initiated by banks. By means of refinancing or deposit facility they could settle the residual liquidity imbalances. However, their use under standard conditions is very rare and in very low volumes because the banks could trade the potential temporary lack or surplus of funds on the interbank market.

#### Liquidity need of banking sector

The liquidity need of the banking sector of the euro area is defined according to the ECB by means of two factors. The most important role is played by autonomous factors (AF) representing liquidity flows of the banking sector outside the ECB's control. Their size is conditioned by the behaviour of the general public (e.g. in the case of banknotes in circulation) or institutional agreements (e.g. accounts of governments held in central banks). The amount of autonomous factors of the euro area on the liability side is higher than on the asset side, and that is why the difference in the form of net autonomous factors creates a shortage of liquidity in the banking sector. Another factor contributes to this deepening – minimum reserves. Their tasks is – inter alia – to stabilize money market interest rates. Both factors contribute to the creation of the environment of a system lack of banking sector liquidity in the euro area. For this reason, money market participants depend on ECB refinancing operations to contribute to the better conducting of monetary policy and the ensuring of its goals.

#### Development of market interest rates

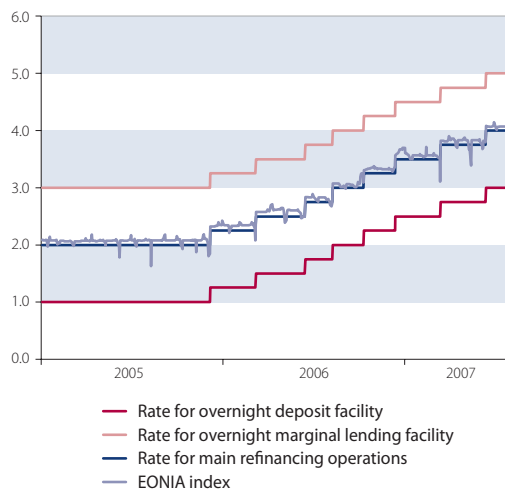
The ECB influenced the development of market interest rates on the money market by means of monetary policy operations. The most significant reaction was showed by overnight interest rates with overnight trades forming the major group of deals on the money market. Consequently the ECB designed the EONIA<sup>3</sup> index to serve for better monitoring of the quality position on the money market. The EONIA index provides information

about the realised overnight transactions of the most important banks in the form of a weighted average interest rate and the amount traded. The ECB selected the EONIA index management to be the operative objective of monetary policy. For this reason it manages banking sector liquidity in such a way that the value of the index oscillates closely around the key interest rate. Its stable development was supported by the allotment of refinancing funds in open market operations at the level of overall liquidity needs.

The corridor for the development of overnight interest rates is formed by the interest rates of automated operations. The standard range is symmetric, i.e. the same distance of the rate of overnight refinancing and deposit facility as the interest rate for main refinancing operations.

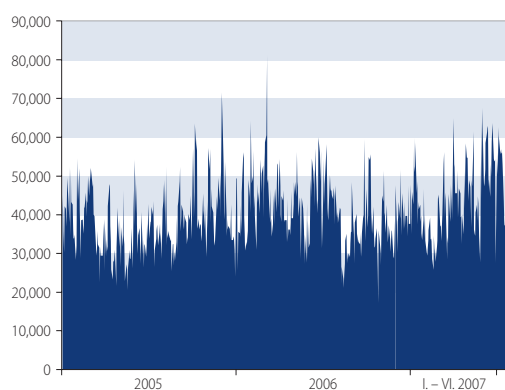
The development of most short-term interest rates was also transferred to mid-term and long-term interest rates. Among such, the ECB monitored the development of three-month maturity indicating the willingness of money market participants to borrow as well as expectations regarding interest rates.

**Chart 5 EONIA index development (in %)**



Source: ECB data, Bloomberg.

**Chart 6 Development of the amount of trades included in the EONIA index (in EUR million)**



Source: ECB data, Bloomberg.



The stabilisation of the money market situation by means of the optimum development of open market operations eliminated the increase of the risk premium of market interest rates. This fact was reflected in better liquidity management, as the simplification of estimating costs related to funds ensuring served to remove insecurity in financing the expected liquidity flows. For this reason it was not necessary to have more funds at disposal than current liquidity needs. This was also reflected on depositing funds on current accounts at the level of minimum reserves. Due to this, during the periods the banks were cumulatively fulfilling determined minimum reserves more evenly, slightly over the level of 100%.

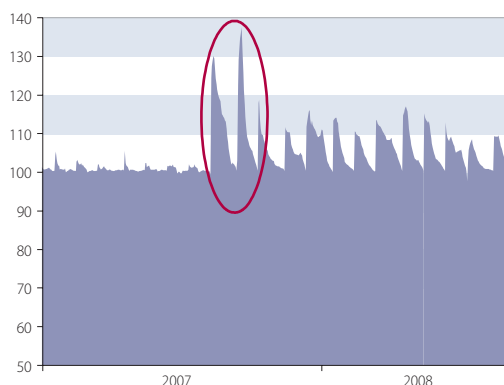
## 2. ADJUSTMENTS IN THE PERFORMANCE OF MONETARY POLICY OPERATIONS AND THEIR IMPACT ON TRADING ACTIVITY ON THE MONEY MARKET SINCE THE FINANCIAL CRISIS

The development on the money market of the euro area can be divided into several stages. The ECB continually made efforts to adjust its procedures to resolve the most significant problems whilst also gradually directing the situation – although only partially – to pre-crisis standards.

### Period from August 2007 till September 2008

Trading on the money market of the euro area were adversely affected by the transferred tension from the US dollar financial market, this led to a major increase in the demand of banks for funds. The insecurity relating to ensuring fund sufficiency contributed to increasing the risk premium across the interest curve. Within the individual maturity periods, the most significant reaction was showed by the shortest interest rates by extending the range between the side of bid and ask and volatility increase. The participants of the money market acceded to business activity limitation as a result of which the leeway for trans-

Chart 7 Fulfilment of minimum reserves after August 2007 (in %)

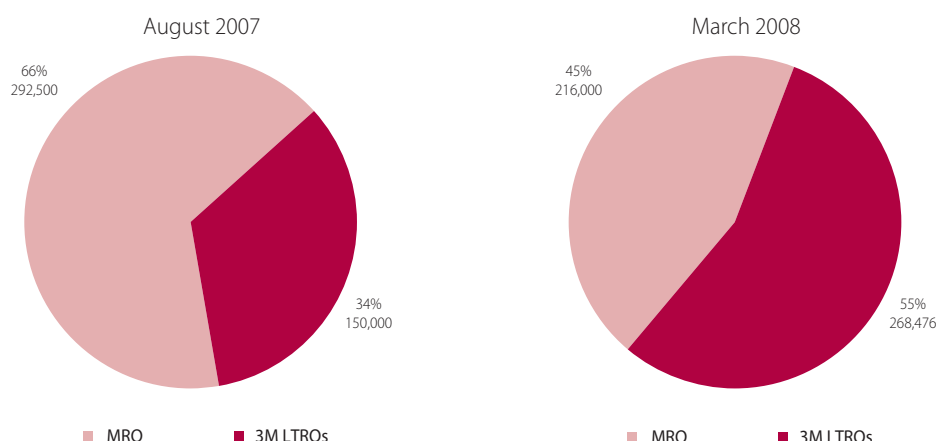


Source: ECB data.

actions narrowed. The ECB accessed the money market to smooth liquidity fluctuations with the supply of refinancing resources by means of fine-tuning operations. The supply of liquidity alleviated the volatility that had supported the fulfilment of the operative objective of monetary policy maintaining the shortest interest rates close to the key interest rate. Only a narrow group of counterparties lending sources provided by the ECB to other entities on the money market could participate on the fine-tuning operation.

The ECB, in addition to providing overnight funds by means of fine-tuning operations also acceded to the change of allotments of refinancing sources in MRO, where it accepted an aggregate demand slightly over the calculated benchmark. It made the most of allotments into operations at the start of the periods so that the banking sector had more funds at its disposal than its liquidity needs. Depositing additional funds on current accounts was immediately reflected in the more significant growth of the cumulative fulfilment of minimum reserves that contributed to the simplification of their fulfilment.

Chart 8 Comparison of the structure of refinancing of the ECB before and after the implementation of supplementary three-month LTROs (in EUR million)

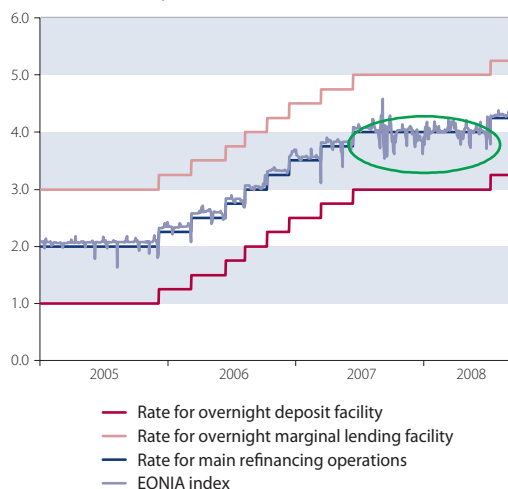


Source: ECB data.





**Chart 9 Development of the EONIA index (in %)**



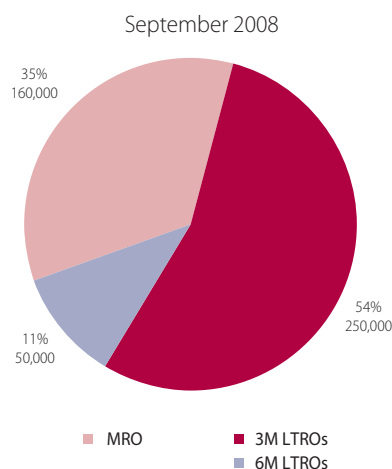
Source: Bloomberg.

The higher supply of shorter refinancing resulted in the decrease of shorter interest rates. To reduce the risk premium of mid-term maturities, the ECB in addition to three-month operations usually performed at month-end also implemented longer-term operations with the same maturity period.

In spite of supplementary operations, the banking sector of the euro area did not have bigger funds at its disposal, because the ECB continued allotments of shorter refinancing based on the calculated benchmark. Its value decreased with the growth of the amount of longer refinancing, which in fact only represented the compensation of shorter funds for longer ones. The objective of the ECB was to retain the balance of the banking sector, thus it balanced short-term liquidity fluctuations with more regular performance of fine-tuning operations during the periods.

Additional three-month operations only contributed to the change of the structure of refinancing of the ECB, namely by major growth of

**Chart 10 Shift in the structure of refinancing of the ECB after the implementation of two six-month LTROs (in EUR million)**



Source: ECB data.

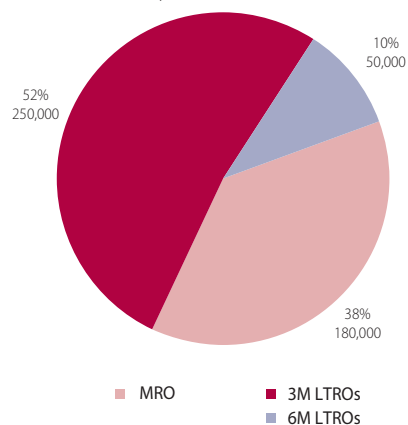
the share of LTROs to the level of 60%. This disrupted the former structure of the maturities of liquidity in the banking sector, because the LTROs of resources assumed the nature of MROs. However, the total funds from refinancing operations of the ECB remained at about EUR 450 billion.

The EONIA index recorded more volatile development around the key interest rate caused by the change in the allotments of shorter refinancing resources. The ECB continued to manage the operative objective of monetary policy, and because of that by means of more regular fine-tuning operations during the periods it moved the EONIA index closer to the key interest rate.

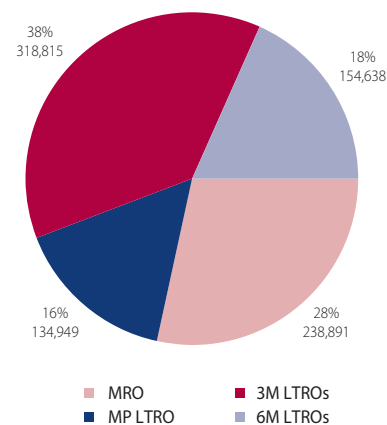
Supplementary three-month long-term operations released the tension in mid-term maturities. However, they started to increase again at the beginning of 2008. The risk premium reached higher levels not recorded since the financial crisis broke (August 2007). To eliminate the growing tension

**Chart 11 Development and structure of the refinancing of the euro area banking sector (in EUR million)**

Before the implementation of unconventional measures (September 2008)



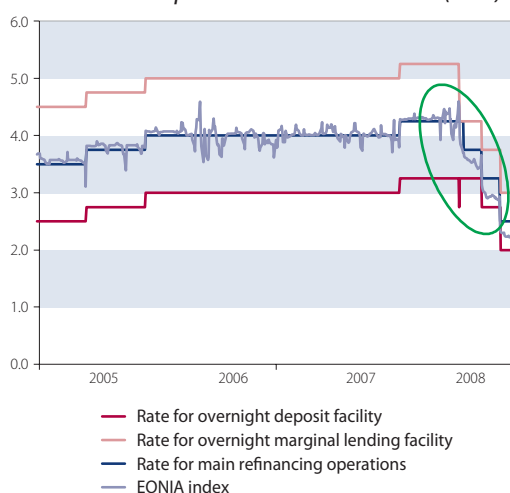
After the implementation of unconventional measures (December 2008)



Source: ECB data.



