**CORVINUS UNIVERSITY OF BUDAPEST**

# KEY ISSUES OF OPERATIONAL RISK MANAGEMENT IN THE FINANCIAL SECTOR

## DISSERTATION

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**Budapest, 2019**

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**Department of Finance**


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## 1. INTRODUCTION

The world economic crisis – started in 2007/2008 – has shown that the vulnerability of international banking system can cause serious economic and political problems, while fundamentally questioned the efficiency of banking risk management processes. The regulators have modified the rules related to capital requirement and risk management processes during the crisis to build in their new experiences and to prepare for the next crisis in the same time.

The last ten years are particularly interesting if we have a look on the practice and regulation of operational risk management. In the European Union, from 2008 – the first years of the crisis – banks are obliged to manage their operational risks and calculate capital on them, so, although this risk has always existed, the history of systematic management is linked to the history of the world economic crisis. Banks had to develop their systems for identifying, measuring, and managing operational risk, while faced significant challenges in other traditional banking risks as well. To make the situation more difficult, the operational risk became the second most important source of risk of financial institutions right after credit risk and before market risk in terms of the level of capital buffer required by the regulator (EBA, 2017/b).

However the operational risk is not bank specific one, it is worth to investigate the experience of the financial sector because of its strict regulation and risk management systems deeply integrated into banking operation. Through this sector we can have the best view about the best practice and problems of risk management processes. Therefore the main topic of current dissertation is the financial sector's, specifically the banking sector's operational risk management practice.

In this dissertation – after reviewing the relevant literature – considering the regulation of operational risk management we outline the characteristic of this risk type; the factors which influence the frequency and magnitude of losses in each country; the picture which financial institutions show about their risk management system and the financial and governance factors which have connection with this picture.

The researches summarized in the dissertation will answer the next most important research questions:

- Which country-specific factors have a significant impact on the magnitude and frequency of operational loss events in each country?

- What kind of information do banks publish on their operational risk management system? Which financial and corporate governance factors are related to content and quality of published information?

- To what extent is the risk appetite framework – the most advanced element of the bank's operational risk management system – in the practice of Hungarian banks found? What challenges do bank experts see regarding the implementation of this framework?

As we can see from the above questions, the researches summarised in the dissertation first examine the definition and characteristics of operational risk, the potential losses what we can suffer on them and the factors which can influence the frequency and magnitude of them. Furthermore we examine the operational risk management and prevention system was built up by participants of banking sector. At the end we analyse separately the most advanced element of this system: the risk appetite framework.

The dissertation contains the next main parts:

I.   Literature review from more aspects paying special attention to regulation and connected scientific discourse.

II.  Presentation of three researches using different research method:

1. research: Analysing the country level factors of operational losses: the effect of the freedom of press;

2. research: Content analyses of banks' risk disclosure in the four Visegrad Countries;

3. research: Analysing the domestic practice and experience of risk appetite framework through questionnaire and interviews.

Accordingly, we first list the changes in the regulatory framework for operational risks in the European Union, the continuous expansion of the content of this highly heterogeneous risk type and the emergence of newly identified risks. Then we look through the changes that have taken place in the past few years in the field of operational risk management.

In the *first research* – using a public loss database – we analyse country-level factors that affect the frequency and impact of operational losses. The empirical study examines

the operational losses of 92 countries between 2008 and 2016. In the regression analysis of country-specific factors, we first run the model discussed by the literature (Li and Moosa, 2015) on the SAS Global Database; then, as a second step, we add a new variable to the regression: the press freedom indicator.

The new approach is based on the hypothesis that databases containing public information may not be complete if, for some reason, corporate operational losses in a given country do not become public.

We found that governance indicators – contrary to previous studies – had no explanatory power at all however; the freedom of the press is significant. Referring to this result in the operational risk element of banking country models the level of press freedom of a given country has to be taken into account.

The *second research* focuses on presenting content analysis of Visegrad four countries' banking sector, aiming to evaluate and compare banking annual and risk reports based on quality and content criterias. The research is based on the annual reports and risk reports under Pillar III of 26 banks of the four countries in the period 2008-2016. The purpose of the descriptive statistics used in the study, cluster analysis and regression analysis is to reveal the financial indicators and corporate governance characteristics The purpose of the descriptive statistics used in the study, cluster analysis and regression analysis is to reveal the financial indicators and responsible corporate governance characteristics of the institutions that have an impact on the content and quality of operational risk disclosure and indirectly on the development of risk management systems operated by banks.

At the beginning of the research we had the hypothesis that the size, profitability and capital adequacy of the bank, the usage of advanced capital calculation methodology, the board independence and the duality of the board chairman and CEO had an impact on the quality of operational risk disclosures.

The results of the analysis show that, although the content and quality of the reports improved significantly during the examined period, the majority of banks report only a few factual information about their operational risks, their risk management system and the new, emerging risk types. Examining the hypotheses the capital calculation methodology and the size of the bank had a significant positive effect on the content of

the information published about the operational risk management system. Based on the analysis we make concrete proposals for banks to fulfil their disclosure requirements.

In the *third research* the previous two quantitative analyses are complemented by a qualitative analysis based on interviews and on-line questionnaires. The research examines the experience and challenges of domestic banks during development of risk appetite framework.

During the research we started with the hypothesis that only a few players in the Hungarian banking sector introduced and use the risk appetite framework as a control function.

The results show that the regulatory guidelines on risk appetite system are rather weak, while the role of the risk appetite framework, both from internal strategic and supervisory perspective has been appreciated. Here we refer to the first chapter of the dissertation, where the causes and the history of this appreciation and shift of emphasis are discussed.

# 2. Concept, regulation and new trends of banking operational risk

## 2.1. Definition, types and management of operational risk

Several studies speak about the changes of risks handled by financial institutions and the role of each risk types. Most surveys are completed annually and summarize the risk expectations of practitioners (Risk.net, 2018), (ORX, 2018). In 2017 the Institute of International Finance asked top executives from 77 banks in 35 countries about risks, the management of them and about risk trends. 40 banks from the participants were domestic SIFI, Systematically Important Financial Institutions. Respondents named cyber risk, risks arising from regulatory changes and their implementation, business model risk and conduct risk as the most important risk in the coming year (IIF, 2017). Based on the analysis the most significant banking risks are classified as operational risks.

Following the publication of the first consultation document (BCBS, 1998) the definition of operational risk and the banks' capital formation obligation ultimately were defined by Basel II. regulation. The consultation document dated 1998 describes operational risks as a potential loss due to the failure of internal controls and corporate governance processes. Basel II. regulation already provides a concrete definition, based on that the "operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk" (BCBS, 2006, 144. pp).

This definition presents that operational risk is a diverse, difficult to grasp risk type which differs in many respects from traditional banking risks (market, credit and liquidity risks). These respects – based on (IOR, 2009), (Lamanda, 2011) and (Homolya, 2012) – are the followings:

- *not sector-specific*, it affects both financial and non-financial corporations, as environmental disasters, human errors, legal changes, hacker attacks etc. can cause losses to participants of every sectors;
- *difficult to grasp risk type*, the number of potential events is large and can be constantly expanded, it includes frequent but low-impact (eg. cashier shortage,

clerical error) and rare but significant impact events (eg. multi-day shutdown of key IT systems, terrorist act);

- the *risk / reward relationship* cannot be interpreted in the case of operational risks, which means that we do not assume (surplus) operational risk in order to achieve (surplus) return. Instead, the risk / cost relationship prevails, that is the cost of the measures taken to reduce the risks should be compared with the potential loss.

- there is a lack of historical data, operational risk models look back on a short past, which makes it difficult to back-test and validate them;

- With the *change of technology and the environment*, the predictive power of past data is reduced. Some risks disappear completely as the underlying technology solution crashes out of practice or the legal environment changes, while other risks emerge from scratch (eg. outsourcing risk due to cloud-based services);

- Risk management requires the *involvement and commitment of the entire organization*; identification and tracking of diverse risks can only be achieved through the development of a well-established and well-trained internal network. An important prerequisite for efficiency is that a few-person central risk management organization will be able to find the right form of collaboration with internal network colleagues and be able to motivate them. Accordingly, with the support of top-management a comprehensive and full-organisation operational risk management system should be developed and be incorporated into corporate culture.

Types of operational risks are summarized in the following table (BSBC, 2006) and illustrated with an example.

Table 1.: Types of operational risk, with concrete cases as examples

| Internap fraud | External fraud | Employment Practices and Workplace Safety |
|---|---|---|
| • deliberate act, in which at least one party is an employee of that organization<br>• **eg. Financial fraud:** In 2008, the broker of the Societe Generale, Jerome Kerviel, made fictitious futures transactions, deceiving the internal audit system, causing a loss of $ 1,500 billion and almost bankrupt the bank. | • deliberate action by a third party<br>• **eg. Hacker attack:** In September 2014, 56,000 cards were stolen from the Home Depot US. | • non-compliance with employment, health and safety rules, violation of equal treatment standards, loss of key persons or massive loss of workers<br>• **eg. Loss of Key Personnel:** Dresdner and Deutsche Bank's failed merger eventually caused 100 key people's leaving. Employees were offered 'virtual shares' to prevent further emigration. Dresdner Bank's loss was HUF 105 bn. |

| Clients, Products, and Business Practice | Damage to Physical Assets | Business Disruption and Systems Failures | Execution, Delivery, and Process Management |
|---|---|---|---|
| • an unintentional incident to a customer or damage due to the products' characteristics or design<br>• **eg. Misleading Customer Information:** Bankinter SA Spanish Bank has been sued by 80 clients for inadequate counseling, alleging that the bank did not report the risks of investing in Lehman Brothers. The Bank's loss was HUF 2.5 bn. | • a natural, industrial disaster or human act that causes property damage, partial or total loss of property, or endangers human life<br>• **eg. Industrial disaster:** On October 4, 2010, the dam of the MAL Zrt. sludge reservoir collapsed, and the red mud flowing out flooded the deeper parts of Kolontár, Devecser and Somlóvásárhely. As a result of the disaster, ten people were killed, more than two hundred injured. | • malfunctions of the IT and telecommunication system and infrastructure<br>• **eg. System breakdown:** At Royal Bank of Scotland's Irish subsidiary in June 2012 there was a malfunctioning software update in the transaction processing center. The bank had to pay HUF 113 million as compensation. to the customers. During the breakdown there was problem with ATMs , online interface and money transfers. | • inappropriate handling of activities, tasks<br>• **eg. Reporting Failure:** Banco Comercial Portugues was fined HUF 700 million in 2008 by the Portuguese Securities Market Committee (CMVM) for misreporting, failure to meet its obligations to shareholders |

Source: by authers based on SAS Global Data and (BCBS, 2006)

Based on Risk.net's annual survey one of the most significant operational risks this year is the failure of IT systems. The survey was conducted by Chief Risk Officers (CROs), managers and professionals dealing with operational risk management. In the similar research was done in 2016 and 2017, the leading risk was cyber risk, which was split between IT system downtime, data security risk and fraud risk this year. The latter two were also at the top of the list.

Figure 1.: The most significant operational risks based on the Risk.net survey

**2016**

1. Cyber risk
2. Conduct risk
3. Regulation
4. AML, CTF and sanctions compliance
5. Organisational changes
6. Outsourcing risk
7. Recruitment and retention
8. IT failure
9. Terrorism
10. Regulatory fines

**2017**

1. Cyber risk and data security
2. Regulation
3. Outsourcing
4. Geopolitical risk
5. Conduct risk
6. Organisational change
7. IT failure
8. AML, CTF and sanctions compliance
9. Fraud
10. Physical attack

**2018**

1. IT disruption
2. Data compromise
3. Regulatori risk
4. Theft and fraud
5. Outsourcing risk
6. Mis-selling
7. Talent risk
8. Organisational change
9. Unauthorised trading
10. Model risk

Suorce: by author based on (Risk.net, 2016), (Risk.net, 2017), (Risk.net, 2018)

Figure 1 summarizes the results of Risk.net's last three-year survey and illustrates the movement of the risk portfolio.

The definition of operational risk and the examples listed above show that managing this risk type means serious challenges for banks. Figure 2 summarizes the processes and tools available to operational risk managers and banks.

Figure 2.: The elements of operational risk management pyramid
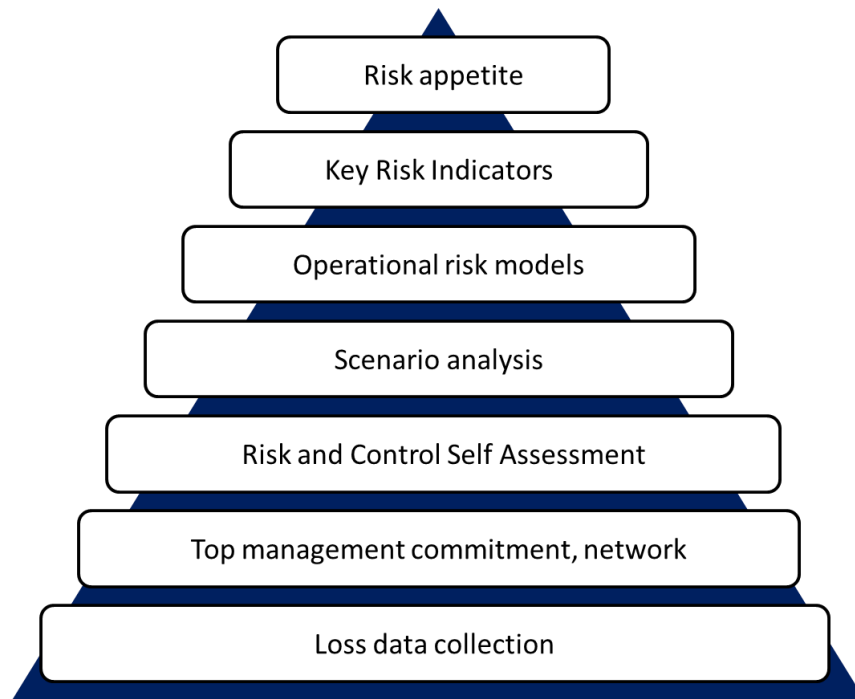


Source: by author

At the bottom of the pyramid we can find the elements that are easiest to implement and with that banks have started to manage this risk-type.

The first, most robust data source for operational risk management is the *loss data collection*, which provides information about the past. In the course of data collection we target to create a comprehensive, standardised database of materialized risks, losses (or profits) that have occurred, which serves as the starting point for both capital calculations and risk mitigation measures.

The problem because of the short time series of losses and lack of experience can be solved by information from outside loss databases. This database can help outline extreme scenarios as well.

The next step is the *top management body* that oversees and supports the operational risk management system. Practical experience shows that in order to obtain senior management support, commitment and involvement of the entire organization, it is

necessary to operate a formalized committee (Operational Risk Committee), to hold its regular meetings and to increase the responsibilities of the members with supervising operational risk management system, functions and making risk management decisions.

At the same time we need a network of contacts that enables the operational risk manager to collect heterogeneous information within the organization and to gain the commitment of the entire organization.

On the next step we find the practice of *Risk and Control Self-Assessment* (RCSA) – in the form of interviews, workshops and brainstorming – which is about to explore the future. In self-assessment we are looking for the answer to the question of what operational risks we have to face in the next period (usually in the next business year), what probability they may have, and if so, what effect they have on the operation and efficiency of the organization. During the self-assessment the control environment is evaluated as well, where we examine whether the controls built into the process to support risk elimination exist and how effective they are.

The third source of understanding operational risks (beyond loss data and self-assessment) is the *scenario analysis* exercise, which evaluates and analyses the significant risks that can have a "catastrophic" effect on the operation of the organization. Examples of scenario-type risks include natural disasters, wars, and mass layoffs, longer shutdowns of IT systems supporting critical processes or dreaded mass withdrawals for banks. [1]

Risk modelling refers to capital calculation models and country risk models to estimate operational risks. These will be discussed later in the dissertation.

*Key Risk Indicators* (KRIs) are designed to continuously monitor the deterioration of risk factors over time between annually self-assessment and scenario analysis, and predict the expected increase in loss events. To do this we are looking for indicators that are related to risks such as fluctuations, workload indicators, the development of complaints or the macroeconomic indicators, etc. Key Risk Indicator system is a kind of control function in the overall operation of the organization.