Chart 12 Development of the EONIA index (in %)



Source: Bloomberg.

and to support the recovery of trading activity on the money market, the ECB extended the scope of longer-term refinancing operations by six-month maturities. However, there were only two operations with amounts lower than the amounts of three-month LTROs.

The ECB continued the management of banking liquidity in such a way that the allotted funds from supplementary operations did not contribute to exceeding liquidity need. Therefore, the change occurred only in the structure of refinancing, namely by the transfer of shorter funds mostly to six-month ones. The share of MRO decreased by longer-term funds below 40%.

#### Period from September 2008 till December 2008

In mid-September 2008 as a result of market participant concerns regarding the insolvency of financial institutions, tension on the money market intensified significantly. The mistrust was supported mainly by the failures and takeovers of several major institutions in the USA. The consequences relating to the bankruptcy of Lehman Brothers had a much stronger impact on trading activity on the money market than the financial crisis at the beginning of August 2007.

By initiating fine-tuning operations, the ECB balanced liquidity fluctuations, and in the following MROs it decided for more extensive provision of liquidity more significantly above the benchmark. In addition, it decided about extending the framework of monetary policy operations by the one the maturity of which is identical with the duration of the maintenance period.

In spite of operations conducted, no satisfaction occurred on the money market of the euro area. The participants limited trades to shorter maturities narrowing also the scope of counterparties. The growing mistrust made the participants access to funds on the money market more difficult. The only possibility for ensuring such funds was participation in the ECB's refinanc-

ing operations. Several banks that had obtained funds before mainly by trading activity on the money market, expressed stronger interest in access to the monetary policy operations. The wider scope of acceptable counterparties was reflected in the increase of bidders in refinancing operations of the ECB.

The ECB approved a set of unconventional measures focusing on the alleviation of the intense tension with the aim of recovering trading activity on the money market. The objective was also to remove uncertainty regarding the ensuring of funds in refinancing operations, and because of that it decided for their conducting at a fixed interest rate and especially for the non-limiting of accepted overall demands (fixed rate full allotment procedures). It also adjusted the schedule of operations during the periods. In addition, it provided all acceptable counterparties with the opportunity to participate in fine-tuning operations.

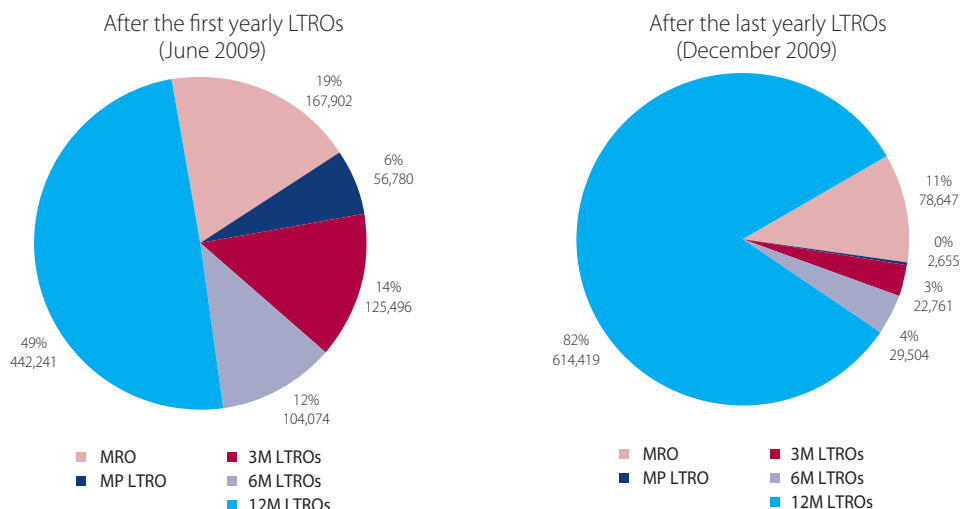
In addition to the changes in the conducting of monetary policy operations, the ECB narrowed the corridor of the interest rates of standing facilities from the original range of 200 base points to 100 base points, and for the first time since the beginning of the financial crisis it decreased the key interest rates.

The ECB left liquidity management up to the banking sector itself. By unlimited demand, participants were drawing much more refinancing than overall liquidity needs. Refinancing by the end of 2008 for the first time exceeded the level of EUR 800 billion.

As a result of narrowing the standing facilities corridor, it was not attractive for banks to access the money market because the premium for transaction execution was too low compared to ECB operations. For this reason, the participants were substituting funds not traded on the money market with the increase of refinancing. Much higher drawing of funds from refinancing operations and continuing mistrust even more significantly inhibited trades. Funds not invested were deposited by means of overnight deposit facility, while in this way the banking sector sterilised about 30% of total refinancing funds. Its significant use was evidence that the money market does not provide for the optimum distribution and re-distribution of free funds among its participants. The role of the ECB as the intermediary on the money market gradually intensified.

Under the impact of the unlimited supply of liquidity and several decreases of key interest rates, market interest rates decreased more significantly. The EONIA index pressurised by the cumulated surplus of liquidity, decreased below the level of interest rate for which the ECB provided refinancing.

The ECB continued to balance liquidity fluctuations by means of fine-tuning operations. However, in comparison with the former period it did not conduct them more regularly during maintenance periods, but only on the last day. The objective was at least on this day to get the EONIA index closer to the level of the key interest rate.

**Chart 13 Development and structure of refinancing resources of the ECB (in EUR million and in %)**

Source: ECB data.

#### Period from January 2009 till June 2009

By the beginning of 2009 the money market participants had a significant surplus of liquidity at their disposal accumulated from refinancing operations made in the previous year. The unallocated free funds were deposited by means of overnight deposit facility, and the use of this facility exceeded for the first time the level of EUR 300 billion. The banks had at their disposal up to 40% of the total refinancing resources as a reserve for covering potential fluctuations in liquidity flows.

By easing tension on the money market, the banks were able to significantly reduce the created reserve of free funds. Most probably, the extension of the interest corridor of standing facilities to the original level of 200 base points participated in the slight recovery of trading activity. The banks decreased refinancing by drawing almost EUR 200 billion. The exposure in longer-term operations decreased most of all, while the interest in shorter ones remained unchanged. Hence its share increased to amounts close to 40%. In spite of a more significant decrease of refinancing, the sector remained in liquidity surplus. The reason was persisted bidders that could not trade on the money market. On the other hand, there were less risky entities that could substitute the due operations with trades. The attractiveness of deals is represented by the use of cheaper financing of liquidity needs for market interest rates below the level of the key interest rate of the ECB.

With the recovery of trading activity on the money market and lower liquidity surplus, the EONIA index gradually got closer to the level of the key interest rate. In spite of that, it did not exceed the level for which the ECB was allotting refinancing funds. The reason was the continuing limitation of trades to less risky entities.

A more significant reduction of refinancing occurred after the ECB announcement to conduct one-year operations. The attractiveness of this operation was represented by the maturity that

could not be traded on the money market. In addition, the participants considered the interest rate of this operation to be advantageous as they did not expect further adjustments of key interest rates.

#### Period from June 2009 till December 2009

The initial objective of the one-year operations was to reduce the risks related to the financing of liquidity needs. The one-year funds provided would contribute to the creation of a reserve for the support of confidence improvement among participants on the money market. By freeing the tension at ensuring funds to increase the willingness of banks to lend to non-financial sector. This meant that the conducting of the one-year operation was focused, in addition to the money market, also on the support of the recovery of economic growth in the euro area.

Participants most significantly reduced shorter shortly before the first one-year operation. With the supply of one-year funds in the amount of EUR 442 billion, refinancing reached a new historical maximum of EUR 900 billion. This amount contributed to the decrease in market interest rates to lower levels, and the EONIA index got closer to the interest rate level for overnight deposit facility.

By ensuring sufficient funds from the first one-year operation, banks were reducing interest in other operations. However, in the upcoming two one-year operations participants showed much lower interest caused by the satisfaction of liquidity needs in the first operation, or limited investment opportunities.

After the supply of one-year funds, access to temporarily free funds on the money market did not change which means that the trading activity among less risky banks continued. One-year operations contributed to the coverage of summary liquidity needs as reflected in the minimisation of realised trades.

*To be continued in the next issue.*





# Financial education and financial literacy in Slovakia

Ludmila Fabová

*Institute of Management of the Slovak University of Technology in Bratislava*

*Every day we come across many financial products that have a bigger or smaller impact on our lives and the lives of our families – that is why we should understand these products and be able to use them for our benefit. This requires at least some basic financial knowledge necessary for the successful management of our personal finances, i.e. financial literacy. It is generally known that financial literacy in Slovakia is low as not enough attention is currently being paid to it.*

## FINANCIAL LITERACY

The low level of financial literacy of Slovak inhabitants can be seen in the high numbers of deceived people who have fallen for the fake promises of non-banking entities, often losing their life-long savings to such unscrupulous operators. Even today, it is not uncommon to hear and read about cases of people who unwittingly sign disadvantageous loan contracts with similar non-banking institutions, at high interest rates and even higher sanctions for delayed payments. Unable to repay such loans, or with excessively growing sanctions, people often lose their homes – these are the main focus for the mostly bogus creditors, as property usually serves as the guarantee for such loans.

However, a lack of financial literacy may also be a threat to people related with renowned financial institutions that are concerned more with their profits than with the security and satisfaction of their clients. Some financial institutions often use massive advertising to offer people “greatly beneficial financial products” – though many people do not really understand them, they are allured by their “beneficial” qualities. This means that people with low financial literacy run into excessive debts because they have chosen a loan, or more loans, that do not correspond to their incomes, or they have believed financial consultants who have convinced them about the profitability of insurance or investment products that they sell. This is also seen in the growing number of complaints from bank clients as dealt with by the bank ombudsman.

## FINANCIAL LITERACY SURVEYS

The low level of financial literacy in Slovakia was also pointed out by the Slovak Bank Association (SBA) which, in cooperation with MVK, carried out a survey of the financial literacy of the Slovak Republic general public in September 2007. When ordering the survey, the SBA relied on background papers and the results of similar surveys carried out abroad as well as following OECD recommendations. The aim of the survey was to as-

certain the level of financial literacy, respondents' opinions on the topic of financial education, and their opinion on the current level of informedness about financial products. Survey respondents were bank clients aged 18 – 75.

The level of knowledge regarding the personal finances of respondents was measured by the financial literacy index (I-FIG) that measures the ability of clients to make efficient decisions in the area of personal finance management on the basis of analysing available information. The index is based on respondents' objective assessments, and consists of 10 questions covering the topics of current accounts, loans, deposits and investment. It may reach a value of 0 to 1 and represents the basic initial value for future comparisons. The financial literacy index reached an average level of 0.56 points in the SBA survey, which means that out of 10 questions, fewer than 6 questions were answered correctly on average; in other words, 56% questions were answered correctly. The achieved index level was mainly influenced by respondents' education and income level (continual proportion), and less so by age (reciprocal proportion) or occupation.

The highest I-FIG levels were achieved by university-educated consumers (0.66), entrepreneurs, self-employed people (0.65), and respondents aged 26 – 45 (0.60). On the other hand, the lowest I-FIG level was achieved by retired people (0.48), unemployed (0.47), consumers aged 66 – 75 (0.44), and consumers with elementary education (0.43). The survey suggested that there was enough information about offered financial products; however, bank clients did not understand basic financial concepts; that is why they were not able to analyze and evaluate such products. Most survey respondents felt that financial education was necessary for them (63%), should be available to all age groups (72%), and should be included in the school curricula (71%).

The SBA found the financial literacy level as shown in their survey to be insufficient or lower than expected, as the optimum result they had hoped to reach was two-thirds of questions an-



swered correctly. However, this was not the case. For example, respondents had problems understanding the concept of 'yearly cost percentage' (RPMN), while only 19% of respondents knew what it meant; it was even unknown to clients who had a mortgage. Survey respondents could not distinguish between the concepts of a credit and a debit card, and they were also not able to evaluate the offer of term deposits; half could not compare these products, instead trusting their banks or families/friends. [1] [2]

A similar survey to the above-mentioned was carried out by us as part of the instruction of economic subjects at one of the faculties of the Slovak University of Technology in Bratislava, with survey respondents being first-year students of both Bachelor and Master degree courses. The students were asked 10 questions covering basic financial knowledge that standard bank clients need to have when managing their own personal finances. Questions concerned yearly interest rate, nominal and real interest rate, taxing of interest yields, loan insurance, and the selection criteria of deposit and loan products.

The financial literacy index of our respondents reached an average level of 0.568, similar to the SBA survey (0.56). In particular, it means that 56.8% questions were answered correctly. Most respondents also evaluated their own financial literacy before the survey as being average, a view that was confirmed. Interestingly, the same success rate was achieved by first-year students of Bachelor and Master degree courses – i.e. there is no difference between their financial literacy. The students were quite well-oriented in deposit products; however, this cannot be said of loan products, which might be connected to the fact that they have never drawn a loan. The question of 'which indicator reveals most about total loan costs' was answered correctly (RPMN) by 50% of the first-year students of Bachelor degree courses, but by only 32% of first-year students of Master degree courses. The worst-answered question regarded deposit insurance – only 15% of respondents answered correctly that if their bank went bankrupt they would not lose any of their savings. In contrast, the highest success rate (98% correct answers in both student groups) was achieved with the answer to the question: who bears liability for damage incurred for a credit card loss with its PIN written and placed together with it (the card holder)?

All in all, our respondents achieved the financial literacy level of an average Slovak inhabitant, or slightly higher. However, if we compare them with the group of SBA survey respondents from the point of view of achieved education, i.e. high-school graduated respondents who have passed their school-leaving examinations, in the SBA survey their average was 60% correct answers, while our respondents had only 56.8% correct answers. This means that they have a slightly lower financial literacy than the average high-school graduate Slovaks who have passed their school-leav-

ing examinations. It may depend on which high schools they graduated from, and how much their schools were concerned with financial issues.

Let us state one interesting fact – the mentioned faculty offers an optional subject focused on banking in the first year of Bachelor degree courses where students can obtain basic financial literacy. We carried out the survey with students who had selected this subject as part of their final exam. The financial literacy index of these students was 0.759, which means that almost 76% of answers were correct. Having finished the subject, the financial literacy of these students increased by 0.191 points, i.e. the number of correct answers was 19.1% higher than before they started the subject. To compare: the highest I-FiG in the SBA survey was 0.66 and was achieved by university graduate respondents. In spite of better results, almost 63% of respondents still found their financial literacy as being average, and only less than 15% as being above-average – this roughly corresponds to the number of students who were marked 'A' in the mentioned subject.

## FINANCIAL EDUCATION

Nevertheless, the low financial literacy of inhabitants is not only a Slovak problem. It is a worldwide issue which was being dealt with by the OECD a few years ago. They appointed a committee whose task was to elaborate the principles of financial education in the form of a syllabus, the subject of which should be taught at schools in each member state. Students aged 13 to 16 would become familiar with the basic principles of personal finance management. It is exactly these young people becoming adults who should learn how to manage their finances in the future.

The European Union is also concerned with the financial education of its citizens. As early as December 2007 the European Commission stressed the need for such education and called on member states to support the provision of financial education by the means of national and regional offices, non-government agencies, and the financial service sector. Financial education should help people understand financial products and notions, develop the skills necessary to improve financial literacy, and to make informed decision when selecting financial services. The point is that based on the committee surveys, a lot of consumers do not understand financial products and services and cannot choose products suitable for their needs and their financial provision for the future. That is why the European Commission has pursued several activities to support consumer education in the area of financial services. The online education module, DOLCETA, represents a useful aid in the area of financial services not only for consumers but also for teachers to help them incorporate financial education in the study programs of elementary and secondary schools. [3]

The Government of the Slovak Republic responded to the appeal of the European Commission in July 2008 by approving the paper "Propos-



ing a strategy in financial education and personal finance management" submitted by the Minister of Education. Among other outcomes of the proposal was a task to implement the strategy of financial education in the educational activities of further education submitted for accreditation. In relation to the adopted resolution was a "National Financial Literacy Standard" elaborated where financial literacy is defined as 'the ability to use knowledge, skills and experience for the efficient management of one's own financial resources with the aim of guaranteeing life-long financial well-being for people and their households. Financial literacy is not an absolute state; it is a continuum of abilities that are conditioned by variables such as age, family, culture and residence. Financial literacy denotes a state of continuous development enabling each and every person to respond efficiently to new events in their personal lives and to a constantly changing economic environment.' [4] The National Financial Literacy Standard defines the scope of knowledge, skills and experience in the area of financial education and personal finance management. It is determined by school founders, teachers, creators of school education programs and the authors of methodical materials.

According to the National Standard, financially literate secondary-school graduates should understand all key aspects of personal finances at least in general terms. That means that as part of their financial education they should learn mainly the following:

- to understand basic financial concepts;
- to be well-oriented in services provided by financial institutions and be able to use them efficiently;
- to obtain and assess financial information;

- to use basic rules of personal finance management and to meet their financial obligations.

The National Financial Literacy Standard sets ambitious goals in the area of financial education; however, teachers will find here neither contents nor methods of financial education, though many are also in the group of low financial literates. They should be helped by the Centre of Methodology and Pedagogy which offers education programs focused on financial literacy to teachers. There is also an idea to create a Financial Literacy Bank – an on-line portal for teachers, students, as well as graduates offering education materials as well as discussion forums related to financial literacy issues. There is also a plan to publish two teaching aids for teachers, a Financial Literacy Calendar, and an Open Book of Financial Literacy. The following organizations should participate in the educational activities: the Entrepreneurs Association of Slovakia (Združenie podnikateľov Slovenska), non-profit organization Junior Achievement Slovakia, and the Foundation for the Children of Slovakia (Nadácia pre deti Slovenska) with the project "Get to know your money".

As the state or the Ministry of Education is now dealing with issues of financial education mostly at primary and secondary school level, the faculties are left to deal with the financial literacy of university students of non-economic faculties (economic faculties have these issues incorporated in their study programs) who have not received such education until now; or it will be up to professors teaching economic subjects at such faculties, or the students themselves. If interested, students can increase their financial literacy also individually, as currently there are many free materials dealing with financial literacy, and several web pages also focus on financial education.

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3. <http://www.fininformation.eu>
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# Trading on BSSE in the module of auction trading

Ing. Radoslav Bajus, PhD.

Faculty of Economics of the Technical University in Košice

*Trading Rules of Bratislava Stock Exchange, j.s.c., (BSSE) are issued in accordance with Article 18 of Act No. 429/2002 Coll. on stock exchange as amended by subsequent legislation, and they govern the conditions of trading with securities on BSSE, conditions for the suspension and interruption of trading, cancelling of stock exchange trades, and the pertinent rights and obligations of the members and the stock exchange. The Rules and changes thereof are approved by the National Bank of Slovakia upon the proposal of BSSE Board of Directors in accordance with Act No. 747/2004 Coll. on financial market supervision and on change and complementing of certain acts of law as amended by subsequent legal regulations.*

In accordance with stock exchange rules, stock exchange trade is considered to be the purchase and the sale of securities – through the conclusion thereof, an obligatory relationship between the trade participants originates, as governed by generally binding legal regulations and stock exchange rules. Buying and selling stock exchange members act as participants of the stock exchange trade here. A buyer and a seller in a stock exchange trade can also be the one and the same subject.

Time and place of the stock exchange trade are determined by stock exchange rules. Only stock exchange members and the National Bank of Slovakia can trade on the stock exchange. A legal person licensed to trade with securities can only be a member of the stock exchange. Stock exchange trade participants are not allowed to conclude stock exchange trades aimed at causing damage to third parties, especially stock exchange trades where the aim is to achieve such quotation of security that does not correspond to the current demand and supply of this security.

BSSE organizes trading with securities on the market of listed securities and on the free stock exchange market. It organizes trading with shares, bonds and allotment certificates.

The following types of stock exchange trades are concluded on BSSE:

- quotation making trade – where a buyer and a seller undertake to buy and/or sell such a number of securities at such a price as generated by matching their orders in the trading system,
- direct trade – where a buyer and a seller undertake to buy and/or sell such a number of securities at such a price as confirmed in their orders for direct trade conclusion.

The BSSE trading system is divided into the following modules in accordance with the method of matching:

- auction trading module,
- continuous trading module,
- module of trading with market makers,
- block trading module.

Trading on the BSSE is carried out through the Stock Exchange Electronic Trade System (EBOS) daily. The basic principle consists in the active

**Table 1 Course of trading on the BSSE**

Time	Trading
8:30 – 10:30	Placing orders, trading results acceptance from previous day
10:30 – 10:50	Trading in the module of auction trading, results processing, placing orders
10:50 – 11:00	Preparation – placing orders
11:00 – 14:00	Placing orders
11:00 – 14:00	Matching in the module of continuous trading, in market makers module and in the module of block trading
14:00 – 14:10	Confirmation of orders for direct trades and repo trades
14:10 – 14:20	Preliminary close
14:20 – 14:50	Close of the day
14:50 – 16:00	Distribution of results and trading information

Source: Processed based on [http://www.bsse.sk/Content/SK/Burza/burzove\\_pravidla.1st/05\\_Prav\\_obchod\\_od010409.pdf](http://www.bsse.sk/Content/SK/Burza/burzove_pravidla.1st/05_Prav_obchod_od010409.pdf).



Table 2 Allowed bands

Trades	Allowed price band boundaries
Quotation making trades and block trades with shares and allotment certificates being traded on the listed market	$\pm 10\%$ from the value of middle price band, minimally $\pm \text{€ } 0.1$ from middle price band
Quotation making trades and block trades with shares and allotment certificates being traded on the free market	$\pm 30\%$ from the value of middle price band, minimally $\pm \text{€ } 0.1$ from middle price band
Quotation making trades and block trades with bonds and state treasury bills being traded on the listed market	$\pm 5\%$ from the value of middle price band, minimally $\pm \text{€ } 0.1$ from middle price band
Quotation making trades and block trades with bonds being traded on the free market	$\pm 10\%$ from the value of middle price band, minimally $\pm \text{€ } 0.1$ from middle price band
Direct trades	without limit
Repo trades	without limit

Source: Processed based on [http://www.bsse.sk/Content/SK/Burza/burzove\\_pravidla.lst/05\\_Prav\\_obchod\\_od010409.pdf](http://www.bsse.sk/Content/SK/Burza/burzove_pravidla.lst/05_Prav_obchod_od010409.pdf).

placing of orders for purchase and sale to the computer by each member separately. It means that a stock exchange trade is concluded directly between members who are represented by brokers. Orders for purchase and sale are placed by members through the working stations of the EBOS system, which are located in their registered offices and connected to the stock exchange central computer.

Trading on BSSE is exemplified in Table 1.

### AUCTION TRADING MODULE ON BSSE

Trading in this module is based on the batch processing of orders for purchase and sale of securities at a given moment of time. For each emission of securities, which was a subject to at least one offer, there is calculated one auction price according to an algorithm at which price all trades are concluded. The algorithm for calculation secures the maximal number of traded securities and minimal overhang, i.e. the difference between total purchase and sale. The calculation of auction price – fixed quotation is as follows:

- auction price has such value that secures the highest total number of securities in matched orders,
- if there are several auction prices, the auction price is such price, by which there is minimal overhang, whereby the term overhang is the difference between the total number of securities on the side of purchase and orders on the side of sale with price not worse than the given price,
- if there are several auction prices, in the case of an overhang of orders on the side of purchase the highest of these prices is chosen, and in the case of an overhang of orders on the side of sale the lowest of these prices,
- in the case there are several auction prices, the auction price is such price nearest to the previous average quotation,
- in the case there are several auction prices, the stock exchange will decide on determining the auction price.

Stock exchange rules stipulate a condition, by which the auction price cannot be higher than the value of the upper boundary of the allowed price band, and it cannot be lower than the value of the bottom boundary of the allowed price band. Values of upper and bottom price band boundaries are depicted in Table 2.

Table 3 Orders accepted prior to trading

Time	Purchase /Sale	Limit in EUR	Number of pcs of securities
8:31	P	38	25
8:32	P	32	14
8:38	S	33	18
8:39	S	39	25
8:41	S	to the best	55
8:44	P	31	29
8:45	S	34	18
8:48	S	37	28
8:55	P	37	33
8:57	P	36	45
8:59	S	39	26
9:05	P	to the best	42
9:07	P	38	44
9:09	S	35	41
9:15	P	34	28
9:19	S	33	47
9:45	S	38	55
9:55	P	41	41
9:56	S	41	25
10:00	P	38	54
10:01	P	40	22
10:05	P	35	45
10:10	S	40	35
10:29	S	40	25

Source: Own processing.



Table 4 Orders for purchase and sale arranged according to price

Orders for purchase		Orders for sale	
Number of pieces	Limit in EUR	Number of pieces	Limit in EUR
42	to the best	55	čo naj.
41	41	18 + 47	33
22	40	18	34
25 + 44 + 54	38	41	35
33	37	28	37
45	36	55	38
45	35	26 + 25	39
28	34	35	40
14	32	25	41
29	31	19	42

Source: Own processing.

Table 5 Calculation of a fixed quotation

Orders for purchase		Limit in EUR	Orders for sale		Difference (number of unrealized trades)
Accumulated volume	Number of pieces		Number of pieces	Accumulated volume	
42	42	to the best		373	373 – 42 = 331
83	41	41	25	373	373 – 83 = 290
105	22	40	35	348	348 – 105 = 243
105		39	26 + 25	313	313 – 105 = 208
228	25 + 44 + 54	38	55	262	262 – 228 = 34
261	33	37	28	207	261 – 207 = 54
306	45	36		179	306 – 179 = 127
351	45	35	41	179	351 – 179 = 172
379	28	34	18	138	379 – 138 = 241
379		33	18 + 47	120	379 – 120 = 259
393	14	32		55	393 – 55 = 338
393		to the best	55	55	393 – 55 = 338

Source: Own processing.