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[1] At first glance the deposit withdrawal appears to be a liquidity risk, but it cause much more work and preparation for operational risk side. When deposit withdrawal occurs, capacity problems have to be solved in both branches, e-channels, and call-center; security issues, external and internal communication and provision of currency and cash have to be addressed.

*Operational risk models* for capital calculation are based on loss data, self-assessment and scenario analysis data. In some banking models KRIs can serve as adjustment factors for the final capital calculation. The methodologies and parameters used for modelling are primarily determined by the regulatory requirements and the possibilities provided by regulation.

The four different information sources – the loss data collection, self-assessment results, scenarios, and KRIs – can be complemented (and already done by many banks) by the risk appetite framework. It is not an accident that risk appetite framework is at the top of the hierarchy, its introduction, or even the definition of the concept itself, makes it difficult for the organisation. It is no coincidence, because the operational risk management here, at the top of the pyramid, is already closely related to the management of other traditional banking risks and the organization's strategy management. Chapter 7 of the dissertation deals with the domestic practice of the risk appetite framework.

## 2.2. OPERATIONAL RISKS IN SCIENTIFIC DISCUSSION

The management of operational risks should not be limited to the operational risk management activities of the financial sector. However we can find the most available data, best practice and the strictest regulation in the financial sector, therefore in this dissertation and in this literature review we concentrate on the researches related to the operational risk management activities of financial sector. The literature of operational risks is closely intertwined with risk regulation. In this chapter we present the most important topics in the scientific discourse, and in the next chapter we deal with the issue of regulation.

Figure 3.: Structure of literature related to operational risks



Risk appetite

Key Risk Indicators

Operational risk models

Scenario analysis

Risk and Control Self Assessment

Top management commitment, network

Loss data collection

Regulation
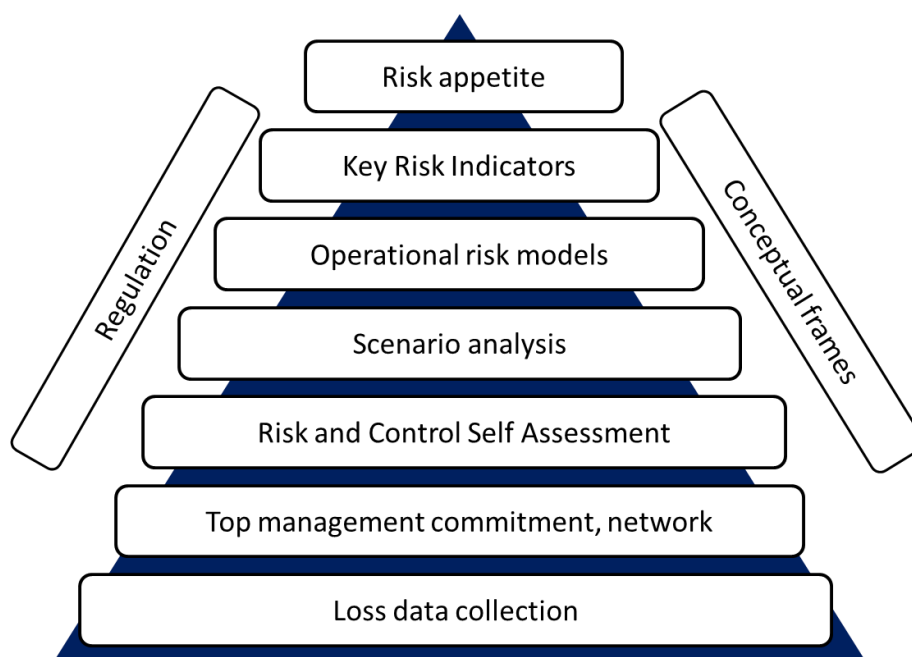
Conceptual frames

Source: by author

In the course of presenting the literature we use the same figure that previously contained the elements of the operational risk management activity, complemented by the conceptual frameworks and regulation of operational risks, which are closely related to each other. As shown in Figure 3, articles on operational risk management can be classified into the following groups:

1) **Regulation and conceptual frameworks**: We can find here the articles about operational risk definition, types, management and integration into processes, most of which appeared when operational risk was incorporated into financial sector regulation. There are related articles analysing, criticizing and interpreting the operational risks of the bank.

2) **Loss data collection**: These are mostly empirical researches that exam the operational losses, identify loss-influencing factors and contain cross-sectional analyses. A prerequisite for these studies was the existence of databases containing operational loss events. Surprisingly some research was back in the 1980s with data. It is also possible to list articles about the impact of operating losses on reputation and stock prices and to mention case studies that analyse the lessons and consequences of a specific loss event.

3) **Operational risk models**: It may include articles on quantification, modelling of operational risks and, through them, the calculation of bank regulatory capital.

4) **Qualitative approach of operational risks**: Other elements of the pyramid, like leadership engagement and relationship network, risk and control self-assessment, scenario analysis, key risk indicators, and risk appetite framework represent a qualitative approach to operational risks. In addition to the literature dealing with these issues, they include studies that focus on specific types of operational risk (like reputation risk, model risk, cyber risks etc.).

In the next part we focused on the main thoughts and findings of the four categories in recent years.

## 2.2.1. Regulation and conceptual framework

Articles dealing with the regulation and conceptual frameworks of operational risks, on the one hand, analyse this type of risk globally, systematically and on the other hand, criticize banking regulation and risk capital calculation.

Overcoming the impact of operational risks at the border of an institution has been particularly acute during the recent world economic crisis, which has led several researchers towards such investigations. McConnell and Blacker (2013) emphasize the systemic aspect of operational risks, and two years later McConnell (2015) argues that large operating losses (eg. fines) are not independent of each other, often affecting several players in the banking sector, therefore the capital calculation should also focus on systemic capital calculation instead of individual one.

The most important element of banking operational risk regulation is the set of rules for capital calculation. De Fontnouvelle et al. (2006) have already made calculations of the operational risk capital requirement in 2006 and found that this element of banking capital would in many cases outperform the capital requirement of market risk.

Criticism of regulatory capital requirement calculation methodologies is expressed in several studies. I would like to highlight the article by Mora and Valencia (2017), which provides a literature review of the advanced measurement approach (AMA) and the scientific discussion about SMA capital calculation methodology introduced from 2022 onwards, and in the same time offers an alternative methodology to the regulator. Cohen

(2017) argues for using a uniform loss distribution, as an alternative solution. McConnell (2017) stands next to the critics of the SMA methodology, arguing that the loss data collection on which the methodology is based is not uniform at individual banks, so that capital figures will not be comparable between institutions. According to Mignola et al. (2016) the biggest problem with the new methodology is that it does not follow the change in the banking risk profile. Peters et al. (2016) highlight the weaknesses of the SMA methodology, such as the instability, risk insensitivity, super-additivity and increase in systemic risk. Hinchliffe (2016) analyses the benefits of introducing SMA for banks using currently a simpler methodology, but warns of its dangers for banks which are using the advanced measurement approach. Sinha and Sharma (2016) analyse the impact of the introduction of the SMA methodology on Indian banks and find that the impact on small banks is marginal; at larger banks they are expecting a minimum capital increase. Scannella and Blandi (2015) prove that risk transfer significantly contributes to reducing regulatory capital requirements in operational risks. Feria-Domínguez et al. (2015) deal with Basel III's new policy on operational risks and their capital effects. Migueis (2018) offers a new capital calculation approach that reduces the vulnerability of advanced measurement approach (AMA). Mendonça et al. (2011) estimated the capital requirement for the Brazilian banking sector using several methodologies. Sharifi et al. (2016) examined 61 Indian banks to find the factors influencing the magnitude of "extra capital" (capital over regulatory capital) between 2010-2013 and found that smaller banks hold higher extra capital. There was no detectable relationship between the ownership structure and the amount of extra capital.

The next major chapter on regulation discusses in more detail the literature that analyses and criticizes the regulatory capital requirement calculation methodologies.

### 2.2.2. Loss data collection

As described earlier most empirical researches on loss events, on the one hand, analyse company-specific and country-specific factors affecting losses, on the other hand, analyse the impact of events on different areas of the bank's operations and, thirdly, the characteristics of a large loss event. The following figure summarizes the publications in each topic.

Figure 4.: Summary of articles analyzing operational loss events

| Analysis of operational loss events in the literature | | |
|---|---|---|
| Analysis of factors influencing the losses | Impact of losses on the bank's performance and reputation | Analysis of big losses |

| Corporate-specific factors | Country-specific factors | | |
|---|---|---|---|
| Fiordelisi et al. (2013); Chernobai et al. (2011); Gao and Li (2009); Doyle et al. (2007); Krishnan (2005); Beasley (1996); Tej et al. (2013) | Li and Moosa (2015); Moosa (2015); Cope et al. (2012); Povel et al. (2007): | Barakat et al. (2019); Barakat et al. (2018); Barakat et al. (2014); Jiang (2018); Kaspereit et al.(2017); Fiordelisi et al. (2014); Gillet et al. (2010); Cummins et al. (2006); Sturm (2013/a); Sturm (2013/b); Moosa and Silvapulle (2012); Plunus et al. (2012); Hambuckers et al. (2018); Abdymomunov és Ergen (2017); Li et al. (2017); Dionne és Hassani (2017); Han et al. (2015) | McConnell (2013); McConnell (2014); McConnell (2018); Clauss et al. (2009) |

Source: by author

Fiordelisi et al. (2013) proved that higher profit and company size, higher capital investment and movable assets lead to lower operational losses. According to Chernobai et al. (2011), the "older" company, lower credit risk, more stock options for senior management, the higher ratio of moving wage in the senior management package brings the same result. In the research of Doyle et al. (2007) larger, older companies with less complex activity and better financial situation showed a better loss history. Gao and Li (2009) highlighted listed companies, according to Krishnan (2005) the independent Audit Committee with experienced, highly qualified members leads to lower risk. Beasley (1996) also studied corporate governance and identified the higher number of

independent board members as significant variables. Tej et al. (2013) investigated the Slovak banking sector and built a regression model to determine the factors affecting operational risks. In their study the positive relationship between operational losses and bank size has been demonstrated and then analysed how the bank can reduce its operational risk capital. Based on their results, paying attention to personal and IT costs can bring the biggest capital savings.

When analysing country-specific variables, Li and Moosa (2015) found that GDP, GNI/capita, legal system, region and government indicators influence the variation in loss events between countries. In a separate study, Moosa (2015) found that higher GDP and better government indicators result lower operational risk. Cope et al. (2012) found the legal system, the region, government and economic indicators significant for operational risks. Povel et al. (2007) investigated the recovery and the credibility of publicly available information and found them to be decisive explanatory variables.

The literature about the impact of operating losses on reputation and through this on stock prices or other indicators (CDS premium, profitability) is rich.

Barakat and his co-authors examined the reputation deterioration following the announcement of operational losses in several articles. They found that lack of certainty, well-understood facts leads to the most significant reputational problems (Barakat et al. 2019), and the shares offered for purchase or speculation suffer higher reputation loss when reporting operational losses (Barakat et al. 2018). In a previous article a similar study has already been carried out, when between 1995 and 2009 the impact of reporting operational loss events on market prices was examined. The main purpose of the study was to review information asymmetry and finished with the result that information asymmetry much more increases after the announcement when corporate governance is weak, board independence is lower, senior stock options are lower and institutional ownership is smaller (Barakat et al. 2014).

Jiang (2018) also investigated the impact of high operational losses on North American and British banks and found that the announcement of an internal fraud in particular shakers confidence in the bank. Kaspereit et al. (2017) found that stock prices would only be moved by events exceeding the loss of EUR 50 million, which, moreover, would have a negative effect on the stock price of non-affected banks, showing some kind of infectious effect. Fiordelisi et al. (2014) examine the impact of operational

losses on stock prices of European and American banks from 1998 to 2008. They found that higher profitability and size may indicate a higher reputation loss, but higher invested capital may reduce the likelihood of reputational loss. Gillet et al. (2010) conducted a similar study for European and American banks on data from 1990 to 2004 and both negative abnormal returns and the increase in turnover have been shown after reporting events. Cummins et al. (2006) examined the loss events of American banks and insurers between 1978 and 2003 and achieved similar results.

Sturm's (2013/a) study examines the impact of operational risks on CDS spreads based on European banks' data from 2004 to 2010 and shows an 5 basis points increase at the bank's CDS spread after the announcement. Another from his studies (Sturm, 2013/b) analyses the impact of operational risk reporting on stock prices in the European financial sector between 2000 and 2009. The article concludes that the magnitude of the reputational effect depends on the bank rather than on the loss event, this means that the larger leveraged companies suffer a higher fall in share price.

Moosa and Silvapulle (2012) investigated 54 loss events of 6 Australian banks between 1990 and 2007 and confirmed the negative impact of losses on stock price and market value. Plunus et al. (2012) show the negative impact of reporting loss events on bond yields, and that this effect is significantly influenced by the loss event type and the ratio of loss amount to market capitalization.

Based on the loss database of Unicredit Bank, Hambuckers et al. (2018) analysed the impact of macroeconomic, financial and company-specific factors affecting the severity of operational losses. Abdymomunov and Ergen (2017) investigated the loss events of US banks to detect their correlation inside of each bank and between banks. The study draws attention to the significant model risk at operational risk models which do not calculate with the correlation between major loss events. Li et al. (2017) analysed Australian banks' loss events between 2010 and 2014 and showed the characteristics that are similar at all operational loss events. Dionne and Hassani (2017) investigated loss data from US banks between 2001 and 2010 in the context of the global economic crisis. It was found that in times of crisis banks' capital maintenance was low compared to losses, while in 'good' times it was too high.

Han and co-authors (2015) examined the characteristics of 533 Chinese loss events between 1995 and 2012 and built VAR and ES models for them. On the basis of the

database they investigated, it was found that Chinese commercial banks are primarily confronted with internal fraud.

Finally, studies that analyse specific loss events are particularly interesting. McConnell (2018) writes about one of the first major operational loss events, the GAS (Global Analysts Settlement) scandal. The first case of "conduct risk" was followed by others, such as the Libor manipulation scandal, which McConnell reports in a 2013 and 2014 studies about. Clauss et al. (2009) conducted a case study on Madoff fraud.

### 2.2.3. Operational risk models

If we can call the literature of empirical studies rich then this word is more suited to the collection of articles on operational risk modelling. Operational risk models are complex because of risk heterogeneity, difficult quantification of exposure and lack of historical data. In the same time the regulation provides the banks a great deal of freedom in modeling, so it is not surprising that researchers have seen challenges in this area. A significant part of the relevant literature was born only after the regulation was published in 2006 (BCBS, 2006).

The most important topic in the modelling:

- Which data source should be used for modelling? Some of the authors argue for modelling based on loss data, others promote the scenario-based modelling and experts appeared who propose combined models.
- What is the risk measure of operational risk in modelling? Some of the researchers argue for VAR (value at risk) and the other part for ES (expected shortfall).
- How do we aggregate loss distributions?
- How to quantify the diversification effect?
- What mechanism should be used to allocate capital within the bank group?

Amin (2016) supports the scenario-based approach. Aroda et al. (2015) deal with the modelling of scenario analysis. Dutta and Babbel (2014), Cope (2012) and Rippel and Teplý (2011) propose a combination of scenario analysis and loss data approach.

Article of Zhou et al. (2016) deals with the LDA (loss distribution approach). Opdyke (2014) concludes through the example of US banks with high or systemic risk that the LDA approach leads to overcapitalization, therefore proposes a modified capital calculation methodology, the reduced-bias capital estimator (RCE). Einemann et al. (2018) formulated LDA criticism and suggested using of the EBOR model (exposure-based operational risk model) which takes the current exposure instead of historical loss data and gives more room for expert estimates. They suggest the combination of the two methodological approaches for each type of operational risk. Morais et al. (2018) dealt with the LDA method as well – especially with the scenario element of it – through the example of the Brazilian Development Bank.

Guegan and Hassani (2018) analyse the pros and cons of value at risk (VAR) and expected shortfall method (ES) for measuring operational risks. Cirillo and Taleb (2016), Tursunalieva (2014), and Blagini and Ulmer (2009) set a model for estimating the expected shortfall value, while Tursunalieva and Silvapulle (2016) and Esterhuysen et al. (2008) present a VAR model in their study.