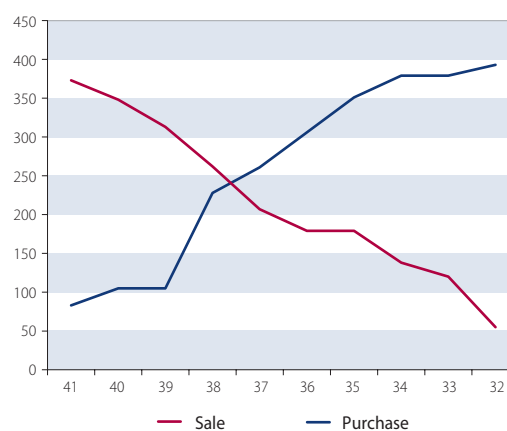
Trading in the auction module will be shown in an example. In Table 3, there are orders for the purchase and sale on the BSSE presented. They are arranged according to the time placed into the EBOS system.

It is necessary to differentiate these orders from orders defining sale and orders defining purchase, and at the same time to arrange them according to the limit. On the stock exchange the limit on the side of purchase means the maximum possible price the buyer is willing to accept for the purchase, and on the side of the sale it means the minimum possible price at which the seller is willing to sell the security. In Table 4, there is a differentiation of the orders for purchase and sale according to the limits depicted.

The creation of the fixed quotation of security follows next. The calculation is exemplified in Table 5.

Table 5 shows the fixed quotation is € 38. The number of trades carried out will be 228, the number of unrealized trades will be 34. All of trades will be concluded at the price of € 38. On

Graphical depiction of the fixed quotation



Source: Own processing.

the side of purchase, the orders with the limit higher than and equal to the fixed quotation of € 38 will be carried out, on the side of sale the orders with limit lower than and equal to fixed quo-





tation will be carried out. A graphical depiction is on the following figure.

A basic factor influencing the creation of the quotation of securities and its changes on the stock exchange is the relation between supply and demand. A particular amount of quotation is thus being created on the basis of this relationship. Under the supply of securities of a particular kind are both individual and aggregate offers understood as the sum of individual offers. By analogy it is in the case of demand – here it is also necessary to differentiate between individual and aggregate demand. The supply is represented by existing securities (whether physical documents or as data in computer memory), the demand is represented by money in the hands of investors (in cash or in accounts). The encounter of supply and demand on the stock exchange must take place in an organized manner within the time allocated for trading. The manner of accomplishing this encounter is also influenced by the amount of the quotation. Basically there can either be an individual centre when the quotation is determined at a certain moment of time and it does not further change during the course of time allocated for trading, or there are encounters of changing supply and demand within the time allocated for trading on the stock exchange.

Based on the mentioned example, the following rules can be formulated:

- The quotation must enable the realization of the highest possible number of securities, i.e. it must be near as possible to the equilibrium between demand and supply.
- All orders limited "to the best" are to be carried out with priority.
- All orders for purchase limited with price higher than quotation and all orders for sale limited with price lower than quotation are to be executed.
- Orders for purchase or for sale limited by recorded quotation do not have to be executed at all, as long as this quotation does not represent an ideal equilibrium.
- All orders for purchase limited with the price lower than quotation and all orders for sale limited with the price higher than quotation cannot be taken into account.

Quotations of securities on the stock exchange are market prices. They are created and changed freely as a function of aggregate supply and demand as concentrated on the stock exchange, and the prices are thus a point of equilibrium. Quotations enable the daily encounter of a large number of intended purchases and sales. Quotations thus do not originate at random. The change of quotation is an expression of the change of intentions of the buyers and the sellers, and of the change of their opinion on the value they attribute to the securities with which they are trading.

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# International regulatory standards regarding the financial market

JUDr. Peter Pénzeš, LL.M., PhD.  
Národná banka Slovenska

*The objective of this contribution is to provide brief characteristics of the duty of international regional associations, international financial institutions, and associations of supervisory bodies the regulatory standards of which play a role in the design of binding regulations of the financial market legal governance.*

1 Argentina, Australia, Brazil, China, France, India, Indonesia, Japan, South Africa, Canada, Republic of Korea, Mexico, Germany, Russia, Saudi Arabia, United States of America, Italy, Turkey and Great Britain

2 For more details: Declaration of Summit on Financial Markets and World Economy, 15 November 2008. Available on: [http://www.g20.org/Documents/g20\\_summit\\_declaration.pdf](http://www.g20.org/Documents/g20_summit_declaration.pdf). Declaration on strengthening of financial system, London, 2 April 2009. Available on: [http://www.g20.org/Documents/FM\\_CBG\\_Declaration\\_-\\_Final.pdf](http://www.g20.org/Documents/FM_CBG_Declaration_-_Final.pdf). Leaders' statement, Pittsburgh Summit, 24 and 25 September 2009. Available on: [http://www.g20.org/Documents/pittsburgh\\_summit\\_leaders\\_statement\\_250909.pdf](http://www.g20.org/Documents/pittsburgh_summit_leaders_statement_250909.pdf).

The legal governance of financial market entities was subject to national regulation up to the beginning of the 1970s. Banking sector growth, its gradual globalisation, and at the same time the bankruptcy of several big banking institutions, however, have led to a strengthening of the need for co-operation between supervisory bodies at the international level for information exchange as well as determining the same regulation standards for entities under supervision. From the banking industry, this trend has with some delay also been transferred to other areas of the financial system. From the end of the 1980s international institutions started to play a major role in the field of creating standards of legal governance of the financial market. Especially after the Asian financial crisis in 1997 and 1998, it became evident the serious impacts that financial industry crisis can have on the whole economy. For this reason, the World Bank and the International Monetary Fund which had previously focused on measures in the area of the real economy, have started to be more involved in this area.

## DUTY OF INTERNATIONAL REGIONAL ASSOCIATIONS AND INTERNATIONAL FINANCIAL INSTITUTIONS IN THE REGULATION OF FINANCIAL MARKET ENTITIES

At the political level, the key role in the field of financial market regulation is played by the **G20** group of countries. It is an informal association of representatives of major developed and developing world economies, established in 1999 as a response to the already mentioned Asian financial crisis. It consists of the finance ministers and governors of central banks of 19 countries<sup>1</sup>, the twentieth member being the EU represented at the negotiations by the chairing country of the EU Council and the European Central Bank.

The G20 meetings are also attended by representatives of the International Monetary Fund and the World Bank. Its members represent 90% of world gross domestic product, 80% of world trade, and two thirds of the world population. This gives the G20 quite a strong mandate to accept strategic decisions that influence regulation

in a global scope. The meaning of G20 is mostly represented by the fact that it provides for discussion among its members, and looks for solutions acceptable for developed and developing countries. It focuses on issues of economic development and global economic stability, an important part of which is financial market stability. Inter alia, at its summits they approve documents and determine priorities for further development of the legal regulation of key components of the financial market. It played a major role in relation to the financial crisis between 2007 and 2010 when it assumed the duty of liaison in this issue and accepted fundamental principles of world financial system reform (regulation of bonuses in financial institutions, creating supervision of rating agencies and hedge funds)<sup>2</sup> by which it influenced the legislative initiatives of the European Commission.

Another important institution is the **Financial Stability Board (FSB)** which plays a key role in the co-ordination of other bodies, organisations and associations in the field of determining global standards and co-operating with the International Monetary Fund and the World Bank. The Board was established in 2009 based on the resolution accepted during the London G20 Summit when it substituted the Financial Stability Forum (FSF) which had performed the function for the previous ten years. Compared to its predecessor, it fulfils a wider mandate comprising the following duties:

- assessment of risks that endanger the financial system and the formulation of measures needed for the removal of such risks
- improvement of co-ordination and information exchange among the supervisory bodies
- monitoring of financial market development and assessing whether any changes in regulation are required
- monitoring the development of standards prepared by global regulatory organisations and co-ordinating their work in such a way that it focuses on the current priorities and covers areas without sufficient regulation
- preparation of guidelines for the support of the foundation of supervisory bodies boards that



3 International Bank for Reconstruction and Development (IBRD), International Development Association (IDA), International Finance Corporation (IFC), Multilateral Investment Guarantee Agency (MIGA) and International Centre for Settlement of Investment Disputes (ICSID).

will simplify the performance of supervision over global financial groups

- fulfilment of duties in the field of crisis management, and in co-operation with the IMF, improving the system of timely warning against crisis occurrence.

The Board associates the representatives of central banks, supervisory bodies, and ministries of finance of the G20 countries and Spain. The members include the European Commission and the majority of global institutions in the field of financial market regulation. The resolutions and documents accepted by the Board are not legally binding, however, the members respect them. At the same time, they must duly implement the key standards for a secure financial system prepared by global institutions. Compliance with these standards is monitored by means of the so-called peer review mechanism, i.e. mutual assessment among the members.

At the expert level we have to mention the **International Monetary Fund** that focuses on global issues of the balance of payments and exchange rates. It provides countries with loans for bridging problems associated with imbalances in balance of payments, which is often the reason for various deformations in the economic system either of a structural nature or incorrect macroeconomic policy. The equilibrium of the balance of payments is also determined, however, by the stability and creditworthiness of the financial market. For strengthening, it provides developing countries with technical assistance in the form of financing of consulting at the improvement of the legal framework. In this respect, the standards prepared in the area of data presentation, and transparency in the field of fiscal and monetary policy and the implementation of which its supports are also also important.

It also co-operates in the improvement of the standards of the global regulation system and supervision of the financial markets created by other institutions. It performs activities in the field of the improvement of some items of the analysis and prevention of a crisis situation occurring, e.g. in the area of a better understanding of relations of the real economy, financial sector, and the external stability of individual economies. Its objective is also the improvement of an efficient system of timely warnings against potential crisis.

In the field of promoting own and other global regulatory standards, it participates in the preparation of programmes of financial sector assessment that may be ordered by any Member State.

A major role in this respect is also played by the **World Bank**, as established during an international conference in July 1944 in Bretton-Woods (U.S.A.). Membership in the World Bank is conditioned by membership in the International Monetary Fund. The World Bank consists of a group of institutions<sup>3</sup> each of which focuses on its partial matters within the main mission of the Bank, which is the fight against poverty. From the perspective of financial market regulation,

the importance of this institution is especially represented by its analytical work and providing so-called technical assistance to less developed countries, i.e. assistance with the building of institutional and legislative framework of financial market. The Slovak Republic was authorised to accept aid from the World Bank till 2008, when it was transferred to the category of developed countries meaning that it lost the right for technical assistance. The World Bank participated here, for instance, in the implementation of the second pillar pension scheme.

Together with the International Monetary Fund, it participates in the development of financial sector assessment programmes.

### INTERNATIONAL REGULATORY STANDARDS

The institutions mentioned so far fulfil rather a decision-making, co-ordination, or advisory role in the field of international regulation of the financial market. In addition are international standardisation institutions that directly form the rules for the regulation of individual sectors of the financial market. In so doing, they follow the best practices of their members, mostly supervisory bodies in the individual states. The standards so created are of a so-called "soft law" nature, i.e. rules not formally enforceable that become binding only by potential transformation into the national legal order. From the legal point of view they are usually international organisations or interest associations of national supervisor bodies. Their meaning increased mostly at the end of the 1990s and at the beginning of the 21<sup>st</sup> century when under the impact of big financial scandals (the bankruptcies of Enron, Worldcom, Parmalat) and the crisis on the financial market (the so-called "dot com" crisis) they started to focus more on formulating and asserting regulatory standards.

The objective of the **Organisation for Economic Cooperation and Development (OECD)** is support for accepting legal regulations for ensuring sustainable economic growth and employment. This objective also includes support for the efficient functioning of financial markets where the OECD focuses on the harmonisation of the legal regulation in this area, and the convergence of supervisory bodies' procedures. By placing the ratification deed of the Slovak Republic's accession to the OECD Convention with a depositary (Government of the Republic of France) on 14 December 2000, the Slovak Republic became the 30<sup>th</sup> official member of the OECD. In the OECD the Slovak Republic is represented by a Permanent Mission of the SR at the OECD in Paris. The most important standards of the OECD for the area of the financial market from our point of view are definitely the OECD Principles of Corporate Governance accepted in 1999, updated in 2004. The reason for the update was experience from the mentioned accounting scandals in some American and European companies at the turn of the millennium. The OECD Principles have become the basis for the creation of national codes of cor-



- 4 [http://www.bsse.sk/Content/SK/Emiteni/Corporate\\_governance.lst/kodex\\_od100709.pdf](http://www.bsse.sk/Content/SK/Emiteni/Corporate_governance.lst/kodex_od100709.pdf)
- 5 Act No. 431/2002 Coll. on accounting as amended
- 6 Commission Regulation (EC) No. 1126/2008 of 3 November 2008 adopting in compliance with the Regulation of the European Parliament and of the Council (EC) No. 1606/2002 certain international accounting standards (text with EEA relevance) Official Bulletin of the EU L 320, 29 November 2008, pg. 1 – 481
- 7 Regulation of the European Parliament and of the Council No. 2006/43/EC of 17 May 2006 on statutory audit of annual accounts and consolidated accounts amending and supplementing the Regulations of the Council 78/660/EEC and 83/349/EEC and cancelling the Regulation of the Council No. 84/253/EEC of 9 June 2006 L 157/87
- 8 International Standards on Auditing (ISAs) at EU level. A Study on the costs and benefits of an adoption of the ISAs in the EU. Available on: [http://ec.europa.eu/internal\\_market/auditing/docs/ias/study2009/report\\_en.pdf](http://ec.europa.eu/internal_market/auditing/docs/ias/study2009/report_en.pdf)
- 9 Consultation on the adoption of the international standards on auditing. Summary of comments. March 2010. Available on: [http://ec.europa.eu/internal\\_market/auditing/docs/isa/isa-final\\_en.pdf](http://ec.europa.eu/internal_market/auditing/docs/isa/isa-final_en.pdf)
- 10 Article 18 of the Act No. 540/2007 Coll. on auditors, audit and supervision of audit and on amendments and supplements to the Act No. 431/2002 Coll. on accounting as amended.
- 11 The original name is the Committee on Banking Regulation and Supervisory Practices (CBRSP). It subsequently became the Basel Committee on Banking Supervision.
- 12 Regulation of the European Parliament and of the Council No. 2006/48/EC of 14 June 2006 on taking up and pursuit of the business of credit institutions (reviewed wording) (text with EEA relevance), Official Bulletin of the EU L 177, 30 June 2006, pg. 1 – 200.

porate governance in the majority of developed countries. Also in the conditions of the Slovak Republic, the Code of Corporate Governance in Slovakia<sup>4</sup> has been accepted. This forms part of the exchange rules of the Securities Exchange in Bratislava. According to the Act on accounting<sup>5</sup> every company that issues securities accepted for trading on the regulated market, is obliged in its annual report to provide a declaration about corporate governance comprising a reference to the code and information about any deviations from the code and reasons for such deviations (the so-called “*comply or explain*” principle). Compliance with the code is not imposed as a liability, but in such instance of non-compliance a company must declare that it does not follow any code. At the same time it must state the reasons for such position.

Compared to the institutions mentioned before, the **International Accounting Standards Board (IASB)** is of the nature of a private non-profit company headquartered in London. The main duty of the Board is to create a common set of high quality global accounting standards that will ensure that the accounting information reported by companies is transparent and comparable worldwide. The main outcome of the activities of the Board are International Accounting Standards (IAS) and International Financial Reporting Standards (IFRS) generally accepted and integrated into European law.<sup>6</sup> In this way they became binding for instance for Slovak banks, insurance companies, other financial institutions, and firms obliged according to the Act on accounting to prepare financial statements in compliance with the IFRS.

**The International Auditing and Assurance Standards Board (IAASB)** is part of the International Federation of Accountants headquartered in New York (IFAC). Its objective is improving the harmonisation of audit work performance in individual countries. Its most important “product” is the International Audit Standards. These have not been adopted by European secondary law yet, however it can be assumed that the European Committee will soon propose this. According to Article 26 of the Statutory Audit Regulation<sup>7</sup> the Committee is authorised to accept the stated standards in the form of issuing a binding legal regulation, if such would contribute to the high credibility and quality of audited financial reports. A study<sup>8</sup> prepared for this purpose in 2009 clearly comes to such conclusion, likewise public consultations<sup>9</sup>, and it can be expected that it is only a matter of time before the stated standard becomes part of the regulation.

In this respect, the Slovak Republic has gone even further and also based on the outcomes of the Financial Sector Assessment Programme (FSAP) it determined the legal obligation of audit for accounting units headquartered in the Slovak Republic according to the International Audit Standards issued by the International Federation of Accountants (IFAC).<sup>10</sup> In this instance, the standard has been absorbed directly into the national

legal order. Similarly, the standard prepared by the International Association of Insurance Supervisors (IAIS) has also been reflected in the Slovak Act on insurance business. The European legal regulation is more detailed in this respect and its transposition into our legal order resulted in an improved level of regulation than prescribed by the standard.

The most important international institution in the field of banking regulation is the **Basel Committee on Banking Supervision (BCBS)**. It was established in 1974 by the central banks of the G10 countries and Luxembourg as one of the committees of the Bank for International Settlement (BIS).<sup>11</sup> It is a platform for the co-operation of countries that are its members in the field of banking supervision regulation. Its duty is to prepare regulatory, standards, guidelines and recommendations binding only for members of the Committee. Such only become binding for financial market entities if transposed to national legal regulations. It is the most important international body in the field of regulatory standards, as evidenced by the fact Basel I and Basel II became the model for the regulation of the prudent business of banks, and in the conditions of the European Union they have been transposed to the banking guidelines<sup>12</sup> that all EU Member States had to transpose to their national orders.

**The International Association of Insurance Supervisors (IAIS)** was established in 1994 as a forum for the co-operation of the bodies of regulation and supervision in the field of insurance. At present, it associates over 190 members from 140 states. Its main duty is preparing international standards for efficient regulation and supervision over insurance companies. Its most important outcome are the Insurance core principles that should serve as a benchmark for developing countries and as an aid for developed countries when preparing and improving domestic legislation in this area. The Financial Market Authority was accepted as an IAIS Member in 2002. At present, the Slovak Republic is represented in this organisation by the Národná banka Slovenska.

**International Organisation of Securities Commissions (IOSCO)** established in 1974 associates the national bodies of supervision and regulation in the field of financial markets. Its main objective is the creation and dissemination of regulation standards in this area. The most important outcome of the organisation are Objectives and Principles of Securities Regulation. At present, it has 110 ordinary members. In IOSCO, the Slovak Republic is represented by the Národná banka Slovenska.

**The Committee on the Global Financial System (CGFS)** was established by the central banks of G10 countries similar to the Basel Committee. Its main duty is the systematic monitoring of the conditions of the world financial system, and preparing prospective analyses of financial markets operation. In addition to analytical work, it also focuses on formulating recommendations





*Twelve key standards for a safe financial system according to the Financial Stability Board*

Area	Standard name	Standard originator
Economy policy and data transparency		
Transparency of monetary and fiscal policy	Code of Good Practices on Transparency in Monetary and Financial Policies	IMF
Transparency of fiscal policy	Code of Good Practices on Fiscal Transparency	IMF
Data presentation	Special Data Dissemination Standard (developed countries)/General Data Dissemination System (developing countries)	IMF
Institutional and market infrastructure		
Bankruptcy	Insolvency and Creditor Rights	World Bank
Corporate governance	Principles of Governance	OECD
Accounting	International Accounting Standards (IAS)	IASB
Audit	International Standards on Auditing (ISA)	IFAC
Payments and clearing	Core Principles for Systemically Important Payment Systems, Recommendations for Securities Settlement Systems	CPSS CPSS/IOSCO
Market integrity	The Forty Recommendations of the Financial Action Task Force / 9 Special Recommendations Against Terrorist Financing	FATF
Regulation and supervision of the financial market		
Banking supervision	Core Principles for Effective Banking Supervision	BCBS
Regulation in the field of securities	Objectives and Principles of Securities Regulation	IOSCO
Insurance of insurance business	Insurance Core Principles	IAIS

Source: [http://www.financialstabilityboard.org/cos/key\\_standards.htm](http://www.financialstabilityboard.org/cos/key_standards.htm)

for the improvement of the operation of financial markets and the improvement of their stability. Its specific outcome, for instance, was the development of principles for the creation of a liquid market with state securities.

**The Committee on Payment and Settlement Systems (CPSS)**, like the already mentioned committees, was established by the central banks of the G10 countries. It provides for the co-operation of its members in the field of payment and clearing systems and provides monitoring and performs analyses in this area. It formulates regulatory and supervisory standards in this field which are the basis for the framework of the supervision of payment systems of the ECB.

**The Financial Action Task Force on Money Laundering (FATF)** was established at a G7 meeting in Paris in 1989 with the objective of analysing trends in the field of money laundering and means of its suppression. Its most important outcome was the formulation of forty recommendations for the battle against money laundering, amended after 11 September 2004 in the USA with nine recommendations for the battle against the financing of terrorism.

The group consists of 33 countries; Slovakia is not a member. In addition to the preparation of standards it also assesses compliance therewith and supports the implementation of such standards by non-member states.

The global standards prepared by the above mentioned institutions were summarised in 1999 by the Financial Stability Forum (now the Financial Stability Board) under the common name of "Twelve key standards for a sound financial system". From the formal point, the above mentioned standards are divided according to scope into the three areas indicated in the table. They cover all the "building blocks" of the sound legal regulation of the financial market.

## CONCLUSION

In addition to the institutions mentioned above in the area of standards determination, there are a number of other international entities the impact of which however is low. An example is the International Organisation of Pension Supervisors (IOPS), established recently that has not issued any important standards so far.

As for the quality and acknowledgement of international standards by financial market entities, in 2006 the International Monetary Fund issued a study<sup>13</sup> from which it results, inter alia, that from the perspective of financial institutions, the most valuable is the Core Principles for Effective Banking Supervision prepared by the Basel Committee. Much less respected are the IAIS and IOSCO standards. It must be noted, however, that the stated principles are not determined for financial market entities, but rather for states and the supervisory bodies thereof.

<sup>13</sup> Regulation of the European Parliament and of the Council No. 2006/49/EC of 14 June 2006 on the capital adequacy of investment firms and credit institutions (recast), Official Bulletin of the EU L 177, 30 June 2006, pg. 201 – 255.



# From Micro- to Macro- prudential Financial Regulation

Ing. Tomáš Tózsér, PhD.  
Národná banka Slovenska

*The article deals with the topical issue of the improvement of financial system regulation. It presents selected proposals which often concur in the fact that financial regulation should place more emphasis on systemic risk, i.e. endogenous systemic risk. This is the result of the tendency among financial institutions to behave in the same way, and from the activities of large and complex financial institutions in the systems. In order to reduce the likelihood of systemic crises occurring and the entailing significant costs to the taxpayer, micro-prudential regulation needs to be expanded to include a macro-prudential dimension.*

<sup>1</sup> The Bank of England Discussion Paper (2009) distinguishes between two forms of systemic risk against which the capital surcharge is imposed: 1) aggregate risk (which relates to collective tendencies in markets at any point in time in the credit cycle), and 2) network risk (which arises from individual institutions not taking sufficient account of the spillover effects of their actions on others in the financial network).

## MACRO-PRUDENTIAL REGULATION AND SYSTEMIC RISK

One of the basic tools of bank regulation is the capital adequacy requirement – i.e. the minimum amount of capital that a bank is required to hold against risks related to its business. The credit crisis of 2007-2009 demonstrated that the current approach to the capital adequacy of banks is too narrow. The crisis exposed the fallacy of composition that strong financial institutions collectively ensure the safety and soundness of the system as a whole. Banks have a tendency to behave in the same way – they invest in similar assets, they are exposed to identical risks, and their risk appetite shifts at the same time.

Persaud (2009) shows that this homogeneity in banks' behaviour may even be supported by the rules of micro-prudential regulation (regulation focused on individual firms). If a bank sells an asset on which the risk of a loss is high, it acts prudently and in accordance with capital adequacy rules. If, however, several banks act in a similar way at the same time, the asset prices will fall, thereby triggering losses and further sales. If this leads to a general fall in asset prices in different markets, the situation may snowball into a loss spiral with liquidity being drained from the markets. The spread of contagion in financial markets is further amplified by the ever greater interconnectedness between banks, other financial institutions, and their customers. Thus the collapse of one firm can easily jeopardise the stability of others, and a local event of relatively minor significance can take on systemic or global importance. The Warwick Commission Report (2009) warns that if financial regulation is excessively focused on the resilience of individual institutions (banks, insurance companies, etc.) to exogenous risks, it may in practice lead to an escalation of systemic risk. The regulatory framework for prudential business therefore needs to be redirected towards systemic risk. An endogenous risk of the financial system arises

from the collective behaviour of institutions, as well as from the systemic importance of individual institutions. The task of reducing endogenous risk should be part of macro-prudential policy.

## THE BANK OF ENGLAND'S PROPOSAL FOR A MACRO-PRUDENTIAL REGIME

In a 2009 Discussion Paper, the Bank of England proposes a regime for the macro-prudential regulation of banks. Its main objective is to mitigate the procyclical behaviour of banks, so as to maintain a continuing flow of lending to the economy. This should be supported by the application of capital surcharges that depend on the risk profile of the individual bank. The so-called systemic capital surcharge will be linked to the credit cycle, since the cycle has a significant influence on the collective behaviour of banks. The Bank of England proposes that systemic capital requirements for risk over the credit cycle be applied to headline capital requirements or at a more disaggregated level through so-called 'risk weights' on particular types of bank exposure. In addition, capital surcharges should separately be levied on banks to reflect their individual contribution to systemic risk based on factors such as bank size, connectivity to the rest of the system, and the complexity of their activities (so-called 'institution-specific capital surcharges'). This capital surcharge would lower the probability of the failure of a systemically important institution, and would also provide an incentive for such firms to adjust their balance sheets in order to reduce their systemic importance.