Cormack (2014) draws attention to the fact that we do not find data in the external or internal database for modelling operating losses below the reporting threshold, so their estimation poses a serious challenge. In his study he offers a solution for estimating the distribution of losses below the threshold. In their article Abdymomunov et al. (2014) – beyond the basic models – highlight the stress testing of the models and incorporation of stress scenarios.

Kiss and Homolya (2014) deal with how to operate the data consortium for collecting and sharing operational risk loss events and how to maintain the high quality of data. They also analyse the impact of non-monetary and monetary sanctions and find that a good financial penalty or, to a lesser extent, a good structure of consortium can lead to improved data quality.

In their article Balta and Degen (2014) show the importance of taking into account the diversification effect within the operational risk capital calculation model. They also declare that many banks achieve significant capital reductions by selecting the appropriate methodology.

Gara and Belkacem (2018), Del Castillo (2017), Zolotareva, 2010, and Mitov et al. (2010) propose methodologies for modelling extreme losses. Mitic and Hassani (2018)

describe the allocation of operational risk regulatory capital between business lines using the Shapley methodology. Guégan and Hassani (2013) offer solutions for modelling non-independent operational loss data. Dahen and Dionne (2010) provide a possible solution for scaling the external loss data used in the model and show the VAR value and it's back-testing.

In 2013 in their article Colletaz et al., propose a solution for the validation of operational risk models which method deals with the scale and number of extreme losses and the graphical presentation of the model's goodness as well. Huber (2010) draws attention to the problems of operational loss databases such as missing or outline values, and as Gzyl (2011) analyses the distribution types used in models to estimate the loss effect.

Among the other articles dealing with the modelling of operational risks, I would like to highlight the latest ones (Embrechts et al., 2018) (Khoza, 2018), (Opdyke, 2017), (Kato, 2017), (Mayorov et al., 2017), ( Chung et al., 2017), Chavez-Demoulin et al. (2016) and (2006 / a).

### 2.2.4. Qualitative approach to operational risks

The qualitative side of operational risk management is dealt with by Luburić (2017), who argues for uniform management of quality assurance and operational risk management practices at central banks. Mabwe et al. (2017) review the operational risk management practices along the three lines of defence in English banking sector. They state that there is no consensus among the individual institutions on the role of defence lines, therefore duplication or lack of responsibilities and tasks can be observed. Meunier and Bakker's article contains (2016) another approach. Authors view the uncertainty inherent in regulatory capital as an opportunity to increase risk awareness, develop appropriate scenarios, and take risk mitigation measures. Štěpánek et al. (2013) propose a new quantitative model for carrying out risk assessment. Hemrit and Ben Arab (2012) in their article deal with the identification of risk sources and the benefits of managing operational risks. They find that although the management of risks is in the interest of senior management, its unified practice has not developed, and even the recognition of this interest and the arguments for it are unclear. Chernobai and Yildirim

(2008) examine the characteristics of operational risks on data from US commercial banks, with particular attention to the changes between loss identification and actual settlement.

Let's choose some examples of research focused on specific risk types within operational risk: Yan and Wood (2017) develop a risk-sensitive, structured model for conduct risk related to retail banking products and services. Eckert and Gatzert (2017) build on three models of reputation risk estimation using traditional operational risk models and find that loss from reputational risk can far exceed the loss effect of the initial operational risk event. Ibrahimovic and Franke (2017), Fheili (2011) and Savić (2008) investigate IT system shutdowns just as Friedhoff and Mansouri's (2015) article, where the authors suggest an incident-based approach to monitoring business failure and system problems. The impact of IT incidents is also analysed by Benaroch et al. (2012) in the US financial sector examining events between 1985 and 2009. They determine that IT-related operational loss events are penalized by the market more and the reputational effect is particularly strong at banks, at companies with high growth prospects and at larger and more risky companies. Terblanché (2012) deals with legal and compliance risks within operational risks and proposes to manage compliance risks within legal risks. Wiszniowski (2011) places and analyses internal fraud within operational risks and points out that, although rare internal fraud is under-represented in the loss database, we cannot underestimate this risk type because an internal fraud can cause serious shock for the institution. Chen and Cox (2009) build a real option model to the epidemic as operational risk.

We can see that the literature on operational risk management is far-reaching. In order to be able to understand the literary aspects of the research contained in the dissertation, at the beginning of each chapter we review the previous researches related to the given topic in more detail.

## 2.3.  REGULATION OF OPERATIONAL RISK[2]

This chapter discusses the regulatory requirements and their development that influence the management of operational risks and the methods of capital calculation. We have already discussed the definition of operational risk in the first chapter, so here we focus on capital calculation and the qualitative framework. Figure 5 summarizes the most important milestones of regulation.

Figure 5.: Key milestones of operational risk regulation
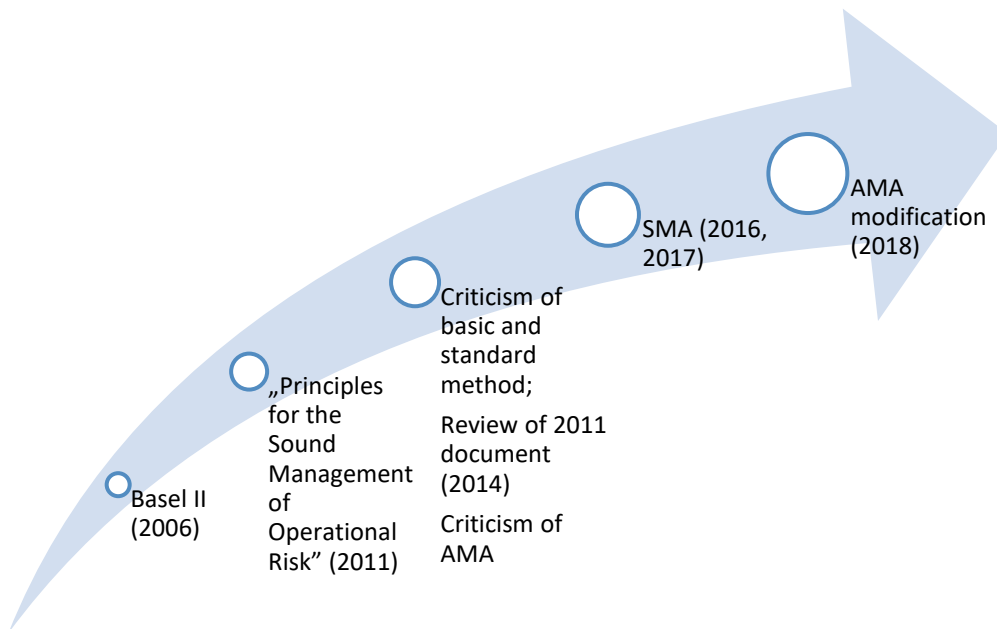


Source: by author

Basel II primarily concentrates on ensuring that banks set aside sufficient capital to cover their risks. The regulations contain the three basic methodologies for measuring the capital to be set aside for operational risks, namely the Basic Indicator Approach, the Standard Approach and the Advanced Measurement Approach (AMA), and summarises the qualitative and quantitative requirements for use of these methodologies. The requirements for the Advanced Measurement Approach regulate in

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[2] This chapter was published as an independent article in the Economy and Finance journal (Gazdaság és Pénzügy) in 2018 (Vőneki, 2018)

detail the risk identification, assessment and management processes that have to be operated by the financial institutions. While the two simpler methodologies require a calculation based on gross income, the Advanced Measurement Approach allows banks to use the model that best fits their own risk profile for measuring the capital set aside for their operational risks.

The Basel II Accord provides the basis for the projects, launched at financial institutions, which have led to the emergence of an entirely new framework, permeating throughout the bank, for the mapping, assessment and management of operational risks. The emergence of the new processes, and their need to be widely supported within the organisation, is attributable to the special characteristics of operational risk – mentioned in previous chapter –, the most important of which are: heterogeneity, the difficulty of measurement, the difficulties in defining exposures, lack of historical data and the diminishing forecasting power of historical data (Lamanda and Vőneki, 2015).

The introduction of the Advanced Measurement Approach triggered a heated debate in both professional and academic circles. Cope and colleagues (Cope et al, 2009) proved, with calculations, that the operational risk measurement models are too sensitive to extreme data points, and their reliability is low; and therefore they lull regulators into a false sense of security about banks' capital. In addition to this, the modelling uncertainties result in an uneven distribution of capital between the banks. Jobst also highlights the wide range of usable methodologies, and thus the impossibility of consistent supervisory monitoring (Jobst, 2007). The banks' capital set aside for operational risks is becoming dependent on a number of factors: the complexity and size of banking operations, the quality of collected loss data, and the methodologies used for the identification and measurement of risk. In his 2008 paper, Moosa reviews in depth the criticisms raised with regard to the AMA, placing the literature and main arguments against the approach into three categories: the range of applicable methodologies is obscure, with banks able to choose between statistical methods; the data are unsuitable for statistical modelling; introducing the methodology is too complex and expensive (Moosa, 2008). Sherwood also highlights the modelling difficulties, the problems of gathering data and the diversity of such data (Sherwood, 2005), while Danielsson et al (2001) also draw attention to the shortage of modelling data.

In 2011, the Basel Committee decided that the time had come – based on the experiences of the crisis – to supplement the regulations with expectations relating to

responsible corporate governance, the risk management environment and public disclosure, through the publication of the document entitled "Principles for the Sound Management of Operational Risk" (BCBS, 2011). Similar guidance on the management of operations risks had already been published in 2003; however, by 2011 – due to the requirements of the Basel II Accord – operational risk management practices had changed radically, so new guidelines were needed with regard to the risk culture and corporate governance.

This duality has always accompanied the regulation of operational risk. On the one hand, the regulator sets out to isolate the risk and substantiate the capital allocation using mathematical and statistical tools, while on the other it tries to create effective and crisis-proof risk management processes through a strengthening of risk culture and the commitment of management teams. In the interest of achieving the latter objective, the AMA's qualitative requirements include the continuous briefing of senior management, incorporation of the results of risk measurement and assessment into business processes, the operation of a key risk indicator system, and determination of the risk appetite.

The next turning point in the development of the regulations was the wave of documents issued from 2014 onwards, which attempted to refine the capital measurement methodologies and the framework built up around the more advanced methodologies.

First the simple (basic indicator and standard) approaches were criticised BCBS, 2014a) on the grounds that capital measurement methodologies which depend on the size of the bank do not satisfactorily reflect the changes in risk exposure.

In 2014 a review of the 2011 document summarising the operational risk management principles was also published, containing the results of a study of 60 systemically important banks (SIBs) operating in 20 different legal jurisdictions, with the intention of eliminating the flaws revealed in that study. The document primarily sheds light on the problems associated with the identification and measurement of risks, change management, risk appetite and public disclosure (BCBS, 2014b).

After this, more criticisms of the Advanced Measurement Approach (AMA) were expressed, principally emphasising the complexity of the model, the limited comparability of bank models, and the difficulties of controlling (BCBS, 2016b).

PWC's study, meanwhile, warns that the AMA model is built on historical loss data; and therefore, due to the rapid changes in technology and the environment, they do not reflect the institution's latest risk profile (PWC, 2015).

In the first round, the Committee set the target of standardising the Advanced Measurement Approach, reflecting on the arguments that criticised the wide range of chosen methods and the banks' individual solutions. Consultations were still in progress between banks and stakeholder organisations regarding the standardisation of the Advanced Measurement Approach and the use of stricter parameter-setting, when a newer, uniform capital measurement method replacing both the simple and advanced methodologies, the Standardised Measurement Approach (SMA), emerged (BCBS, 2016a) and was then incorporated into the European regulations (BCBS, 2017). The new capital measurement approach, which is based on controlling data and only takes the development of operational loss data into account in the case of large banks, will be introduced from 2022. With respect to the transitional period, however, the Committee has not left the earlier methodologies unchanged; at the beginning of this year it published its previously agreed requests for changes relating to the AMA (EU, 2018).

These two documents clearly show the two possible strategies for measurement of the operational risk capital requirement:

1. Standardising the AMA models and ensuring their controllability
2. Discontinuing the internal models and replacing them with a simpler calculation

In the long term, the regulator has chosen the second option, but nevertheless expects the AMA to be standardised in the transitional period.

Figure 6 shows the distribution of the number of credit institutions in Hungary based on the chosen capital measurement methodology.

Figure 6.: Distribution of the number of credit institutions in Hungary based on the chosen capital measurement methodology (operational risk, based on 2016 data)
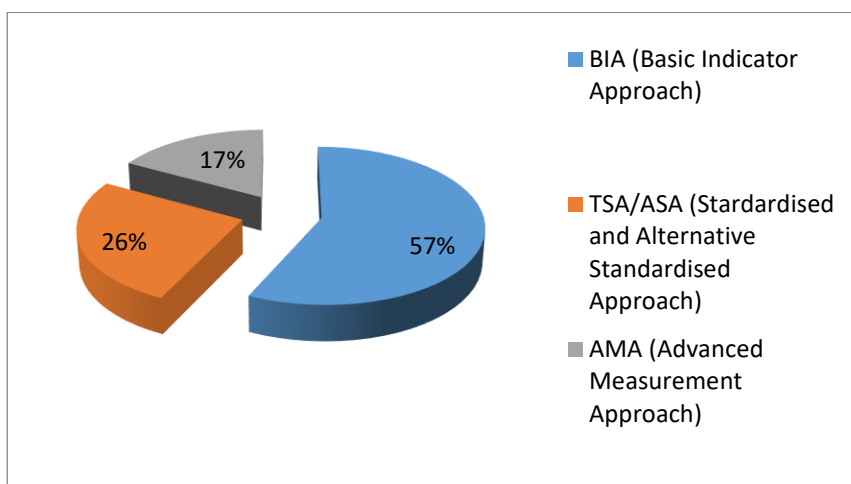
Figure 7 shows the same distribution, but in terms of the amount of capital set aside for operational risk.

Figure 7: Distribution of the amount of capital set aside for operational risk (Hungary, based on 2016 data)
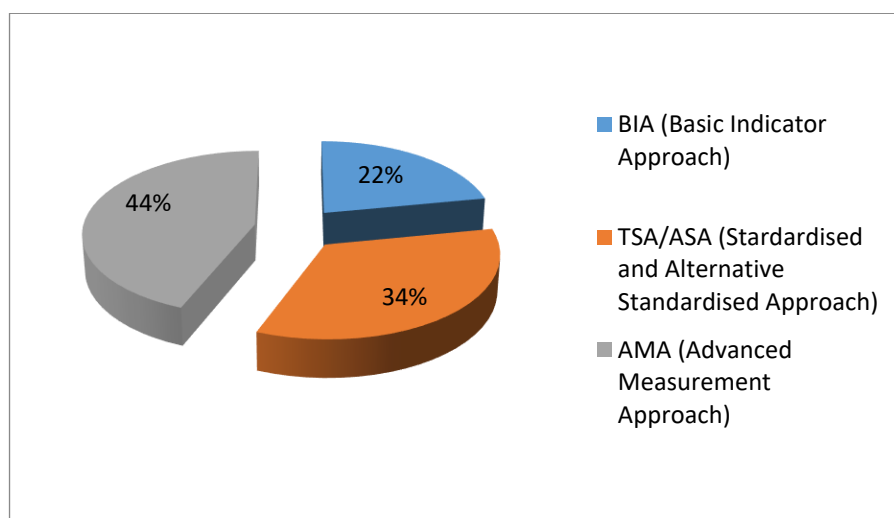
The transition to the Standardised Measurement Approach (SMA) affects all the banks, but it creates the most uncertainty for banks that use the advanced approach, which account for 44% of allocated capital in Hungary.

Just like the AMA more than a decade before, the SMA has also triggered a debated in professional and academic circles. Peters et al seriously criticise the introduction of the SMA on the grounds that the SMA does not ensure the stability of the capital requirement, is not sufficiently risk-sensitive, and is super-additive; in other words the capital is higher at group level than if it were calculated for individual banks, and this could have a negative impact on the development of systemic risk (Peters et al, 2016a). Other authors see the disadvantage of introducing the SMA in the fact that it does not follow the changes in the bank's risk profile, and does not differentiate between banks of varying risk profile (Mignola, 2016).

The new methodology will also have an effect on the total amount of the banks' capital. Based on a survey of its own members by ORX, three quarters of the banks expect to see a rise in capital. The greatest increase in capital can be expected by the European banks, where the capital set aside for operational risk will be on average 63% higher than it is at present (ORX, 2016).

The regulations do not, at present, offer any reference point with regard to which qualitative requirements will remain in place for the banks following the introduction of the single SMA methodology, or with regard to how the expectations relating to responsible corporate governance, risk appetite and risk awareness will develop. The banks have invested considerable money and resources in the development and operation of their risk management processes. The new SMA methodology eliminates the connection, and the motivation that this provides, between the management's risk management efforts and the capital set aside (Mignola, 2016). The crisis has highlighted that the management of risks is inadequate without the appropriate risk-awareness and management focus, and this inadequacy can have a serious impact that spills over into the real economy. Knowing this, it is hard to predict what will happen if the regulator phases out the capital measurement methodology that forces market participants, through the data requirement of the models and through enhanced supervisory controls, to maintain refined operational risk management systems.

Overall the uncertain regulatory background raises the following questions:

- How does standardization, which is obviously starting with capital calculations, affect the use of internal banking models? Do these models survive under Pillar II. (ICAAP)?

We do not yet know the answer to this question. Regulators emphasize the importance of internal risk-sensitive models. However, preliminary calculations show that the new methodology will result of higher capital than the internal model (ORX, 2016), so the latter will not play a role.

- How does the simplification of capital calculations affect the efforts made by banks to build risk awareness culture and risk reduction?

It is not easy to answer this question either. Banks – as a profit-oriented institution – will not be able to maintain functions whose benefits cannot be demonstrated unless the regulation explicitly requires its operation. Supervisors will have an important role to play in the next few years to require the transparent operation and development of the operational risk framework despite the change in capital calculation rules.

- Is capital regulation the most effective way to encourage banks to manage operational risks or the regulator has to introduce other incentives, controls and prohibitions?

In terms of operational risks we must emphasize the fact that the reputational risk as a consequence risk can cause many times higher loss than the original loss event (Eckert and Gatzert, 2017). Therefore events are possible where the qualified capital is not enough to cover the losses. The regulation of operational risks cannot be satisfied with the creation of capital rules, but must be supplemented by continuous monitoring of the framework, prohibitions and regulations.

## 2.4. NEW RISKS AND TRENDS

The multiple changes of direction by the Basel Committee are indicative of the kind of uncertainty that surrounds the future tasks relating to operational risk management. Besides the prevailing regulations, it is also worth paying attention to the talks given at professional debates and conferences, and to the focus points of annual audits by bank regulators, which augment the regulatory requirements and often presage the forthcoming changes in regulations.

Following the introduction of the requirements relating to operational risk management in 2008, supervisory audits concentrated on the establishment of loss data gathering and verifying the presence of the qualitative framework. As a growing number of banks started using the Advanced Measurement Approach, a far-reaching process of developing/fine tuning and examining the models – requiring sophisticated statistical and mathematical knowledge – also got under way.

As the crisis drew to a close and the announced regulatory changes took effect, a change of direction was observed both in the focus of the audits and in professional discourse. Supervisory authorities' expectations shifted away from the setting aside of sufficient capital and the operation of the framework system, to prevention and the most widespread possible establishment of control functions. In addition to this, new risk types emerged, some of which had previously been managed by the financial organisations as a part of operational risk, but now had to be addressed separately. (Figure 8).

Figure 8: Focus points of operational risk management
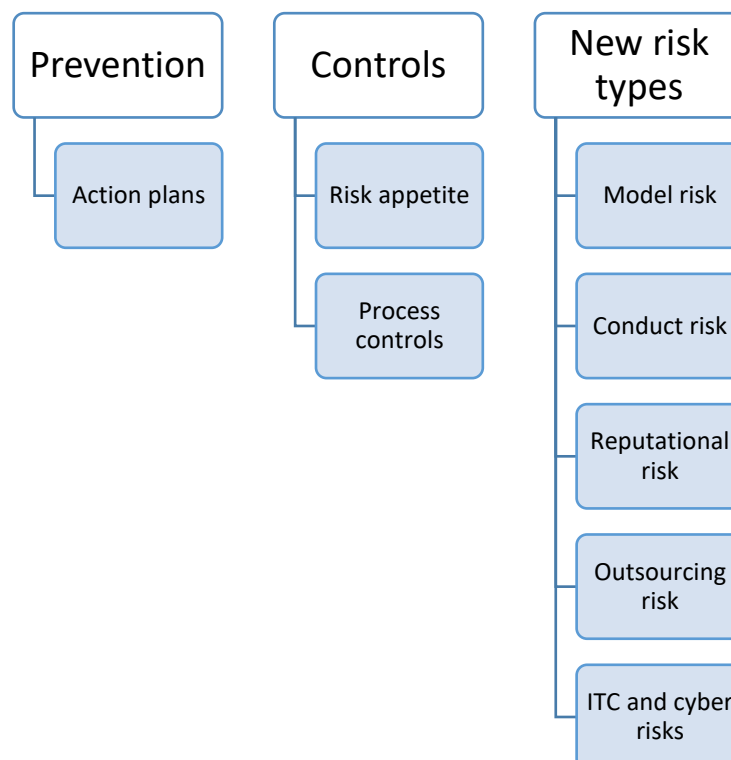


Source: by author

In the following subsections we present the trends summarized in Figure 8 individually.

## 2.4.1. Emphasis on prevention

The primary purpose of identifying and assessing risks is to define a capital requirement that is suitable given the institution's risk profile, so as to avoid a situation in which unexpected losses might endanger the bank's capitalisation. While retaining that objective, in the course of the audits, there is a strong expectation that the institution should be making substantial efforts to mitigate the risks that are identified, and to prevent the re-occurrence of losses that have already been suffered.

To make it possible to determine which measures can be used to avoid the recurrence of losses that have materialised, it is necessary a detailed analysis must be conducted to explore the incident and uncover the causes of the problem (case study). The key risk indicator system and annual risk self-assessments create the opportunity for risks to be eliminated before the loss materialises. Risk reducing measures must cover every pillar of operational risk management. The banks have to draw up action plans after significant loss events, in the event of a limit breach of key risk indicators, and when necessary in order reduce the risks that are revealed in the course of the self-assessments and scenario analyses and found to be unacceptable to management.

### 2.3.2. Strengthening control functions

The risk management function serves as an important control, representing the organisation's second line of defence under the internal lines of defence concept (EBA, 2017). An integral part of the operational risk management framework is the Risk and Control Self-Assessment, which goes some way to fulfilling the regulator's expectation that the operational risk management unit should assess, evaluate and test the functioning of the controls.

Another control function that deserves a separate mention is the operational risk appetite framework, which is not only a means of developing a bank's risk culture, but also a controlling tool that the bank's management to determine the acceptable level for each individual risk type, monitor the utilisation of limits, and intervene where necessary (Lamanda and Vőneki, 2015). Another means of controlling is the key risk indicator

system, which permits the monitoring of trends relating to the individual risks, and the implementation of measures in response.

### 2.3.3. The emergence of new risk types

The EBA's annually published risk assessment of the European banking system highlights those risks, categorised among operational risks that receive special attention from the senior risk management officers of banks. Based on the survey published in 2017, ICT (Information and Communication Technology) risks, cyber risk, outsourcing risk (especially with regard to IT outsourcing), legal and reputational risks have made it onto this list (EBA, 2017/b). Based on a survey by ORX, conduct risk, cyber risk and traditional fraud occupy the first three places (ORX, 2018). A survey by Risk.net also highlights outages in IT systems, breaches of data security and regulatory risks (Risk.net, 2018).

The risk categories receiving special attention from the regulator are consistent with the survey results. They include model risk, conduct risk, outsourcing risk and reputational risk. The latter is not deemed to be a part of operational risk under the Basel II definition, but during its audits of banks the regulator nevertheless deals with reputational risk in the context of operational risks, treating it as a consequential risk of these. These risks also feature in the ICAAP manual as factors that deserve special attention (MNB, 2018).

*Model risk*
In the financial institutions sector, the use of models has become extremely widespread in the past twenty years, with a growing number of decisions based on some kind of statistical-mathematical model. This phenomenon has been accompanied by the emergence of model risks. Model risks are defined as the risk of "losses resulting from errors in the model's input data, parameter-setting or use, including the operational risks arising in the course of running and applying the model" (Vőneki and Báthory, 2017:103). The banks are expected to elaborate and operate a model management framework in order to reduce the risk of erroneous decisions made on the basis of the models. The model risk management is primarily by providing the appropriate control environment, works with rigorous standards for model review, independent validation, documentation and business continuity planning. Chapter 3 of this dissertation is a good example of model risk.

*Conduct risk*

The clearest example of conduct risk, and also the most painful for the Hungarian banking sector, was foreign currency lending (the exchange rate cap and conversion of loans to forint) and the losses related to this. Based on the definition applied by the EBA (European Banking Authority), conduct risk means the current or prospective risk of losses to an institution arising from inappropriate supply of financial services including cases of wilful or negligent misconduct (EBA, 2014). These risks are treated as a priority within operational risks; in the course of preparing for the EBA stress test, banks have to make separate estimates of the potential loss arising from conduct risks. The risk is difficult to determine, and the supervisory authority believes that the way of keeping this risk type under control is primarily through products and the training courses associated with them (Szendrey et al, 2018).

Figure 9 shows the evolution of fines for this risk in the United States and Europe between 2009 and 2016.

Figure 9: Fines due to misconduct in the United States and Europe between 2009 and 2016
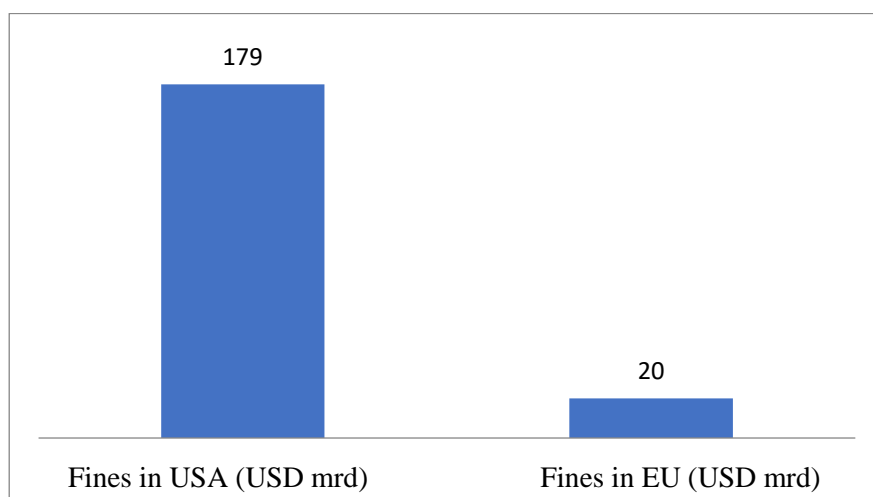


Source: EP, 2017

*Reputational risk*

In most cases, reputational risks arise as a consequential risk of operational risks. A serious reputational risk we could mention is the British Petroleum scandal of 2010, when an explosion on an offshore drilling rig took 11 lives and resulted in an

inestimable environmental disaster (The Guardian, 2010). The principal tool for managing these risks is crisis management, and the establishment of a crisis communication framework. The measurement of reputational risks is made possible within the system of operational risk management by the key risk indicators and the risk appetite framework.

*Outsourcing risk*
The significance of outsourcing risks lies in the outsourcing of IT systems and processes to external service providers. The banks' control systems established to deal with operational risks have difficulty transcending the organisation's boundaries, although the standard of the service provided to the final consumer can be profoundly affected by the availability of purchased services. Outsourcing risks are further complicated by the tightening of regulations relating to data processing and data security (EU, 2016).

*ICT and cyber risk*
As the cited surveys show (EBA, 2017/b), (ORX, 2018), (Risk.net, 2018), (IIF, 2017), the operational problems of IT systems and cyber risks represent the greatest threat to the operation of today's credit institutions. The biggest system crash so far took place at the Royal Bank of Scotland in 2012, affecting more than 6 million customers and resulting in a fine of 56 million pounds for the banking group on top of the compensation it had to pay. (Financial Times, 2015). Among the cyber-attacks, I would like to highlight the WannaCry and Petya ransomware viruses that appeared within barely two months of each other in 2017, with the former infecting some 230,000 computers in 150 countries (The Guardian, 2017), while Petya, a virus attacking Ukrainian government agencies and banking system (Telegraph, 2017), also caused serious financial and reputational losses

The assessment and quantification of cyber and other risks affecting IT systems also causes problems for banks, but with advances in digitalisation it is imperative to confront these sources of danger.

# 3. ANALYSING THE COUNTRY LEVEL FACTORS OF OPERATIONAL LOSSES: THE EFFECT OF THE FREEDOM OF PRESS[3]

The first research presented in this dissertation covers two elements of the operational risk pyramid, the loss data collection and modelling (Figure 10). The analysis is based on operational loss events between 2008-2016 and the conclusions drawn from the research concern risk models.

Figure 10.: Elements of operational risk pyramid affected by „Analysing the country level factors of operational losses: the effect of the freedom of press" research (the affected elements signed by blue)
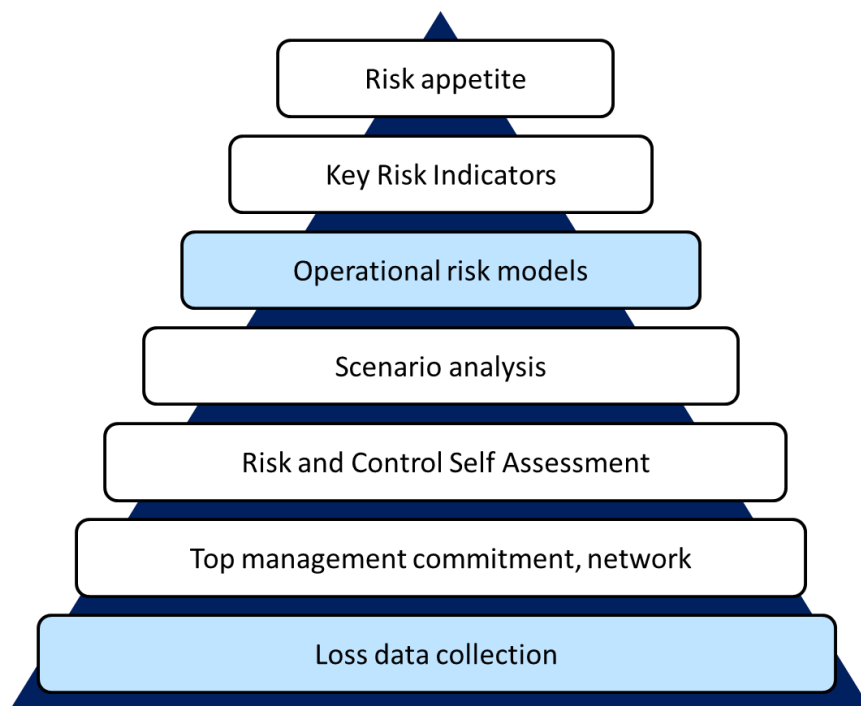


Source: by author

Operational risks that occur in other institutions or in other countries affect the participants of banking sector in many ways. The contact points can be summarized as follows:

- When calculating regulatory capital for operational risk using advanced approach we have to take account of external operational losses incurred by

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[3] The research was carried out together with Edina Berlinger and Lilla Keresztúri. The joint results were presented at the PRMIA Conference on October 17, 2018 and at the 9th Annual Financial Market Liquidity Conference.

other banks (BCBS, 2006). Thus, one of the elements of capital models is the external loss database, which, if not significantly but influencing the amount of the capital.

- Banks are using internal models to judge which amount and combination of maturity and product can be their limit towards partner banks. These internal models take into account partners' liquidity, profitability, capital position, country risk and other qualitative factors such as the level of development of risk management processes. In assessing country risk and the level of development of the risk management system, the expected operational losses in the country and operational risk management efforts of the partner are also part of the model's income data. Establishing of partner limits, tightening or freezing in case of loss of confidence has a significant impact on liquidity within the banking system, as we experienced during the 2007/2008 crisis.