This paper also deals in detail with the technical aspect of making a macro-prudential regime operational. In the case of a systemic capital surcharge, it will first be necessary to define a set of variables indicating the size of the aggregate risk<sup>1</sup> at any point in time. Calibration of the systemic capital surcharge is then based on modelling the link between the set of indicators and banks' de-



fault probabilities, and the link between banks' probability of default and capital ratios.<sup>2</sup>

The calibration procedure for institution-specific capital surcharges is analogous. The objective is to set capital surcharges that lower the probability of default (PD) of those banks whose failure would lead to system-wide losses. The first step is to identify indicators of network risk, including balance sheet size and connectivity to other institutions. To calibrate the capital surcharge, it would then be necessary to quantify the link between a bank's balance sheet indicators of network risk and its contribution to system-wide loss given default (systemic LGD), and also between an individual bank's probability of default and its capital ratio.<sup>3</sup>

Several other measures for mitigating aggregate risk and network risk are also touched on in the Bank of England Discussion Paper (2009). For example, liquidity surcharges could in both cases be calibrated above the existing micro-prudential liquidity requirements, so as to create a liquidity buffer.

### A CONCEPT OF MACRO-PRUDENTIAL REGULATION ACCORDING TO BRUNNERMEIER ET AL.

The view that bank capital requirements need to be raised so that they take into account systemic risk and have a countercyclical effect is also reached by Brunnermeier et al. (2009), the Warwick Commission (2009), and Persaud (2009).<sup>4</sup> These papers (partly because of overlaps in their authorship) all stress that the progress and scope of the recent financial crisis could have been more moderate if the financing of long-term assets with extremely short-term funding had not been expanded to such a marked degree. Since regulation has up to now paid little attention to maturity mismatches between assets and liabilities, banks were emboldened to substantially enlarge their balance sheets (and leverage) through cheaper short-term funding and thereby to boost their profitability. These papers therefore argue (in contrast to the Bank of England Discussion Paper) that if regulation is to be effective in protecting the system as a whole, the capital requirement must also reflect each bank's degree of leverage and the maturity mismatch between its assets and liabilities (illiquidity risk). Brunnermeier et al. (2009) suggest that the final regulatory capital requirement for banks be calculated by multiplying the micro-prudential Tier 1 capital ratio, estimated under Basel II, by factors relating to systemic risk. The weights on systemic factors (credit and asset price expansion, maturity mismatch) and the time period over which credit and asset price expansion will be estimated with respect to quantitative impact studies. When there is increasing systemic risk, the multiplication factor will be greater than 1, while during periods of deleveraging (when lending declines), it will be less than 1. The maturity mismatch multiple should be a function of the months of effective mismatch between the

asset maturity and the funding maturity.<sup>5</sup> The multiple could be in the range of 0.5 to 2.0 with a maturity mismatch of somewhere between 6 months carrying a multiple of 1.0.<sup>6</sup> These papers focus less on the operational details of the macro-prudential regime, and more on the principles on which it should be based. Where certain calculation procedures are mentioned (for example, the abovementioned procedure for increasing the capital charge to take into account liquidity risk), they have an *ad hoc* character. Brunnermeier et al. argue that such an approach is less subjective compared with the calibration process for capital or liquidity surcharges (as in the Bank of England's approach).

### OTHER PRINCIPLES OF MACRO-PRUDENTIAL REGULATION

#### Explicit rules or discretion in regulatory decisions on measures?

The choice of procedure for setting macro-prudential capital requirements clearly influences the stance on how much discretion the regulator should be allowed when deciding on the need to increase or lower capital. The Bank of England maintains that since it is difficult to find an effective rule for macro-economic policy, regulators will base their decisions on judgment to a large extent.<sup>7</sup> The technical judgment will be based on the quantitative data and information available from market participants. On the plus side, a discretionary approach to decision-making means a more flexible macro-prudential regime and the opportunity to enhance it through examining the links between macro-prudential tools, the financial system, and the economy. A clear downside will be that decision-making is less predictable than under fixed rules. With firms thus facing greater uncertainty about their future regulatory requirements, the effectiveness of the regulatory regime may be impaired. The risks of discretion within a macro-prudential policymaking framework may also include the regulator being more susceptible to regulatory capture and to the influence of lobbying from regulated firms, especially at the most sensitive points of the credit cycle. Responding to these disadvantages, the Bank of England proposes that discretion in a macro-prudential regime be constrained through greater transparency in its objectives, decision-making framework, and the policy decisions themselves. It will also be important to have accountability for macro-prudential policy measures enshrined in statute. By contrast, Brunnermeier et al. (2009), the Warwick Commission (2009) and Persaud (2009) stress the need for subjecting macro-prudential regulation to clear pre-specified rules. This is because of the abovementioned downsides of discretionary decision-making, particularly any external efforts to put pressure on decision-making. Having explicit rules in place is, in their view, one of the key principles of effective macro-prudential regulation, since such rules provide a far

- 2 For further details about the final indicative calibration of the capital surcharge on the basis of the available set of variables, see the Bank of England Discussion Paper (2009), Box 4. The indicative calibration implies, for example, that it will be difficult to find a fixed set of indicators that would deliver a robust rule of macro-prudential policy for each situation.
- 3 A more technical treatment of the calibration procedure for the institution-specific capital surcharge is given in Box 5 of the Bank of England Discussion Paper (2009).
- 4 A. D. Persaud is a co-author of Brunnermeier et al. (2009) and a member of the Warwick Commission.
- 5 Banks would, for example, have to prove to their supervisor that the effective maturity of their deposits is longer than one day, perhaps using past deposit behaviour in a stressed environment as evidence. The effective maturity of an asset takes the asset's market liquidity into account and whether the asset is accepted by the central bank as collateral for a loan.
- 6 Regarding a possible approach to raising the micro-prudential capital requirement using a multiplier for credit expansion and leverage, see Persaud (2009), p. 4.
- 7 While rules based on stock imbalances may perform well in capturing mounting risks in an upswing, they are slow to react in a cyclical downturn. Flow measures such as the growth rates of credit and asset prices are affected by the reverse problem, reacting more quickly to the downswing but missing the boom.



8 This proposal is partly a response to the failure of Icesave, an online branch of the Icelandic bank Landsbanki. After Landsbanki was placed into receivership by the Icelandic Financial Services Authority, more than 400,000 British and Dutch depositors were unable to access their money. In the UK, Icesave provided savings accounts offering 6% annual interest, while its annual deposit rates in the Netherlands started at 5% and later rose to 5.25%. In the Netherlands, over a period of five months, Icesave attracted 125,000 customers who invested €1.7 billion. The issue of how to settle these inaccessible deposits blew up into a diplomatic row between the UK and Iceland.

9 For determining the size of an individual institution's contribution to systemic risk, the authors propose using the risk measure CoVaR (Adrian, Brunnermeier, 2009). CoVaR is the VaR (Value-at-Risk) of the whole financial system after conditioning that firm X is in financial difficulty. The marginal contribution of X to systemic risk is expressed by the difference between the CoVaR and VaR values of the whole financial system.

stronger guarantee that regulatory policies will actually be enforced.

### Who should implement macro-prudential regulation?

The Bank of England and Brunnermeier et al. share certain principles of macro-prudential regulation. They concur on the need to increase capital for systemically important financial institutions since these are the source of systemic risk. There is also agreement in their recommendations that cross-border financial institutions operate in host countries through subsidiaries that have their own legal personality (and own capital adequacy ratio), thereby bringing them under the macro-prudential regime of the host country. This would prevent regulatory arbitrage (the avoidance of regulation at the national level). Macro-prudential regulation will be more efficient if implemented at the national level, given that credit cycles, asset-price developments, and the size of systemic risk differ from country to country. At the same time, the host regulator knows how best to assess the risks to "its" financial system. Europe, however, has basically set off in the opposite direction. The establishment of a single financial market in which also the branches (without their own capital) of foreign financial institutions have the freedom to provide cross-border financial services allows the avoidance of macro-prudential regulation at the national level. Thus there is also a need to establish a pan-European systemic regulator whose primary task should be the international coordination of macro-prudential regulatory policies. The Bank of England (2009), for example, proposes that under an international accord, the host regulator could have control over the regulatory requirements applied to exposures to domestic customers, irrespective of where the lending bank is established.<sup>8</sup>

### Which institutions should be covered by macro-prudential regulation?

As for the institutional scope of a macro-prudential policy regime, the Bank of England does not clearly resolve this vital issue, stating that it will be necessary to assess the costs and benefits of two alternative approaches: either restricting coverage to banks, or including a wider set of institutions. The advantage of one is the other's disadvantage. In the first case, where the perimeter of macro-prudential regulation would be the banking sector, a possible drawback is that systemic risk shifts to the unregulated sector. Extending coverage to a wider set of institutions would help prevent this problem, but at the cost of increasing both the operational complexity of the regime and the risk of moral hazard (if non-banks were perceived as having gained access to the state safety net). A clearer view is presented by Brunnermeier et al. (2009), who contend that any financial institution that contributes to systemic risk should be covered by macro-prudential regulation. They divide these institutions into the following four groups

according to the degree of their contribution to systemic risk:<sup>9</sup>

1. 'individually systemic' – large, complex and massively interconnected institutions which have the status of 'national champions' and whose failure by itself could threaten the stability of the entire system;
2. 'systemic as part of a "herd"' – relatively small and insignificant on an individual basis, but their correlated behaviour when they move together as a group could represent a systemic risk (for example, highly leveraged hedge funds);
3. 'non-systemic' – large and not highly leverage financial institutions (for example, insurance companies, pension funds);
4. 'tinies'.

According to Brunnermeier et al. (2009) additional macro-prudential regulation (beyond the scope of micro-prudential regulation) is essential for institutions falling within the first two groups. The respective supervisory authority should periodically update the list of systemically important financial institutions within their jurisdiction and share such information with other regulators/supervisors. Full publication of this list could, however, have more disadvantages than advantages, especially in that it could heighten the risk of moral hazard.

### ALTERNATIVE PROPOSALS FOR MAKING SYSTEMICALLY IMPORTANT INSTITUTIONS MORE RESILIENT TO SHOCKS

The critical events that unfolded in global financial markets in the autumn of 2008 clearly showed, among other things, the considerable shortcomings in the regulation and supervision of systemically important financial institutions. We have already looked at the issue of additional regulatory capital requirements, which, according to the approach proposed by the Bank of England (2009), should also reflect the measure of a financial institution's importance to the stability of the whole system. The greater the amount of assets that a firm manages and the more complex and extensive are its links to other financial market participants, the higher the risk of its failure to the system's stability. The regulatory capital requirement should be raised so as to cover that higher risk. Alternative proposals for how to approach the regulation of these firms are being driven by efforts to limit the moral hazard associated with their business activities and to minimise the material risk that their failure would pose to society and the taxpayer. These proposals centre on making large and complex firms more resilient to shocks, and on resolving any insolvency of such a firm in an effective way.

### Hybrid capital – contingency convertible debt

The Squam Lake Working Group on Financial Regulation (April 2009) proposes a regulatory charge for holdings of convertible debt, i.e. long-





term debt which is issued by a bank during a tranquil period and which, in the event of a systemic crisis and conditional on other conditions being met, is automatically converted to share capital. This solution should be effective for a bank that is undercapitalised and under the threat of insolvency. Since such a measure potentially saves taxpayer funds from being spent on bailing out systemic institutions, it has attracted the interest of regulators (especially in the US and UK). It has in the meantime been put into practice, firstly in autumn 2009 when the United Kingdom's Lloyds Banking Group issued contingent convertible bonds (CoCos) worth GBP 9 billion. Then in March 2010, the Dutch firm Rabobank made a trial issue of contingent conversion bonds worth €1.2 billion. What is critical in regard to this measure is the conversion-triggering event and investor demand for this type of investment.<sup>10</sup> For example, the linking of the triggering event to regulatory capital may not necessarily guarantee the expected results. Experience shows that even banks with a sound CAR have collapsed, the reason being financial contagion arising from investor fears. Investors in these tools will require higher profits, but at the same time, there is a threat that at the first sign of problems they will opt out of these investments much faster. This points to the need for an earlier triggering event. Flannery (2002), for example, proposes that the conversion of debt to common equity be contingent on developments in the bank's market capitalisation. However, several observers are sceptical about the potential of convertible bonds to contribute effectively to the reduction of systemic risk in practice.<sup>11</sup> Convertible bonds should rather be a supplementary tool for measures that are more preventive in nature, such as additional regulatory capital requirements (outlined above).