- Going further, we can complement the role of operational risks aggregated at the country level with the cross-border activity of financial institutions, when they found or buy subsidiaries or branches and evaluate the country risk, including potential operational losses as well.

Country risk estimates are available by rating firms, but they focus primarily on credit risk and only marginally consider the possibility of regulatory change, natural disasters, war, terrorist attacks, corruption or other operational risks. At the same time, to evaluate the political and operational risk, a number of country risk indicators have been identified, replacing the aforementioned shortfall. There are several institutions among the political risk rating agencies:

- Insurance brokers like Marsh with Political Risk Map or AON with Political Risk Rating (AON Political Risk Rating);

- Credit insurers like Atradius with STAR (Sovereign Transfer and Arbitrary Risk) (Atradius, 2015) also deal with such analysis;

- Operational Risk Map prepared annually by the Economic Intelligence Unit;

- Oxford Economics has developed EPRE, listing 164 countries based on their economic and political risk (Oxford, 2017);

- Coface's Political Risk Index focuses on security, political and social risks, and evaluates 159 countries.

These indexes aim – beyond the credit risk – to estimate the effect of political, terrorism and other non-financial risks.

When examining the factors affecting the operational risk of a country we first compared the AON Political Risk Rating with actual operational losses. The result of the regression calculation showed that the rating does not explain or predict the size and frequency of operational losses; therefore, based on the literature, we examined which factors explain the variation of operational losses at country level. After that, with the reconsideration of the previously used variables, we aimed to create our own model. In the course of modelling, we first worked with the explanatory variables used in the literature and then introduced a new variable: freedom of the press index.

## 3.1. *EXAMINATION OF COUNTRY DISTORTION OF OPERATIONAL RISK IN THE LITERATURE*

The frequency and magnitude of operational losses vary from country to country, industry and company. Since the systematic collection of operational losses has been started due to the provision of data necessary for operational risk capital calculation, researchers have been given the opportunity to analyse these data and examine the differences and patterns.

In the analysis and modelling of operational risks, the micro- and macro-level approach can be found in the literature as well. Table 2 shows the most important literature focusing on country and company-specific operational risk factors. The table contains the most important findings of the articles: which corporate and country-specific characteristics lead to lower operational risks.

Table 2.: Country and company-specific factors affecting operational risks

| Firm characteristics with lower level of operational risk | Country-level determining factors of operational risk |
|---|---|
| Fiordelisi et al. (2013): larger profit and size of the company, larger level of capital investments and tangible assets | Li és Moosa (2015): GDP, GNI per capita, legal system, region, governance indicators |
| Chernobai et al. (2011): older company, lower credit risk, higher level of provision, more stock options of CEOs, more bonuses relative to salary of CEOs | Moosa (2015): GDP, governance indicators |
| Gao and Li (2009): listed on the exchange | Cope at al. (2012): legal, regional, governmental and economic indicators |
| Doyle at al. (2007): larger, older firms with less complex activities in better financial situation | Povel et al. (2007): booms, informativeness of publicly available information |
| Krishnan (2005): independent Audit Committee, with practiced, well-educated members | |
| Beasley (1996): higher number of independent board members | |

Source: by author

The most comprehensive paper dealing with country-level effects, Li and Moosa (2015) analysed 4,388 loss events in 53 countries between 1975 and 2008 using the database of Fitch First, and found that the composite index measuring the quality of governance GOV (including political stability, corruption, regulatory environment, the rule of law, etc.) was a significant determining factor. They used the following control variables: GDP (proxy for the size of the economy), GNI per capita (proxy for the living standard), legal system LES (French, English, German, or Scandinavian type), and geographical regions REG. They concluded that better governance led to a lower level of operational risk, while higher GDP and GNI per capita increased operational risks but other control variables (LES and REG) were insignificant.

In this research, first, we replicated the analysis of Li and Moosa (2015) covering 6,199 loss events in 92 countries in the period of 2008-2016 using the comprehensible database of SAS Global.

We found that governance indicators had no explanatory power at all, which is contrary to the academic consensus. Moreover, we proposed a new factor, the freedom of press which proved to be significant for loss frequency but not for loss severity.

In the next chapter the data and method are described, and then we show the results of different model settings and conclusions.

## 3.2.  DATA AND METHOD

For modelling, we used operational loss data on the one hand and country-specific economic, government and press of freedom indicators on the other.

### 3.2.1. SAS Global Data

There are two ways for banks to collect operational losses. On the one hand, the data consortiums created after 2008, to which the member banks can upload their loss events anonymously, and then get the aggregated data back. On the other hand, recognizing the business need, some service providers have built and maintain public databases that contain loss events published in the media.

SAS Global Data selected for research is one of the public databases and widely used by financial institutions through modelling operational risk capital. The database contains worldwide all loss event data which became public, in such detail that complies with Basel definition and specifications (BCBS, 2004). I got access to the database through my work, after my employer bought it from SAS and made it available to me for research purposes under the terms of a contract.

The use of public databases may raise the question of what biases they contain and whether they are suitable for academic research. J. Earl, A. Martin at al., (2004) examined the biases in media news and found that although the selection bias (i.e. not all events get publicity) and the description bias (which details are emphasized), public data can still be used for research purposes. In case of operational losses – in my opinion – we have to account for even smaller biases, because some of the cases (natural disasters, system shutdowns) cannot remain hidden in front of the media, and in

case of details detection and validation, the company providing the database does investigation and research.

SAS OpRisk Global contains publicly reported operational losses exceeding 100,000 US dollar, which in general also cause significant, but hard to quantify reputational risk. The high limit means that in 10% of the cases the losses in the database amount to 1-10% of the balance sheet total of the affected company. The role of external databases in financial institutions is rarely seen in the modelling of rare but significant effects ("tail" of distribution). For such losses internal loss databases do not provide enough data for capital calculation.

Several researchers have already performed analyses on the database. Fontnouvelle, DeJesus-Rueff and their co-authors (2003) used to model the capital requirements for internationally active banks, Dionne and Hassani (2016) analysed loss data and their heterogeneity between 2001 and 2010. So far, the literature has not addressed the need to compare actual operational losses and political risk indices.

For the purposes of current analysis we have chosen operational losses between 2008 and 2016. When we look at the database we see that the financial sector has a 30% share (Figure 11).

Figure 11.: Distribution of loss amounts by sectors 2008-2016
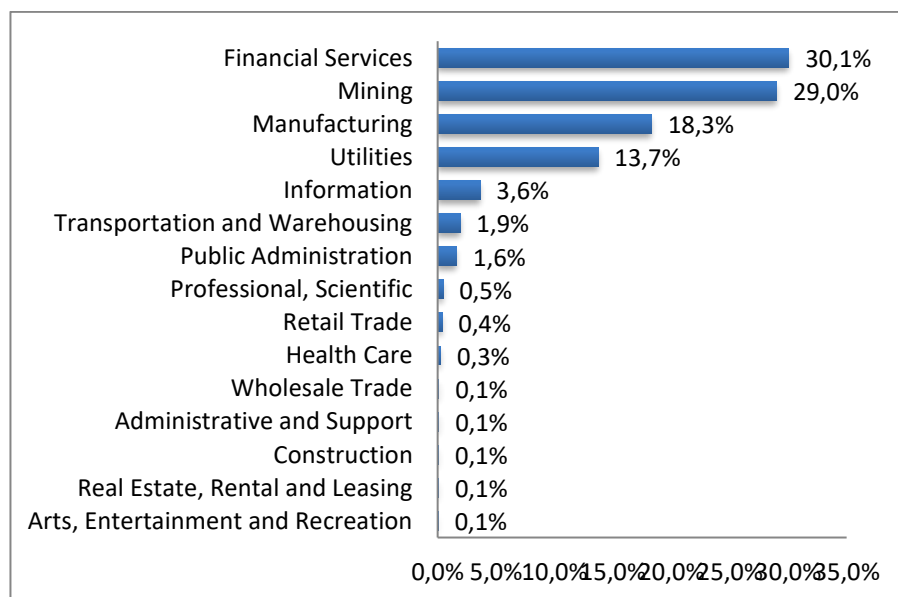


Source: SAS Global Data

In terms of the number of loss data the role of the financial sector is even more prominent (Figure 12) with more than 55%.

Figure 12.: Distribution of cases by sectors 2008-2016



| Sector | Percentage |
|---|---|
| Financial Services | 55,0% |
| Manufacturing | 10,8% |
| Utilities | 9,7% |
| Information | 8,3% |
| Mining | 7,5% |
| Transportation | 2,3% |
| Retail Trade | 1,9% |
| Public Administration | 1,3% |
| Professional, Scientific | 0,7% |
| Administrative | 0,6% |
| Wholesale Trade | 0,5% |
| Health Care | 0,5% |
| Accommodation and Foodservices | 0,2% |
| Arts, Entertainment and Recreation | 0,2% |
| Real Estate, Rental and Leasing | 0,1% |
| Agriculture | 0,1% |
| Educational Services | 0,1% |
| Construction | 0,1% |

Source: SAS Global Data

If we only consider financial institutions, we see that the data originates primarily from the North American, European and Asian regions. The Basel Risk Map, which shows which types of risk and which banking lines produce the most losses, indicate that the critical points are:

- External fraud
- Internal fraud
- Clients, Products, and Business Practice

Most of the events have affected the retail banking business with additional reputational losses.

### 3.2.2. Country-specific indicators

We go through the indicators used as explanatory variables in the model.

One of the explanatory variables used in the regression model was **Worldwide Governance Indicator** (WGI) accessed from the webpage of the World Bank. WGI index is composed of the following sub indices:

- Voice and Accountability
- Political Stability and Absence of Violence
- Government Effectiveness
- Regulatory Quality
- Rule of Law
- Control of Corruption

In line with (Li and Moosa, 2015), we used the aggregate WGI index as a proxy for the good governance, because the correlation is very high between them (0,8-0,9).

We used the following data from the World Bank database:

- **GDP (at 2016 value)**
- **GNI/capita (at 2016 value)**

Based on the information on the government websites countries are listed in the following **legal systems**:

- French system
- Anglo-Saxon system
- German system
- Scandinavian system

The legal system may affect several aspects of operational risks, such as regulatory risks and legal risks.

In order to define the regions, 92 countries were classified into 12 regions according to their location. Regions are as follows:

- USA, Africa, Canada, China, East Asia, Europe, Middle East, Australia and Oceania, Latin America, United Kingdom, Former Soviet States (except Baltics), Japan

For measuring press of freedom we selected the Press Freedom Index, which is published yearly by Reporters without Borders (RFS). The index is based on a questionnaire composed of 87 questions by experts and statistical data on violent events. Questionnaire questions cover the following topics:

2. Pluralism: Diversity of opinions in the media.
3. Independence of the media: How can you separate the media from economic, political, business, religious and other influences?
4. Environment: The environment in which the media works.
5. Transparency: Transparency of the process that leads to the emergence of news.
6. Infrastructure: Quality of media support infrastructure.
7. Abuses: The atrocities against journalists and reporters.

In each of the seven aspects an index of between 0 and 100 is created from which the Freedom of the Press index finally comes together.

Countries can enter the following categories based on the composite index:

➢ points 0-15: good situation
➢ points 15,01-25: Satisfactory situation
➢ points 25,01-35: Problematic situation
➢ points 35,01-55: Difficult situation
➢ points 55,01-100: Very serious situation

The index is published annually for 180 countries. The risk map of countries and the description of the methodology can be viewed with at https://rsf.org/en/detailed-methodology website (RSF, 2019).

### 3.3. RESULTS

At first we investigated the same regression model on our database for all industries as in (Li and Moosa; 2015):

$$LOSS_i = \alpha + \beta \ln GDP_i + \varphi GOV_i + \gamma \ln GNI_i \qquad (1)$$

$$+ \sum_j \delta_{i,j} LES_{ij} + \sum_j \lambda_{i,j} REG_{ij} + \varepsilon_i$$

where a $LOSS_i$ can be the frequency or the severity of operational losses in the ith country in a year; $GOV_i$ is the aggregate governance index (a higher value means better governance); $GNI_i$ is the GNI per capita, and LES and REG are dummy variables for the legal system and the geographical region.

After running the original model we found that the same composite indicator of good governance GOV is not significant explanatory variables any more. Moreover, the most important significant control variable is the geographical region which strengthens the idea that countries are very different in operational risk but these differences remain completely unexplained (Table 3).

Table 3.: Regression output for the model of Li and Moosa (2015) on other database, 2008-2016

| Factors | | Total loss | | Frequency | | Severity | |
|---|---|---|---|---|---|---|---|
| | | Coeffic. | Sign. | Coeffic. | p | Coeffic. | Sign. |
| **Logarithm of GDP** | | | 0.000 *** | 0.3477 | 0.000 *** | 0.4202 | 0.000 *** |
| **Governance Indicators** | | | 0.695 | -0.0150 | 0.122 | 0.0016 | 0.924 |
| **Logarithm of GNI per capita** | | | 0.113 | -0.0314 | 0.380 | -0.0994 | 0.108 |
| **Legal system** | French system (civil law) | Reference | | | | | |
| | English system (common law) | 0.4449 | 0.020 * | 0.3479 | 0.000 *** | 0.2218 | 0,114 |
| | German system | 0.1468 | 0.491 | -0.0073 | 0.936 | 0.1774 | 0,258 |
| | Scandinavian system | -0.3028 | 0.396 | -0.1244 | 0.414 | -0.1345 | 0,609 |
| **Region** | United States | Reference | | | | | |
| | Africa | -3.8444 | 0.000 *** | -2.6017 | 0.000 *** | -0.8042 | 0,140 |
| | Canada | -2.9045 | 0.002 * | -2.2014 | 0.000 *** | -0.4446 | 0,508 |
| | China | -2.8706 | 0.002 * | -2.7633 | 0.000 *** | 0.2407 | 0,729 |
| | East Asia | -3.6327 | 0.000 *** | -2.5884 | 0.000 *** | -0.5648 | 0,283 |
| | Europe | -3.5711 | 0.000 *** | -2.5718 | 0.000 *** | -0.5660 | 0,279 |
| | Middle East | -4.3483 | 0.000 *** | -2.9566 | 0.000 *** | -0.9921 | 0,069 † |
| | Australia and Oceania | -2.8321 | 0.000 *** | -2.1406 | 0.000 *** | -0.3144 | 0,583 |
| | Latin America | -3.6261 | 0.000 *** | -2.6797 | 0.000 *** | -0.5393 | 0,312 |
| | United Kingdom | -1.1560 | 0.203 | -1.3818 | 0.000 *** | 0.3977 | 0,551 |
| | Ex-soviet states except Baltic states | -3.4743 | 0.000 *** | -2.4296 | 0.000 *** | -0.6329 | 0,266 |
| | Japan | -4.0755 | 0.000 *** | -2.8630 | 0.000 *** | -0.8467 | 0,220 |
| **_cons** | | | 0.058 † | -0.5108 | 0.324 | -2.4543 | 0.006 * |
| **R2** | | | 0.390 | | 0.474 | | 0.251 |

*† p<0.1;    * p<0.05;    ** p<0.001;    *** p<0.0001*

Remarks: Legal system and region were dummy variables. Countries were divided into four categories according to their legal system, the basis (LES0) is the French system (civil law), LES1 is the English Anglo-Saxon system (common law), LES2 is the German system, and LES3 is the Scandinavian system. The basis of regions (REG0) was US.

Source:by author

It is worth to compare data for US and China, the two leading economies with approximately the same level of GDP constituting very different geographical regions, see Table 4.

Table 4.: Operational losses in the US and China, 2008-2016 (million dollars)

| Year | US Total Loss | China Total Loss | US Frequency | China Frequency | US Severity | China Severity |
|---|---|---|---|---|---|---|
| 2008 | 31816 | 1466 | 606 | 9 | 53 | 163 |
| 2009 | 16113 | 0 | 406 | 1 | 40 | 0 |
| 2010 | 2631 | 6 | 310 | 2 | 8 | 3 |
| 2011 | 3188 | 65 | 177 | 9 | 18 | 7 |
| 2012 | 1911 | 0 | 137 | 0 | 14 | - |
| 2013 | 875 | 196 | 104 | 3 | 8 | 65 |
| 2014 | 157 | 8 | 27 | 1 | 6 | 8 |
| 2015 | 24 | 899 | 11 | 7 | 2 | 128 |
| 2016 | 29 | 0 | 6 | 0 | 5 | - |

Source: SAS Global Data

Operational losses are shockingly much more frequent in the US than in China except for the year 2015 of „China crisis". Clearly, these differences cannot be explained by better governance in China, especially because China has spectacularly poorer governance indicators than the US. We came to the idea that the difference may be due to the fact that operational losses were measured by summing up SAS Global Data which are composed of all publicly available information. The publicity of operational losses may depend heavily on the freedom of expression in the country or, more specifically, on freedom of the press.

Accordingly we have set up the hypothesis that greater freedom of press will lead to more operational loss events (fraud, corruption, product recall, process errors, etc.), thereby increases the number of losses in the SAS Global Data database. Press freedom was not included in previous models and it is not part of the composite government indicator. Of course, in many cases freedom of press goes hand in hand with better government indicators, but Singapore is a good example when a country boasts excellent government indicators, but freedom of press is not fully guaranteed (Figure 13).

Figure 13.: Quality of governance (GOV) and freedom of press (PRESS)
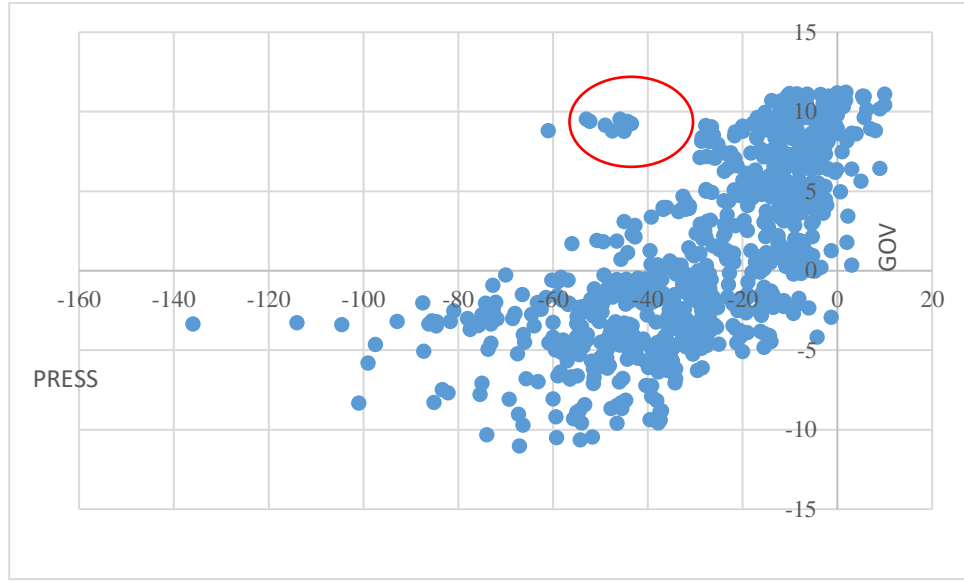


Remarks: Higher indicators mean better governance (GOV) and larger freedom (PRESS). Each country in each year is represented by a dot, and the small island in the red circle belongs to Singapore.
Source: by author

Based of the above argument, we introduced the freedom of press (PRESS) as an extra explanatory variable into our regression model and we found that it became the main determining factor on the whole sample. The Anglo-Saxon legal system (LES1) was significant for the total value of losses and the loss frequency, but its sign was contrary to the expectations as the Anglo-Saxon legal system is considered to support more effective corporate governance structures than the continental legal systems. For this reason, and given that geographical region (REG) was a too obvious explanatory variable without providing any insight into the problem, both LES and REG were excluded from the analysis.

The new model variations are based the following:

$$lnLOSS_i = \alpha + \beta ln\, GDP_i + \varphi GOV_i + \gamma ln\, GNI_i + \theta PRESS_i + \varepsilon_i \qquad (2)$$

where a $LOSS_i$ can be the frequency or the severity of operational losses in the ith country in a year; $GDP_i$ is ith country's annual GDP, $GOV_i$ is the aggregate governance index (a higher value means better governance); $GNI_i$ is the GNI per capita, and $PRESS_i$ is the freedom of press index in the ith country in a year. Based on the model we have run three model variations. In the first we took into account all the explanatory

variables, in the second we left the government indicator and in the third the freedom of the press index.

The results are shown in the following table:

Table 5.: The result of OLS in case of the logarithm of total loss, frequency and severity for all sectors

| Variables | Logarithm of Total loss | | | Logarithm of Frequency | | |
|---|---|---|---|---|---|---|
| | Coefficient | | | Coefficient | | |
| Logarithm of GDP | 0,865 *** | 0,854 *** | 0,816*** | 0,415 *** | 0,407 *** | 0,388 *** |
| Governance Indicators | -0,028 | - | 0,017 | -0,019 † | - | 0,005 |
| Press Index | 0,015 * | 0,012 * | - | 0,008 *** | 0,006 * | - |
| Logarithm of GNI per capita | -0,157 * | -0,208 * | -0,157 * | -0,08 * | -0,115 *** | -0,08 * |
| const | -6,697 *** | -6,229 *** | -6,574*** | -3,121 *** | -2,801 *** | -3,054 *** |
| R2 | 0,337 | 0,336 | 0,329 | 0,356 | 0,353 | 0,344 |

| Variables | Logarithm of Severity | | |
|---|---|---|---|
| | Coefficient | | |
| Logarithm of GDP | 0,079 * | 0,084 *** | 0,084 *** |
| Governance Indicators | 0,012 | - | 0,008 |
| Press Index | -0,001 | 0,000 | - |
| Logarithm of GNI per capita | -0,042 | -0,021 | -0,042 |
| const | -0,096 | -0,287 | -0,107 |
| R2 | 0,021 | 0,020 | 0,021 |

*† p<0.1;      * p<0.05;      ** p<0.001;      *** p<0.0001*

Source: by author

It can be seen that the government indicator does not have any explanatory power on the total value, frequency and severity of operational losses. Increasing the standard of living has an inverse effect on the loss frequency, meaning that in countries with a higher standard of living we can expect fewer operational loss events. We can see that GDP was significant in all settings with a proper sign. Our new variable, the freedom of the press, is significant in terms of total loss and frequency and – according to our hypothesis – in countries with low press freedom (higher index value) we find much less operational loss in the database. However, this is obviously not because these countries concerned are less risky, but that the cases are not made public. Not surprisingly, freedom of press has a greater explanatory effect on the frequency of

operational losses and the total loss value, but is not decisive for average loss. If an event becomes public, its size is less affected by the existence or absence of press freedom.

By examining the models better, we can see that the explanatory power of models using total loss and frequency as a dependent variable is the highest (around R2-32%), which is consistent with the findings in the literature that models for frequency have stronger explanatory power than models for individual loss events (Homolya, 2012).

The same model was run only for financial sector data and we got very similar results. The following table shows the results of regression.

Table 6.: The result of OLS in case of the logarithm of the total loss, frequency and severity of the financial sector

| Variables | Logarithm of Total loss | | | Logarithm of Frequency | | |
|---|---|---|---|---|---|---|
| | Coefficient | | | Coefficient | | |
| Logarithm of GDP | 10,603*** | 10,301*** | 9,034*** | 0,314*** | 0,308 *** | 0,286 *** |
| Governance Indicators | -0,737 | - | 0,694 | -0,015 | - | 0,011 |
| Press Index | 0,470 * | 0,383 * | - | 0,009*** | 0,007 *** | - |
| Logarithm of GNI per capita | -1,594 | -2,93 | -1,603 | -0,085 * | -0,111*** | -0,085 * |
| const | -88,927 * | -76,767 * | -85,037* | -2,145*** | -1,900*** | -2,074 *** |
| R2 | 0,043 | 0,042 | 0,037 | 0,286 | 0,283 | 0,268 |

| Variables | Logarithm of Severity | | |
|---|---|---|---|
| | Coefficient | | |
| Logarithm of GDP | 3,687 * | 3,558 * | 3,016 * |
| Governance Indicators | -0,315 | - | 0,297 |
| Press Index | 0,201 | 0,164 | - |
| Logarithm of GNI per capita | -0,558 | -1,129 | -0,562 |
| const | -23,41 | -18,218 | -21,748 |
| R2 | 0,012 | 0,012 | 0,010 |

*† p<0.1;     * p<0.05;     ** p<0.001;     *** p<0.0001*

Source: by author

In order to examine the resulting conclusion from as many sides as possible, we have run several model variants. What I would like to present in this dissertation is the panel regression model for the entire database. For panel regression, the dependent variables were selected according to the original model (not logarithmized) and the random effect model was chosen based on the Hausman test. The results are shown in Table 7.

Table 7.: Panel regression results in case of total loss, frequency and severity for all sectors

| Variables | Logarithm of Total loss | | | Logarithm of Frequency | | |
|---|---|---|---|---|---|---|
| | Coefficient | | | Coefficient | | |
| **Logarithm of GDP** | 577,189*** | 560,70*** | 470,4088** | 7,919*** | 7,907*** | 6,604* |
| **Governance Indicators** | -62,8743 | - | 33,61 | -0,123 | - | 1,05 |
| **Press Index** | 31,603* | 26,752* | - | 0,383* | 0,377* | - |
| **Logarithm of GNI per capita** | -132,291 | -266,28 | -134,89 | -4,536 | -4,81 | -4,59 |
| **const** | -4278,97* | -3103,63 | -3985,93 | -35,598 | -33,36 | -31,60 |

| Variables | Severity | | |
|---|---|---|---|
| | Coefficient | | |
| **Logarithm of GDP** | 9,799* | 8,743* | 7,117* |
| **Governance Indicators** | -2,570 | - | -0,12 |
| **Press Index** | 0,803* | 0,501 | - |
| **Logarithm of GNI per capita** | 2,930 | -1,72 | 2,91 |
| **const** | -90,129 | -47,80 | -83,48 |

*† p<0.1;      * p<0.05;      ** p<0.001;      *** p<0.0001*

Source: by author

It can be seen that even in this model GDP and the press freedom index shows a significant relationship primarily with the total loss and frequency.

The conclusion behind the figures is that in countries with low press freedom,

- where the media is under economic, political, religious and other influence,
- where the infrastructure to support the appearance of news is of low quality,
- where the news release process is not transparent
- where journalists and reporters are exposed to atrocities

the sensitive operational loss events such as internal and external fraud, process and human errors, corruption, business risk etc. cannot be revealed, so they are not included in the databases. Thus, when analysing loss data, these countries – wrongly – seem less risky.

It follows that in the case of modelling on public databases, we need to pay attention to eliminating distorting effects and correct our data by incorporating press freedom or similar control variable. This conclusion is important because many publicly available databases are being built into the banking models without the attention to the anomalies in the database.

Emphasizing the importance of press freedom we have added a new element to the modelling of operational risks, which may be important in estimating and analysing other risk types as well. In many cases, banks can only use public databases to build risk models. Our investigation has shown that these databases need to be corrected to avoid model risk. Using the extended regression model we are given the opportunity to estimate the real operational risks for some countries, where some of these cases remain hidden due to lack of press freedom.

## 4. CONTENT ANALYSIS OF BANKS' RISK DISCLOSURES IN THE FOUR VISEGRAD COUNTRIES [4]

In this research all elements of the operational risk pyramid are involved, as banks publish in their risk report all aspects of their operational risk management activities (Figure 14).

Figure 14.: Elements of the Operational Risk Pyramid that are involved in the "Content Analysis of Bank Risk disclosures in the Countries of the Visegrad Four" (blue for relevant items)
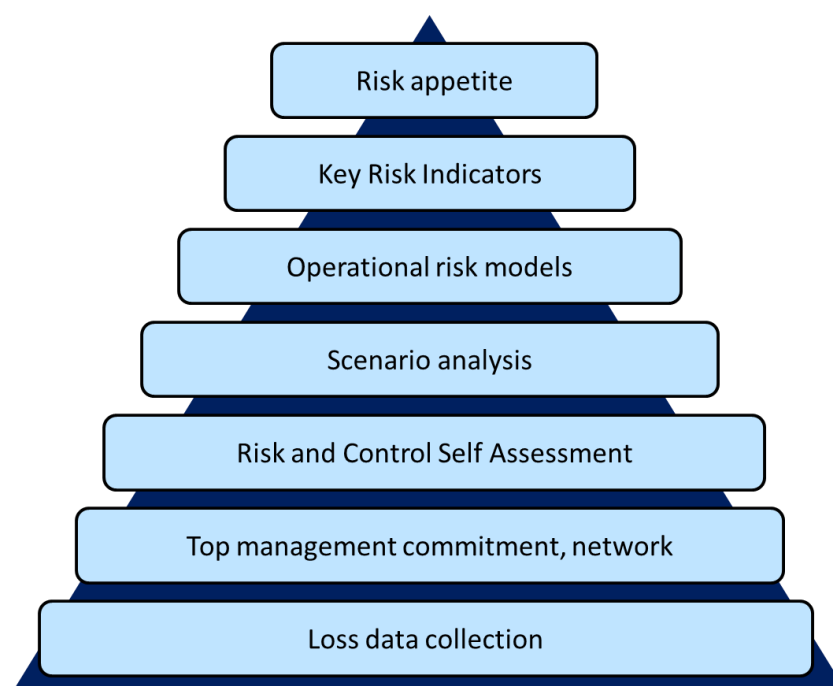


Source: by author

The Basel II Capital Accord targeted the strengthening of market discipline through developing a set of disclosure requirements and widening the range of disclosed information on institutions' risk profile and capital adequacy. Banks' reports based on disclosure requirements according to Basel II Pillar 3, indisputably, play an essential role in the valuation of counterparties and in the assessment of creditworthiness by rating agencies, at the same time, they have a great influence on institutions' reputation. The evaluation of partner banks is important with regard to the partner limit for the

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[4] The research was finished with dr. Gabriella Lamanda. The results were published in Budapest Management Review (Lamanda-Vőneki, 2018)

bank; analysts influence the development of the share price, while the analysis and judgment of rating companies affects the cost of financing.

Pakhchanyan (2016) analysed 279 operational risk related articles published between 1998 and 2014. The survey shows that only 18 articles were focused on Pillar III disclosure and only four of them examined the determinants of risk reporting. Most of these articles were written before the finalization of Basel II (2004) and before the Capital Requirements Directive (CRD) was introduced (2006) in the European Union. For instance, Helbok and Wagner (2006) analyse 142 Asian, European and North American financial intermediaries over the period of 1998-2001. They concluded that the extent and content of voluntary disclosure on operational risk are negatively correlated to a bank's equity ratio and profitability. Oliveira et al. (2011) examined the annual reports of 190 Portuguese credit institutions for 2006. The authors found that the main determining factor for banks disclosing operational risk-related information in their annual reports is saving their reputation. Barakat and Hussainey (2013) investigated the effects of bank governance, regulation, and supervision on the quality of operational risk reporting by more than 80 European banks from 2008 to 2010. They analysed the disclosure quality by a self-constructed index and concluded that "banks with a higher proportion of outside board directors, lower executive ownership, concentrated outside non-governmental ownership, more active audit committee and operating under regulations that promote bank competition disclose higher-quality operational risk reports".

The only paper focusing on Eastern Europe is Herghiligiu (2013). The author examined 41 Romanian commercial banks' operational risk reporting based on the method of Haija and Hayek (2012). Both articles provide general insight on operational risk disclosure practices and do not discuss this topic from a theoretical perspective. The main finding of Herghiligiu (2013) was that "supervisors should put a pressure on Romanian Commercial Banks to disclose qualitative and quantitative data on operational risk."

The 2007 crisis has resulted in the loss of confidence in models with strong mathematical, statistical and IT support, which in many cases do not report in time the decline of the market. As a result, typical behaviour is an increase in the weight of

subjective considerations in monitoring, evaluations and design processes. Such subjective additional information is contained in the risk reports published by the banks.

In the article which inspired our research (Zeghal and Aoun, 2016) the authors analysed the annual reports of 59 banks in the United States. Their purpose was to investigate the effects of the financial crisis on the content and the quality of banks' Enterprise Risk Management (ERM) information published in their annual reports. They observed a significant improvement both in the content and the quality of the reports after the crisis. They found that ERM disclosure is positively associated with the crisis, bank size and significantly and negatively associated with profitability.