#### **Determining the capital requirement for a systemically important financial institution according to its credit default swap (CDS) price**

In proposing a method of setting the capital requirement for large and complex financial institutions (LCFIs) that are too big to fail, Hart and Zingales (2009) adapt the principle applied in the operation of margin accounts.<sup>12</sup> Under their proposed system, the LCFIs should have sufficient capital (collateral) to guarantee the full repayment of their liabilities (not only deposits), including so-called 'systemic liabilities' (derivative and repo contracts). Since the value of some LCFI assets (investments) is not easily determinable, it is difficult to identify when the capital has reached a level that leaves the LCFI's creditors unprotected. The authors therefore use a different trigger: the price of the credit default swap on the LCFI.<sup>13</sup> When the CDS price rises above a critical threshold, the regulator forces the LCFI to issue equity until the CDS price moves back below the threshold. If this does not happen within a predetermined period of time, the regulator intervenes. The regulator first

determines, by carrying out a stress test, whether the LCFI debt is really at risk. If the debt is not at risk (i.e. the CDS prices were inaccurate), then the regulator declares the company adequately capitalised and to prove it injects some government money. If the debt is at risk, the regulator replaces the company's management with a receiver and recapitalises the company, ensuring in the process that the shareholders are wiped out and the creditors receive a haircut (the value of the debt is reduced); these measures thus have a disciplinary effect not only on the management and shareholders, but also on the creditors. The disciplinary effect of the LCFI's quasi-bankruptcy is preserved in this process without imposing secondary social costs. In addition to the capital requirement, the proposal also requires a layer of subordinated long-term debt (with low repayment priority). This debt has a dual function, to provide an additional cushion for systemic obligations and to provide the underlying asset on which the CDS is traded. Since the proposed approach is applicable to all financial institutions, not just banks, it reduces the scope for regulatory arbitrage. The drawback of this proposal is that, in addressing the prevention of default, it looks only at individual systemically important firms. It lacks a macro-prudential perspective, since it does not deal with the capital surcharge in the context of systemic stability, i.e. it does not take account of the phase of the credit cycle or the tendency of herd behaviour among financial institutions. By way of a solution, however, the authors suggest that the trigger mechanism be indexed to macroeconomic factors. In terms of strengthening systemically important companies against shocks, this proposal appears to be more effective than charge on hybrid capital in the form of contingent convertible debt, but its weakness could be the actual trigger mechanism. For example, a lack of demand for trading in the CDS on the debt of a particular bank.

#### **Enhanced resolution of a failing systemically-important firm – "living will"**

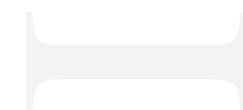
Specific proposals for improving the resolution procedures for a failing systemically-important institutions (e.g. a large investment firm) have appeared, naturally, in the United States and United Kingdom. These proposals were formulated in the United States by the Squam Lake Working Group on Financial Regulation in October 2009, and they are already being discussed at the legislative level in the countries mentioned. One of its recommendations is that every LCFI should be required to produce, regularly update, and file with the regulator a "living will" detailing how the institution should be legally resolved in the event of distress. This plan will help the regulator when deciding on the legal resolution of a troubled LCFI (i.e. whether to sell certain parts of the firm, to wind down other parts, to terminate or review certain contracts, to put part of the firm under the management of other entities, and so on), so as to maintain the stability of the financial

<sup>10</sup> In the case of the CoCo bonds issued by Lloyds Banking Group, the conversion of bonds to shares will occur if the capital adequacy ratio of the issuer's core Tier 1 capital falls below 5%. Investor demand was not a concern in this case since the CoCos were issued to existing investors on the basis of a debt exchange. As for Rabobank, if its capital adequacy ratio falls below 7%, three quarters of the nominal value of the bond will be written off and converted to equity capital while the rest will be returned to investors.

<sup>11</sup> See, for example, Tett (2009), Hart and Zingales (2010), Ponarul and Scott (2010).

<sup>12</sup> Margin accounts are typically held by investors with brokers. The investor will buy an asset on the account, but pay only part of the purchase price; the rest being borrowed from the broker. If the investor's open position deteriorates, the broker will make a margin call (i.e. ask the investor to increase the margin). The investor will either increase the margin or instruct the broker to close the position. Thus the lender's funds are fully secured.

<sup>13</sup> The price of an LCFI's credit default swap represents the price of insuring against the LCFI's default. If the insurance price rises, the probability of default increases, and vice versa.





- 14 Another benefit of 'living wills' is that they give regulators a better understanding of new sophisticated products and their potential risks.
- 15 A cross-guarantee links multiple contracts. Typically, a cross-guarantee states that if a party defaults on one contract, the terms of a second contract change. For example, the second contract may become immediately payable.
- 16 The problems of Basel II in this regard have been pointed out for a long time (Danielsson, J., Embrechts, P., Goodhart, C., Keating, C., Muennich, F., Renault, O., Shin, H. S., 2001).

system.<sup>14</sup> The main reason for this requirement is the complexity of the LCFI's internal and external ties (which the regulator is unable to see) and the complications arising from its cross-border activities (bankruptcy law may vary from one legal system to another). According to the Squam Lake Working Group, these plans should include the following elements:

- detailed and full descriptions of the firm's ownership structure, assets, liabilities, contractual obligations, and the legal code that governs each of these contracts;
- descriptions of the cross-guarantees tied to different securities,<sup>15</sup> a list of major counter-parties and a process for determining where the firm's collateral is pledged;
- a few major distress scenarios, and the likely resolution processes under each scenario;
- a list of potential parties that could take over the firm's contractual obligations at low cost.

If regulators use 'living wills' to resolve insolvent systemically-significant LCFIs in a legally regulated way that is not standard bankruptcy procedure, there should be a reduction in moral hazard (since the bankruptcy of a systemically important institution represents an enormous cost to the taxpayer, there is an incentive for firms to become too big to fail). This would avoid spending public funds on bailing out systemic firms. If capital requirements were set according to the complexity of the firm and how time-consuming it would be to resolve LCFI insolvency on the basis of a 'living will', financial institutions could have an incentive to simplify their organisational structures and contractual relations. But an improved solution to the issue of moral hazard among LCFIs that are too big to fail is not possible without a reliable cross-border failure resolution system for such companies. This is a complex and time-consuming task. 'Living wills' represent a more easily available, but less effective solution.

#### Maximum gross leverage ratio

The stable functioning of financial systems is largely determined by the accurate measurement of a wide range of risks associated with the business activities of financial institutions. Recent experience indicates that if this is not impossible, then it is at best a matter of extreme complexity. The reason lies in the imperfection of the models used for the measurement of financial risks, and the highly unreliable results that they produce. Today's considerably expanded use of statistical models for the measurement and prediction of risks is even contributing to the escalation of endogenous risks of the financial system. By inciting procyclical changes in banks' leverage, these models support

procyclical tendencies throughout the financial system. Several proposals for financial regulation reform (including some mentioned here) remain, however, directly linked to measured risks<sup>16</sup> and so their quality is directly proportional to the quality of the risk measurement. Danielsson (2009) therefore argues that there is no immediate hurry to reform financial regulation and that it is more important to spend the necessary time and effort on solving its efficacy problems. In support of this view is the fact that the part of the financial system hardest hit by the crisis was also the most regulated part – the banks. The Basel Committee on Banking Supervision is now preparing a measure imposing regulatory constraints on bank leverage. The effectiveness of this measure depends on its final form, but in essence it should curb the inherent procyclicality of Basel II. The imposition of a maximum gross leverage ratio is expected to be a counterweight to the risk-sensitive regulatory capital requirements and the imperfect, cyclically-distorted measurement of risk. Leverage constraints at the same time restrict the growth in bank balance sheets that mitigates (il)liquidity risk in the boom phase. This purely micro-prudential regulatory tool therefore also has a macro-prudential function in that it mitigates systemic risk. Bordeleau, Crawford and Graham (2009) studied the regulatory ceiling on an unweighted leverage ratio that has been applied to Canadian banks since the early 1980s, and they found that it had contributed to financial stability in Canada.

#### CONCLUSION

In this article we have presented a selection of current proposals for improving financial system regulation. The papers mentioned concur in the view that financial regulation should place far more emphasis on systemic risk – i.e. the system's endogenous risk – which results from the tendency among financial institutions to behave in the same way and from the activities of large and complex financial institutions in the systems. In order to reduce the likelihood of systemic crises occurring (and entailing significant costs to the taxpayer), micro-prudential regulation needs to be expanded to include a macro-prudential dimension. Some of these proposals go into technical details, while others rather focus on outlining the concepts and principles of a functional macro-prudential framework. Sometimes the papers coincide in their opinions; in other cases they reach different conclusions. Many details, however, remain open and require further discussion. The guiding principle for these discussions should be the efficacy of financial regulation.



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# Macro-prudential aspects of financial supervision and regulation and systemic risk

Mgr. Marianna Červená  
Národná banka Slovenska

*One of the most feared events in the banking sector is the threat of a systemic risk. The fear is similar to crying "Fire!" in a crowded theatre or other public gathering. The only difference is that unlike fire, systemic risk is not clearly defined.*

(Kaufmann and Scott, 2003)

The financial crisis in recent years has presented new challenges for central banks. These challenges highlighted our insufficient knowledge in the area of micro-financial stability, which increased demands on research mainly in the area of macro-prudential aspects of financial regulation and supervision.

The prevailing approach to regulation preceding the recent crisis, which was based on the assumption that it was possible to ensure financial system security as such by supervising the security of individual institutions and instruments, has proved to be wrong. In light of these events, consensus on the need to supplement and strengthen current micro-prudential regulation and supervision (focusing on individual institutions and instruments) was reached within the academic community and the group of central bankers and regulators. Macro-prudential regulation and supervision take into consideration risks for the financial system as a whole. Apart from other causes, these risks can also be a result of the collective behaviour of financial institutions during the credit cycle, of various risk capacity of institutions, as well as the type or scope of risk that individual institutions accept, or of the high degree of interconnectedness of certain companies.

## MICRO VERSUS MACRO-PRUDENTIAL SUPERVISION AND REGULATION

Crockett (2000) and Borio (2008) characterise the macro-prudential aspect in a highly stylised way, namely using the antonymic aspect of micro-prudence. Table No. 1 summarises the main differences between these two aspects, while the micro- and macro-prudential perspectives are in Borio's article (2008) defined and confronted based on different objectives, main focus and risk characteristics.

### Objective

The primary task of macro-prudential supervision and regulation is considered to be preventing or reducing the probability of occurrence of financial system difficulties. This objective is supported by observations of previous crises, since it was shown that financial crises can lead directly to reduced performance of the economy, thus negatively influencing the whole society. On the other side, the micro-prudential approach focuses on the stability of individual institutions regardless of their influence on the economy of the whole financial system. It is possible to say that the micro-prudential approach cares about consumer (investor and depositor) protection.

Table 1 Comparing micro- and macro-prudential perspectives

	Macro-prudential	Micro-prudential
Immediate objective	Limiting difficulties of the financial system as a whole	Limiting difficulties of individual institutions
Main objective	Preventing losses in production (GDP)	Protection of consumers (investors/depositors)
Risk characteristics	(Partial) endogenous	Exogenous
Correlation and mutual exposition across institutions	Important	Irrelevant
Calibration of instruments	In relation to systemic risk, top-down	In relation to risk of individual institutions, bottom-up

Source: Borio (2008).





### Focus

As already suggested by the objectives, while the micro-prudential aspect focuses on examining the situation by looking at the individual institution, the macro-prudential aspect focuses on the financial system. That means as long as the status of the financial system as such is in good condition, the macro-prudential approach does not deal with the status of the individual institutions that are part of this system (in other words, some institutions may fail, as long as such fail does not disrupt the stability of the system as whole).

### Risk characteristics

From the macro-prudential aspect, risks stem from the collective behaviour of individual institutions and their mutual interconnectedness, so they are perceived as endogenous. Institutions can collectively influence the price of financial assets, volumes transacted, and thus the strength of the economy as such, which leads to strong feedbacks. Vice versa, from the point of view of the individual institutions, that is from the micro-prudential aspect, these links are neglected (individual institutions as a rule have an insignificant impact on market prices or the economy).

### THE CONCEPT OF SYSTEMIC RISK

Macro-prudential supervision and regulation is also directly linked with systemic risk, since limiting systemic risk is the main task of macro-prudential policies. Though this term has been used in recent years very frequently as a result of the financial and economic crisis, when speaking with several economists, one may not be sure what exactly this term represents. Moreover, systemic risk is a relatively new term in economic and financial literature<sup>1</sup>. The situation is well depicted by a comment of the International Monetary Fund that notes that in spite of the fact that the term systemic risk is widespread and frequently used, it is difficult to define or consequently quantify, since it is perceived more as a phenomenon that will happen once we see it (IMF, 2009).

In academic and economic policy literature, serious attempts are now being made to define and quantify the term 'systemic risk' so as to provide a workable definition that can be used operatively to allow policymakers to determine implications. These initiatives are very important from the aspect of macro-prudential regulation and supervision, since a unified, clear and quantifiable definition is needed to apply credible measures by policymakers and regulators. There are a number of existing various definitions of systemic risk. Let us mention three of the most quoted and accepted.

#### Kaufmann and Scott (2003)

"Systemic risk refers to the risk of the probability of breakdowns in an entire system, as opposed to breakdowns in individual parts or components and is evidenced by comovements (correlation) among most or all parts."

#### Hendricks (2009)

"A systemic risk is the risk of a phase transition from one equilibrium to another, much less optimal equilibrium, characterised by multiple self-reinforcing feedback mechanisms making it difficult to reverse."

#### De Bandt et al. (2001)

"Systemic risk can be described as the risk of experiencing systemic event in a strong sense. A systemic event is an event that adversely affects a number of systemically important intermediaries or markets (including potentially related infrastructures). The trigger of the event could be an exogenous shock (idiosyncratic or systematic). Alternatively, an event may emerge endogenously from the financial system or the economy at large."

A systemic event is deemed to be strong, if the affected intermediaries fail or the markets concerned crash. De Bandt et al. (2001) continue to distinguish between the horizontal and vertical perspective of systemic risk. While the horizontal perspective refers to financial systems only, the vertical perspective deals with bilateral interaction between the financial system and economy. Such definition of systemic risk should cover a larger definition in the literature.

There are three forms which systemic risk can take. These forms are not mutually exclusive as they may appear both individually or in combination simultaneously. **Contagion** refers to the idiosyncratic problem that gradually (often in sequences) spreads.<sup>2</sup> The second is **aggregate shock**. This shock has a simultaneous adverse effect on a whole range of intermediaries and/or markets. The last is the **accumulation of imbalances** in the financial system over time, such as a boom in the real estate market.

### MONITORING AND EVALUATION OF RISKS FROM THE MULTI-PRUDENTIAL PERSPECTIVE

In the last decade there has been a certain shift in monitoring and analysing financial markets from the macro-prudential perspective. International institutions (such as BIS and IMF), central banks and regulators monitored various macro-prudential indicators, created early warning systems and models of macro-stress testing, however no visible consequences were drawn from the observed situation (also due to a lack of formal mechanisms).

#### Early warning systems

In the last decade, a lot of attention has been given and much sources provided into the building of an early warning system. This involves econometric models. Their primary task is to capture/predict the status in which the probability of a crisis – related to the banking system or currency – is significant. It has been shown that these models can serve as useful indicators of aggregated imbalances, although their predictive ability is limited.

<sup>1</sup> Gerald Dwyer found in a survey of the EconLit database that the first document to include the term "systemic risk" was published in 1994. According to him however, it was not an academic article, but a book review.

<sup>2</sup> An example would be the failure of one bank that brings about the failure of another bank that had appeared solvent ex ante.



### Macro-stress testing

Even greater effort has been put into the development of models for macro-stress testing of the resilience of economy and the financial system. These models are currently used by individual financial institutions, central banks, supervision authorities, and international institutions to estimate various risks. It involves risks resulting from the financial system or risks caused by the economy and their impact on the financial system. Models differ in structure and complexity. Their main feature is that they provide a certain extreme, but plausible scenario (recession or asset-price fall) and consequent estimate of impacts on the system. The problem of these models lies with ignoring the relationships and feedbacks which leads to an underestimation of the real impacts on the financial system.

### Macro-prudential monitoring of the situation

Many national and international institutions undertook to perform regular macro-prudential monitoring of financial systems and global economy, as evidenced by the numerous reports of financial stability. These exercises are based on qualitative, but also quantitative analyses.

Despite significant starts recorded in the past decade, mainly after the beginning of the recent global financial and economic crisis, a large part of the mentioned activities remained unfinished. From the macro-prudential point of view, consensus about key definitions seems to be of high importance. It is necessary to unify the definitions of systemic risk and financial instability so that they are quantifiable and thus applicable for policymakers, regulators, and financial supervision authorities.

### FURTHER STEPS IN THE MONITORING AND ASSESSMENT OF SYSTEMIC RISK

According to Borio and Drehmann (2009) it is necessary to create better models of financial stability

that would link the micro- and macro-prudential aspects. Such involves mainly models explicitly including endogenous amplifying mechanisms and feedback. Currently, no such model exists that is considered to be unproblematic especially from the perspective of macro-stress testing. Without amplifying mechanisms and feedback, it is not possible to identify the real risks accumulated in the system or to estimate the reaction of the financial system to shocks of realistic amplitude. This fact is best seen on the results of stress tests that as a rule do not indicate serious impacts on the financial system even in extreme scenarios. Accompanied with insufficient interpretation of results, policymakers and regulators can erroneously assume that the financial system is sound. On the other hand, informed policymakers in this way lose an instrument that could serve as a strong argument when needed (or as a trigger) to take measures to strengthen the market in terms of public and financial institutions.

Following a relatively exhaustive examination of the contemporary literature and available models, Borio and Drehmann (2009) reached the conclusion that work on the early warning systems is currently more promising from the point of view of policymakers and regulators than other work on macro-stress models. Unless the early warning systems are too ambitious, they can point to general risks accumulated in the system and initiate a deeper examination of the current situation and risk assessment. On the other hand, macro-stress models have larger potential in the long run. A summary of feedback and relationships is non-trivial and requires a lot of research capacities.

When it comes to the practical application of macro-prudential instruments and policies, so far none have been used **systematically**. Asian countries are pioneers in the implementation of ad hoc macro-prudential solutions and their central banks used some of the instruments prior/during the crisis in 1997. For example, central banks in this region during the crisis implemented anti-

Table 2 Macro-prudential instruments and experiences of Asian countries

Objective	Instruments	Examples
Manage aggregate risk over time (i.e. procyclicality)	Countercyclical capital buffers linked to credit growth	China
	Countercyclical provisioning	China, India
	Loan-to-value (LTV) ratios	China, Hong Kong, Korea, Singapore
	Direct controls on lending to specific sectors	Korea, Malaysia, Philippines, Singapore
Manage aggregate risk at every point in time (i.e. systemic oversight)	Capital surcharges for systemically important banks	China, India, Philippines, Singapore
	Liquidity requirements / funding	India, Korea, Philippines, Singapore
	Limits on currency mismatches	India, Malaysia, Philippines
	Loan-to-deposit requirements	China, Korea

Source: Caruana (2010).



cyclic creation of loan-to-value (LTV) and capital surcharges for systemically important institutions. More examples are provided in Table No. 2.

These examples suggest that macro-prudential instruments can be effective at addressing vulnerable parts of the system by increasing resilience. Only the future will show to what extent they are successful at mitigating the growth of credits and asset prices. It is however necessary to have realistic expectations about what can be achieved by such instruments and what lies beyond their scope of influence. Moreover, it is not enough to only create and use new instruments, but also to monitor more actively and mainly resolve problems (as shown by the examples of Asian countries). One needs to realise that no new instruments or approaches to regulation and supervision can prevent all risks and problems, but that they can at best reduce pressure on classical instruments, and lessen the periodicity of crises and/or their seriousness. The aim should be to mitigate the greatest extremes of cycles, but not to eliminate such cycles completely.

### IMBALANCES ACCUMULATED IN THE SYSTEM: EARLY WARNING SYSTEMS

Early warning systems (EWS) are empirical models serving to identify imbalances and risks accumulated in the financial system. Their primary task is to depict and identify situations with current significant probability of the origin of financial crisis. The term of financial crisis is general and includes banking crises, currency crises, government debt market crises, private debt crises, and asset market crises (we will however further deal with banking crises only).

In general, two approaches are used when creating early warning systems. **Signalling approach** and **discrete choice approach**. Another aspect in which the individual EWS differ is the requested outcome. There are early warning systems to predict systemic banking crises for the financial system and early warning systems to predict the deteriorated situation of individual banks. Since we talk about systemic risk, models for individual banks are based not on data on individual banks, but rather they combine indicators for the financial sector as a whole with structural and macro-economic indicators in order to depict the overall situation.

#### Signalling approach

Signalling approach, originally developed to identify economic cycle turning points, was used for the first time to predict banking crises in the study of Kaminsky and Reinhart (1999). In this study the authors focus on predicting what is referred to as the "twin crises", thus, jointly occurring currency and banking crises.

This approach is based on the observation that individual indicators behave differently before or after the outbreak of a crisis than at times of equilibrium. It works on the principles of warning signs given in cases when a selected indicator exceeds

a certain threshold. The threshold is set based on a certain loss function chosen according to the policymakers' preference. The preference can for example be predicting the maximum number of crises at the expense of encountering false signals, or minimising noise (false signals) at the expense of missing some crises. The signalling approach is most suitable for EWS of the individual countries.

A disadvantage of the classical signalling approach is the individual monitoring of individual indicators, thus not considering the larger spectrum of available (relevant) information. This fact can be problematic due to the fact that financial crises are complex phenomena conditioned by various situations. Among the main disadvantages of this approach is the impossibility to distinguish whether an indicator is slightly or deeply under the signalling threshold, or how to deal with cases when indicators signalised the probability of one crisis and others not. The problem of this unilateral approach of systems creating using the signalling approach can partly be dealt with by creating what is referred to as the composite indicator that can better capture the overall situation in the economy.

#### The discrete choice approach

The discrete choice is the alternative to the signalling approach. In this case it is assumed that the probability of crisis occurrence is the role of the vector of explanatory variables. This approach deals with the problem of extracting information from available data. To estimate the probability of crisis occurrence, binomic probit or logit models are used in the majority of studies. However, there are also approaches that allow more than two states of the system in order to increase the reliability of the predictions. Specifically, apart from the states of crisis/equilibrium they also distinguish between other states, such as the period before, during and after a crisis. This approach seems to be more suitable for creating EWS for global economy in the light of empirical studies.

Such created models mostly use annual data to estimate parameters. This factor however conditions shorter time lines available for the estimation of parameters, thus a larger number of countries need to be included in the sample. The correct selection of countries will ensure in this way a sufficient number of observable crises. The problem of this approach lies with its endogeneity. It is necessary to deal with the question of what to do after a crisis outbreak is observed, since explanatory variables can be influenced by the crisis itself through feedback effects.

Regardless of which approach of EWS creation is chosen, **explanatory/signalling variables** can be divided into four categories. The first group is composed of banking variables (individual as well as aggregated). The second group can be labelled as variables related to the structure of the banking sector. In the third group are macro-economic variables, and in the last group variables depicting external factors. Among the most frequently



used variables are the growth of GDP, banking cash and reserves to total assets ratio, growth of indebtedness, exchange relations, real interest rates, inflation, asset prices, real estate prices, and government deficits to GDP ratio.

### Procedure when creating EWS and potential problems

When creating EWS, it is first necessary to assess what type of system is requested and then select the modelling approach based on the decision. Considering the results of empirical studies, it is recommended to use the signalling approach to EWS of individual country and to apply the discrete choice approach in the case of EWS of a certain region/group of countries. Another important step in this process is the identification of the historical occurrence of crisis episodes, this creation of a dependent variable. It is necessary to point out that the selection of a dependent variable is problematic and often based on the subjective emotions of the authors. This fact is often criticised in literature and is a source of the inconsistency of individual systems. The choice of meaningful explanatory/signalling variables applied in a model depends on the structure of the financial system and the individual economies for which the system is created. Finally, it is necessary to verify the predictive ability of the model. It is suitable to carry out the testing of model performance in two steps. First, the model is to estimate the whole sample of data and consequently tests (referred to as in-sample testing). EWS are in general relatively sound in this regard. The model is consequently estimated in a shortened sample of data, and its performance assessed using the remaining data (referred to as out-of-sample testing). To achieve a more realistic testing model, a pseudo-prediction exercise is used simulating the real flow of data, parameters being estimated based on currently available information and predictions of crises performed at every time section. EWS performance is assessed with regards to the actually observed data at the given moments. When it comes to the second aspect, so far there are significant gaps in the performance of early warning systems.

As mentioned before, the selection of dependent variable is a key aspect in creating early warning systems, however it is also a problematic and critical part. This step is purely subjective, thus it is necessary to decide before the creation itself in which cases we want to model to signal problems or indicate the increased probability of crisis occurrence. Based on this decision, artificial variable identifying historical stages of crisis needs to be created.

For the event of systemic banking crisis, we often find in the literature the following four criteria, while the crisis is identified as a state when any or several of the following states occur:

- Non-performing to total asset ratio of the banking system exceeds 5-10%;
- Costs of bailout operations exceed at least 2% of the gross domestic product of the country;
- Occurring problems of the banking sector leading to wider nationalisation of banks;
- Extensive attacks of depositors on banks and special emergency measures taken by the governments as a reaction to the crisis, for example freezing of deposits, prolonging of bank holidays, or general protection of deposits.

In the situation of early warning models for individual banks from the macro-prudential perspective, there are two main groups of criteria contained in the literature that are considered to be indicators of problems. A bank is considered to be "fallen" if its license was revoked, if it was bailed out by the government, if it received money or liquidity from the government, or was taken over or put under forced administration by another bank. Another approach assesses problems based on stricter criteria. It considers banks to be problematic if they are insolvent, in liquidation, or have negative net equity.

The last serious problem that needs to be addressed is the multicollinearity of data. As mentioned before, the problem lies in various indicators behaving differently before, during and after a crisis than at a time of equilibrium, and in feedback existing between dependent variables. Demirguc-Kunt and Detragiache (1998) and Demirguc-Kunt and Detragiache (2005) deal with the issue by excluding observations after the outbreak of a crisis. On the other side, Bussiere and Fletcher (2006) keep in the sample all observations, but they create a multi-dimensional dependent variable. The variable acquires various values depending on the degree of economic cycle before the crisis – crisis – period of equilibrium. This approach is based on the empirical observation of data where all used indicators have significantly different average values in individual samples.

In spite of the mentioned shortcomings, EWS can be of substantial value to policymakers. When we take a realistic look at their performance and purpose, they can help detect underlying weaknesses and vulnerabilities of the financial system. Once the emergence of a problem is confirmed by other instruments, pre-emptive measures can be taken to reduce the risks of crisis occurrence (Bussiere and Fletcher, 2006).





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