Our research follows the content analysis approach applied by Zeghal and Aoun (2016). We analyse the Pillar 3 and annual reports of the largest (65-83,5% based on total assets) and most developed twenty six banks in the Czech Republic, Hungary, Poland and Slovakia, in the so called Visegrad countries (V4), in the period of 2008-2016. The annual report was necessary and should be included in the analysis because it contains additional information on bank capital and risks. On the one hand the selection of countries is justified by the geographical location of Hungary, on the other hand in V4 countries, most of the banks belong to Banking Groups headquartered in one of the developed wealthier EU countries (Italy, France, Belgium and Austria), therefore we assume that V4 countries manage their risks through well-developed approaches  The average growth rate (GDP) of the region under review was 4.3% in 2017, suggesting positive prospects for the banking sector, too.

The focus of the analysis was on the publication of operational risk which is the second largest slice of bank capital.

Despite the fact that operational risk is after credit risk the second largest element of bank capital requirement, it is often considered, due to its elusive nature, as an unimportant risk. In addition, in the past few years several new risks came into focus, which were assigned to operational risk (e.g. conduct-, model-, information and communication technology- (ICT) and reputational risks). On the one hand, this tendency may be considered as a return to the early definition of operational risk, when this risk was defined as everything that is not covered by exposure to credit- and market risk. On the other hand, we may expect that operational risks are in the focus of banks' management and are an essential and highlighted part of the disclosures.

In terms of the content of the reports we examined how banks provide information on specific risks and trends in addition to the general presentation of operational risk management, how they present the location, role and embeddedness of the area within the organization. In the analysis of the report quality, we started from the Basel Committee's principles for Pillar 3, revised in 2015, so we examined how clear and transparent the reports are, how they are suitable for comparisons between banks and years. In addition, we reviewed the factors (AMA introduction, bank size, leverage, profitability, board composition and size) that affect the content and quality of reports in the four countries.

Both annual and risk reports are very incomplete in terms of specific content, banks practically do not disclose their actual operational risks, their trends, potential threats, or devote little attention to emerging risk types such as conduct, model and reputational risk. Reports show a favourable view of risk culture and governance, in line with the Corporate Governance (Internal Governance) Regulation, which has been the focus of attention since 2006.[5] Banks have found the Risk Report (Disclosure Document) appropriate to demonstrate their efforts in this area. It can be shown that the introduction of Advanced Measurement Approach (AMA) – based on advanced internal models – has had a positive impact on the content and quality of risk reporting. The quality of the risk reports is increasing monotonously in the examined period, so we have experienced a slow improvement overall. The examination of the Annual Report has slightly improved the overall picture. Our conclusion is that, in spite of the general improving trend, banks' primary and main concern is to comply with regulatory requirements – which are not too strict and not too broad – in terms of disclosure. The potential benefit of the risk reports – that market participants gain more detailed and complete information on the operation of the institutions – cannot be considered as a significant motivating factor. However, it is clear from the data that the introduction of an advanced measurement approach for capital calculation has a significant positive impact on disclosure.

[5] In Hungary, 11/2006 HFSA issued on the basis of European standards on the design and operation of internal protection lines document is a milestone in this field.

Strengthening market discipline has been a key aspect of the regulation of financial markets in the European Union since the 1990s. The second Basel Capital Accord aimed at ensuring it through the harmonization and increase of banks' disclosure requirements. This is contained in Pillar 3[6], under which banks publish their risk reports annually since 2008.

Risk reports are public platforms, through which banks can provide, and market participants can acquire information on capital adequacy, risks and risk management processes, as well as on their internal prudential defence lines. Regulation (EU) No. 575/2013 (Capital Requirements Regulation, CRR) Part 8, lays down the rules of banking disclosure processes. Based on that "institutions shall disclose their risk management objectives and policies for each separate category of risk", including risk strategy, the organisational place of relevant risk departments, rules and methods of risk mitigation and coverage and the reporting lines. The document should present in a comprehensible form the bank's capital adequacy and risk profile associated with its business strategy (exposure to liquidity, credit, counterparty, market and operational risks), and the interaction of the institution's risk profile with the risk-taking willingness determined by the management body. This way the report makes the operation of the banks more transparent – primarily their risk management activities – for market participants, therefore it reduces information asymmetry.

Risk reports have a great influence on how market participants, including investors, customers, analysts and rating agencies evaluate institutions. Information is included in the annual and risk reports are relevant to the bank's reputation. In addition, reports play an essential role in the calculation of partner counterparty- and settlement limits[7]. The research conducted by 12 domestic banks (Homolya et al., 2013) confirmed that the

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[6] The Basel II Capital Agreement was adopted in 2004, and its implementation by the EU began after 2006. Its main objective is to strengthen banks' risk awareness by giving institutions greater freedom to determine their risk exposure and related bank capital. Basel II is based on three pillars. Under the first pillar, the convention allows banks to determine the required bank capital for their credit, market and operational risks based on their own internal models rather than the statutory standard methods. The second pillar requires the institutions to determine their exposure to all relevant risks and related capital based on their own internal methods and approaches. The third pillar extends the scope of mandatory disclosure to banks' capital and risk situation (formerly the risk report).

[7] The settlement risk is the uncertainty arising from the fact that the order of payment of the value of the transaction does not ensure that the payment order for the sale initiated by the bank is fulfilled only if the payment has already been settled (the paying agent or the bank itself has already been verified (Homolya et al., 2013).

bank's risk appetite, solvency and rating by external credit rating agencies are decisive factors in setting limits. In order to map these aspects, risk reports – given the content expectations – can make a meaningful contribution.

Relating to operational risk disclosure, CRR is rather reticent and focuses on the approach used for the calculation of operational risk capital requirements. Only the banks applying AMA have to provide information on their internal capital calculation models and risk mitigation mechanism (CRR Article 454.).

Although, disclosure requirements are wide-ranging, they are quite general; therefore their interpretation can be very different. In the last few years, much research was published focusing on, and analysing, risk reports and disclosure requirements, as well as, the degree of compliance with expectations. Most of these studies concluded that due to the absence of specific requirements, risk reports are quite heterogeneous, therefore the presentations of given risks are very different. They found significant differences related to the subjects presented, as well as, to the level of detail (CEBS 2009; Beaudemoulin 2009; FSA 2010; and ESRB 2013).

Khlif and Husseainey (2016) summarized and reconciled the findings of 42 empirical studies focused on determinants of risk reporting. They concluded, supported by agency, signalling and political cost theories, that the size of institutions and the leverage ratio (debt-to-assets) are positively and significantly associated with voluntary risk reporting. They pointed out the importance of risk disclosure from an accounting perspective. However, in the banking industry, secrecy, as an additional determinant of risk disclosure, affects risk reporting negatively; market discipline standards are becoming increasingly important.

In 2014, the Basel Committee revised its previous document entitled "Principles for the Sound Management of Operational Risk" (BCBS, 2011a). We have already spoken about the outcome of the review in the regulatory chapter.

As a result of increasing pressure, the Basel Committee published a revised disclosure obligation document (BCBS, 2015) in 2015, after extensive consultation. This document has more specifically defined the principles and aspects that need to be taken into account in the reports.

1. The report should send clear and unambiguous messages with sufficient detail related to complex topics with a clear, comprehensible wording. (*Clear*)
2. It has to cover the entire risk management process and all risks of the bank. (*Comprehensive*)
3. Report has to include risk weighting, highlighting key risks and presenting future trends. (*Meaningful to users*)
4. Report must be consistent, allowing time and trend analysis, tracking major events. (*Consistent over time*)
5. It must ensure comparability between banks, with uniform content and reporting structure. (*Comparable across banks*)

The principles have also been put into practice by the European Banking Authority (EBA / GL / 2016/11), meaning that all European Union banks publish their risk reports on this basis.

Previous disclosure expectations also required the institutions to provide the above information, but in the absence of concrete requirements, this could not be achieved. At the same time, the lack of concrete requirements also means that the audit related to the reports can only be limited.

Although the new modified document has been more specific and structured than its predecessor, it has been difficult for banks to implement the above five principles. Therefore, based on the Basel Committee (BCBS, 2018) banks will have to include the following information in the institutions' disclosure report by 2022, the introduction of the new SMA capital calculation methodology:

- General and qualitative information on banks' operational risk framework (policies, guidelines, structure, organization, reporting, risk culture, etc.)
- Historical losses: banks shall disclose aggregate operational losses incurred over the past 10 years, threshold of collection €20.000 or €100.000
- Business indicator and subcomponents
- Minimum required operational risk capital

However distant the year 2022 may seem today, this proposal brings the banking sector closer to transparency.

## 4.2. SELECTED BANKS AND RESEARCH DATA

Using the content analysis research method (Mayring 2000, Zhang and Wildemuth 2005) we examined the English versions of risk and annual reports of 26 banks in the four Visegrad countries, disclosed in the period of 2008-2016. With the exception of Slovakia and Czech banks, most of the institutions disclosed separate Pillar 3 reports. Disclosure requirements have been in force since 2008; therefore, the start date of the analysis was the year 2008. As we conducted the content analysis at the beginning of 2017, we examined risk reports up to 2016. In the selection of banks two aspects were considered: the size of the bank and the using the advanced measurement approach for operational risk capital calculation. We believe that this banking circle is the most motivated in prudent disclosure and that larger institutions can be considered the most advanced in terms of applied risk management methodology (Homolya, 2016).

Table 8 shows the list of selected banks and their combined market share.

Table 8.: Selected banks and their market share based on 2016 data

|  | Hungary | Poland | Slovakia | Czech Republic |
|---|---|---|---|---|
| Selected banks | OTP Bank | PKO Bank Polski | Slovenska Sporitelna | Československá obchodní banka |
|  | CIB Bank | Bank Pekao SA | VUB banka | Ceská sporitelna |
|  | Unicredit Bank | Bank Zachodni WBK | Tatra banka a.s. | Komercní banka |
|  | K&H Bank | mBank SA | ČSOB a.s. | UniCredit Bank Czech Republic |
|  | Erste Bank | ING Bank Slaski |  | Raiffeisenbank a.s. |
|  | Budapest Bank | Bank BGŻ BNP Paribas SA |  |  |
|  | Raiffeisen Bank | Bank Millennium |  |  |
|  | FHB | Alior Bank SA |  |  |
|  | MKB |  |  |  |
| Market share based on total assets | **65,00%** | **75,50%** | **83,50%** | **77,00%** |

Source: Annual Reports of the banks

In the second half of the 1980s, the Visegrad Four's banking sector became a "two-tier" system, in which foreign investors played a crucial role. Due to their presence, both the structural and the professional development of the financial intermediary system led to effective and competitive banking operations and services currently, a significant part of each examined banking sector is controlled by foreign, European, banking groups. The early 2000s were characterized by dynamic lending activity in all four countries. While in the Czech Republic and Slovakia foreign currency loans to households fluctuated, as a percentage of GDP, at around 1 percent at the end of 2009; the share of foreign currency loans exceeded 12 per cent in Poland and 20 per cent of annual GDP in Hungary. The global financial crisis did not cause lasting harm in the Visegrad countries, but tougher regulatory requirements have meant great challenges for the banks (National Bank of Hungary 2014, 32.p.).

As can be seen in Table 9, the highest share of operational risk capital charge within total own funds is in Hungary; at the same time, Hungary had the highest total capital ratio, in 2016 (18,6%).

Table 9.: Aggregate statistical data relating to operational risk in the Visegrad countries, in 2016

| | | | Czech Republic | Hungary | Poland | Slovakia |
|---|---|---|---|---|---|---|
| **Own funds requirements for operational risk % of total own funds requirements** | | | 12,45 | 16,32 | 8,33 | 10,75 |
| **Credit institutions (breakdown by approach)\*** | % based on the total number of credit institutions | BIA | 69,23 | 68,00 | 91,63 | 15,38 |
| | | TSA/ASA | 30,77 | 32,00 | 3,38 | 61,54 |
| | | AMA | 11,54 | 20,00 | 1,13 | 23,08 |
| | % based on total own funds requirements for operational risk | BIA | 35,26 | 22,53 | 24,54 | 1,81 |
| | | TSA/ASA | 28,58 | 33,66 | 61,98 | 54,34 |
| | | AMA | 36,16 | 43,81 | 13,48 | 43,85 |
| **Number of credit institutions** | | | 56 | 106 | 621 | 28 |
| **Total assets (in MEUR)** | | | 223 825,64 | 107 559,48 | 388 774,82 | 71 348,02 |
| **Total assets as % of GDP** | | | 128,27 | 95,69 | 92,62 | 88,13 |
| **Total capital requirements (in MEUR)** | | | 8 427,73 | 4 432,51 | 18 548,17 | 2 583,00 |
| **Total capital ratio (%)** | | | 16,65 | 18,60 | 16,82 | 18,04 |

\* Banks that use multiple methodologies may appear in multiple rows in the table

Source: EBA statistics

In the largest banking sector in the region, Poland, most credit institutions calculate operational risk capital by using basic indicator approach (BIA), while two-thirds of the total capital of operational risk is calculated by using more advanced methodologies

(TSA or AMA). In Hungary and the Czech Republic – like in Poland – the BIA is the most popular methodology if we consider the number of institutions. However, if we look at the amount of capital, most of it is calculated using the AMA methodology. In contrast to these three countries, the AMA methodology is popular in Slovakia, 23% of the institutions implemented it.

The SAS Global Data database can provide information about major loss events in the region. The following table shows the operational loss events recorded in the database by country and by loss type.

Table 10.: Operational losses in the V4 countries between 1989 and 2018, recorded in the SAS Global Data database for all sectors

| | Number of losses | Amount (MUSD) |
|---|---|---|
| **Czech Republic** | **70** | **1829,44** |
| Clients, Products, and Business Practice | 42 | 313,83 |
| Damage to Physical Assets | 9 | 419,76 |
| Execution, Delivery, and Process Management | 1 | 0,96 |
| External fraud | 6 | 333,25 |
| Internal fraud | 12 | 761,64 |
| **Hungary** | **46** | **1194,517** |
| Clients, Products, and Business Practice | 41 | 444,177 |
| Damage to Physical Assets | 1 | 648,93 |
| External fraud | 1 | 5,86 |
| Internal fraud | 3 | 95,55 |
| **Poland** | **58** | **1751,96** |
| Clients, Products, and Business Practice | 45 | 883,98 |
| Damage to Physical Assets | 3 | 531,03 |
| Execution, Delivery, and Process Management | 2 | 2,64 |
| External fraud | 2 | 136,26 |
| Internal fraud | 6 | 198,05 |
| **Slovakia** | **12** | **134,5** |
| Clients, Products, and Business Practice | 7 | 41,25 |
| Damage to Physical Assets | 1 | 0,18 |
| External fraud | 1 | 4,04 |
| Internal fraud | 3 | 89,03 |
| **Total** | **186** | **4910,417** |

Source: SAS Global Data

39% of the number of losses and 37% of the amount of the losses happened in the financial sector. The second largest sector in the database is the manufacturing sector,

which only affected 7% of the events, but caused significant, nearly $ 1.525 million loss (31% of total loss amount).

## 4.3.  METHODOLOGICAL BACKGROUND AND HYPOTHESES

Focus of our research was – in the first round – the examination of banking risk reports. We later completed the survey with the annual reports, as we found that banks also provide information about the capital position and the risk profile as part of it. In all cases, the reports come from the websites of individual banks. However, there were big differences between the institutions, where exactly these publications are found within the website: between reports or press releases, or under the menu for investors.

Hemrit and Ben Arab (2011) collected a number of commonly used approaches to measure disclosure. They showed that most of the methods applied in empirical studies are self-constructed indexes, content analyses and regression. In our analysis, we followed the methodology applied by Zeghal and Aoun (2016), which inspired us to conduct a similar study with a different focus. This method is content analysis, a subjective, and at the same time scientific, research methodology for examining documents. This methodology ensures systematic classification of our research questions, and supports our study empirically and methodologically. (Zhang and Wildemuth 2005) Content analysis is widely used for literature reviews and for forming measurable indexes from a text. Gaur and Kumar (2018) demonstrated the application of content analysis through gathering high ranking content analysis-based articles between 1991 and 2015.

The starting point was the code sheet presented by the American research. We modified the questions based on European regulation and we have added additional ones which can be important to the market participant to get a comprehensive view of the bank's operational risk profile and lines of defence. Based on the selected aspects we have evaluated and „coded" the operational risk part of the two reports and worked on the results of this coding. In order to minimize the subjectivity of the results, we coded the texts separately and matched the scores for each question.

Zeghal and Aoun (who inspired our research) comprehensively analysed the risk management chapters of 59 US bank annual reports in 2-2 years before and after the crisis (2006 and 2007, 2008 and 2009). In their articles, therefore, not only operational, but credit, market and liquidity risks appeared as well. The evaluation of the volume and the quality of risk reporting were measured and in the same time authors looked for correlation between these potential changes and the bank size, profitability or the composition of the board. In our case we focused on the operational risks, which also required an increase in the number of operational risk questions.

In the application of the methodology, the assessment was based on two aspects: focusing on the content elements and assessing the quality of the report.

Relating to the aspect of content we examined the reports based on 23 questions, assigned to five categories. If we found the answer to the given question in the reports, then the bank got 1 point, if not, got 0 points for the given year.

After summarizing the responses, like the US research, we determined the Oprisk Disclosure Index (ODI) using the following calculation method:

$$\textbf{ODI} = \frac{\sum_{i=1}^{n} Si}{\textbf{23}} \tag{1}$$

where $S_i$ is the code attributed to each item which takes 1 if the item is disclosed and 0 if otherwise; n is the number of questions that is 23.

Relating to the aspect of quality we examined the reports based on 11 questions. As in the case of the content aspects, we calculated the OpRisk Quality Index (OQI) based on the article of the American authors (Zeghal and Aoun, 2016). Depending on the level of compliance, code values moved between 0 and 3. For quality aspects annual reports were not included in the study, only the transparency and availability of risk reports were analysed. While the content of the annual report may supplement the information of the risk report, the quality of the reports can only be independently verified. From the points we formed the OpRisk Quality Index (OQI), which can be calculated as follows:

$$\textbf{OQI} = \frac{\sum_{i=1}^{n} Si}{\textbf{33}} \tag{2}$$

where $S_i$ is the code attributed to each item, n is the number of questions; and 33 is the maximum weighted score for all the items in the index.

### 4.3.1. Details of content and quality aspects

Relating to the aspect of content we examined the reports based on 23 questions, assigned to the following five categories (See Annex 1). We examined whether the reports included information on these categories:

1. Definition

The definition question group examined whether the risk reports and the annual reports included the definition of operational risks, the categorization of business lines and risk types, and the description of the applied capital calculation methodology and the name of the external database.

2. Governance

The governance category includes the location and structure of the operational risk management area, its embeddedness in banking processes, the role of the relevant committees and the operation of controls.

3. Risk culture

Risk culture focuses on the appearance of risk appetite, strategy, annual review, and integration into decision-making processes.

4. Risks and trends

In the category of risks and trends we examined whether the reports only provide a picture of the framework or provide data on actual losses, risks, trends, potential threats of the bank in the year under review. It was also a question of whether market-focused events (eg. foreign currency credit crisis: exchange rate mismatches and compensation because of unilateral interest rate increases) appear in these reports, and whether the data in the report provide time and trend analysis or any information about the banking group (consolidated vs. individual data).

5. New risks

In the case of the new risks we looked for the operational risk types which get special attention from the regulator like model, conduct or reputational risk and some important risk mitigation method like business continuity planning. However the reputational risk – based on the Basel regulation – is not part of operational risk (BCBS, 2006), our experience shows that the regulator review it under operational risk framework. In addition, from a practical point of view, operational risk also has a significant reputational impact (eg. foreign currency crediting, internal fraud).

In assessing the quality of the reports, we focused on compliance with the Basel Committee's revised disclosure principles (BCBS, 2015). As discussed above these aspects are: clear and well-defined messages, complete risk management process, specific information on risks, time-series and inter-bank comparability. The grouping of questions can be found in Appendix 2.

During the examination of the results we analysed the temporal development of the indices defined by the formulas (1) and (2) and the differences between the selected banks. In addition, by running a panel regression, we analysed which economic and corporate governance factors influence the development of the two indexes.

It is in the interest of banks to publish information on their risk profile and risk management activities. Proper disclosure reduces uncertainty, thereby reducing information asymmetry and leading to lower funding costs and easier access to capital markets. Therefore, we can reasonably assume that both the content and the quality of the disclosures show an improving trend during the period under review. The following hypotheses were set up and tested based on the data generated by content analysis:

> H1: The content and the quality of OpRisk disclosure by the V4 largest banks have improved and become more sophisticated in the period of 2008-2016.

H2: The content and the quality of OpRisk disclosure by the V4 largest banks are positively correlated with the implementation of AMA.

H3: The content and the quality of OpRisk disclosure by the V4 largest banks are positively correlated with bank size (natural logarithm of total assets).

H4: The content and the quality of OpRisk disclosure by the V4 largest banks are correlated with the level of equity-to-assets ratio.

According to Khlif and Husseainey (2016) and Hemrit and Ben Arab (2011), association of profitability with risk reporting is not clearly demonstrated. Different studies come to conflicting results. Some of them state that the weaker profitability is, the higher the motivation in order to decrease uncertainty and reflect the firm's promising future prospects. Other studies argue that institutions with high profitability are also motivated to disclose risk information for the purpose of reflecting their efficient risk management processes behind their good performance. While there is no conclusive empirical evidence on this relationship, see also Zeghal and Aoun (2016), we propose the following hypothesis:

H5: The content and the quality of OpRisk disclosure by the V4 largest banks are correlated with profitability.

Zeghal and Aoun (2016) included in their study board structure information: ownership structure, board size, board independence and duality of the roles of a CEO and chairman of the board. In the V4 countries several banks are owned by large banking groups and are not listed on the stock exchange; therefore to capture ownership

structure is not relevant in our sample. However, the variables for the board were taken from the inspirational article and the following hypotheses were set accordingly:

> H6a: The content and the quality of OpRisk disclosure by the V4 largest banks are negatively correlated with board size.

> H6b: The content and the quality of OpRisk disclosure by the V4 largest banks are negatively correlated with duality between the roles of CEO and of the chairman of the board.

> H6c: The content and the quality of OpRisk disclosure by the V4 largest banks are positively correlated with the proportion of independent non-executive directors.

## 4.4. ANALYSIS AND RESULTS

In this chapter we evaluate the annual and risk reports of each bank with the help of indexes based on content analysis in the examined period. At the same time we test the hypotheses were set up in the previous chapter.

### 4.4.1. Evaluation of content and quality of reports

In this chapter we analyse the aggregated data of twenty-six banks and focus on the identification of major trends, patterns and country comparisons.

Figure 15 shows the change in country values for the Oprisk Disclosure Index (ODI), which evaluates the content of reports. As can be seen from the chart, the content of the publication has widened and improved in the three countries of the Visegrad Four

during the period under review. Only in Slovakia we see stagnation, the index ranged between 50-55%. In the case of Poland the improvement is significant. Further research on Polish results is worth pursuing; our assumption is that the positive change is mainly due to the large number of acquisitions.

Figure 15.: The average value of the Oprisk Disclosure Index (ODI) between 2008 and 2016 per country



| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| Czech | 44,3% | 49,6% | 53,0% | 55,7% | 56,5% | 62,6% | 61,7% | 64,3% | 64,3% |
| HU | 39,1% | 48,3% | 50,2% | 54,6% | 56,0% | 57,5% | 54,1% | 57,5% | 56,5% |
| Poland | 39,1% | 40,8% | 39,7% | 43,5% | 50,0% | 65,2% | 69,0% | 70,1% | 71,2% |
| SL | 52,2% | 53,3% | 54,3% | 52,2% | 51,1% | 48,9% | 52,2% | 52,2% | 51,1% |
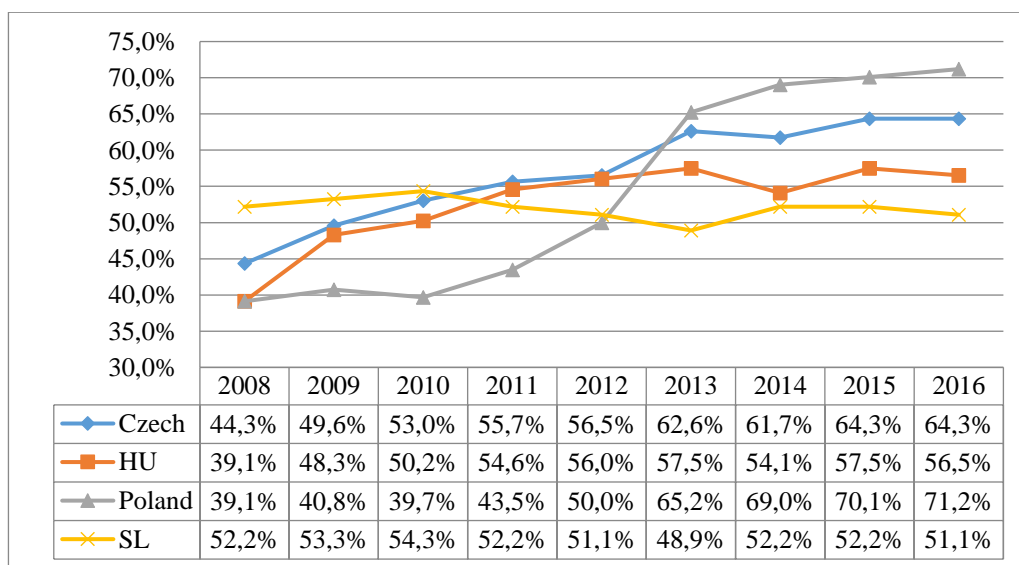
Source: by author

Figure 16 shows the average value of the OpRisk Quality Index per country. In the period under review the value of OQI in the three countries increased only slightly, ranging from 43% to 52%, while the Polish banking system again showed remarkably good disclosure quality.

Figure 16.: The average value of the OpRisk Quality Index by country between 2008 and 2016



| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| Czech | 45,5% | 46,7% | 47,3% | 50,9% | 50,9% | 52,1% | 51,5% | 51,5% | 50,9% |
| HU | 43,1% | 45,1% | 44,4% | 46,5% | 46,8% | 48,1% | 47,8% | 49,2% | 49,5% |
| Poland | 46,3% | 47,0% | 47,3% | 48,9% | 49,2% | 64,4% | 66,3% | 62,5% | 64,4% |
| SL | 47,5% | 44,7% | 45,5% | 45,5% | 45,5% | 43,9% | 47,7% | 47,7% | 47,7% |
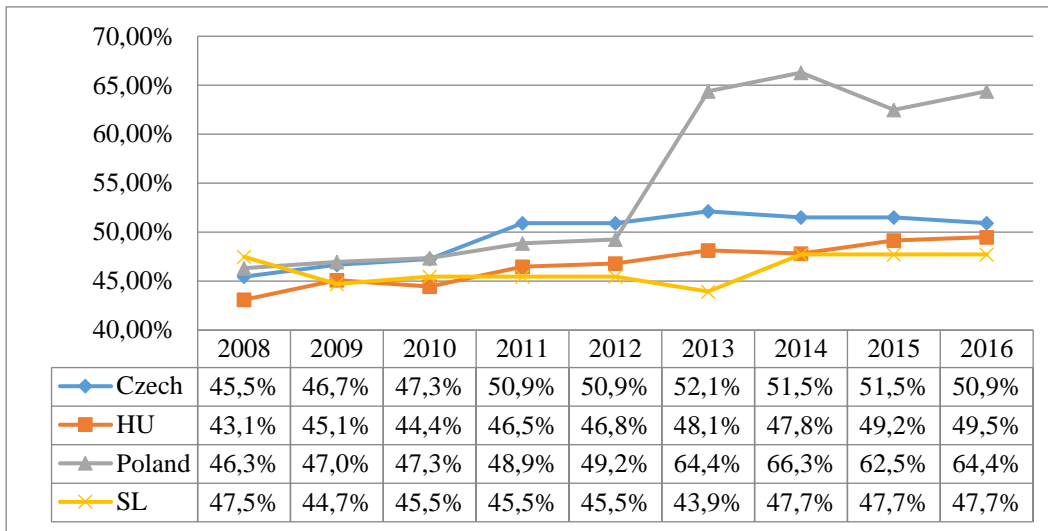
Source: by author

Table 11 summarizes the descriptive statistics of the two indexes examined for the twenty-six (24 in 2008) banks of the four countries.

Table 11.: Descriptive statistics for the ODI and OQI indices of the V4 countries for the years 2008, 2011 and 2016

| 2008 | | | | | |
|---|---|---|---|---|---|
| Indexes | Number of banks | Mean | Standard deviation | Minimum | Maximum |
| ODI | 24 | 41,85% | 16,61% | 17,39% | 78,26% |
| OQI | 24 | 45,08% | 9,92% | 27,27% | 69,70% |
| 2011 | | | | | |
| ODI | 26 | 51,00% | 16,52% | 17,39% | 73,91% |
| OQI | 26 | 47,90% | 10,77% | 30,30% | 69,70% |
| 2016 | | | | | |
| ODI | 26 | 61,71% | 14,71% | 30,43% | 82,61% |
| OQI | 26 | 54,08% | 11,96% | 30,30% | 72,73% |

Source: by author

Based on Figure 17 risk reports focus primarily on risk culture and governance. The implementation and development of risk awareness has been particularly important in the life of banks since the 2007/2008 crisis. In their disclosures banks publish information about their risk strategy, risk appetite framework, control environment and reporting systems, but hardly show how the operational risk management area cooperate with internal audit, compliance, bank security or fraud prevention. Likewise, risk reports hardly contain information about trainings and developments aiming to improve the operational risk sensitivity of employees.

Most of the reports reviewed did not speak about the current risk factors, their trend, losses, potential threats and emerging risks such as conduct, reputational and model risks.

Figure 17.: The evolution of the average ODI index along the five dimensions between 2008 and 2016
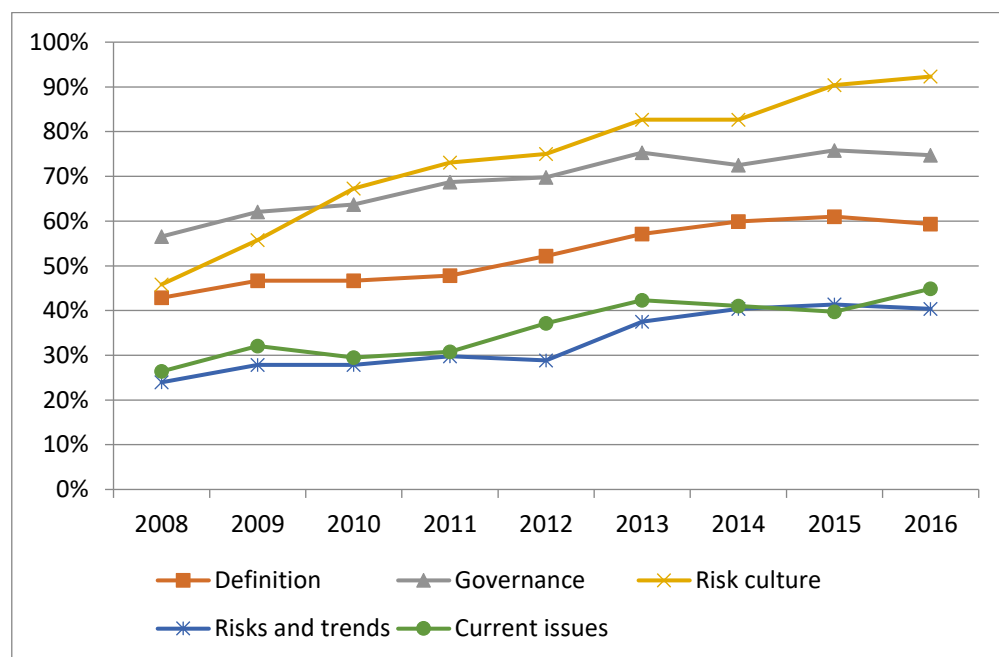


Source: by author

In summary the content and quality of operational risk disclosures at the largest banks in the V4 have improved and become more sophisticated over the period 2008-2016, confirming our first hypothesis (H1).

Figure 18 shows that among the banks surveyed, the average ODI index for AMA users was 67.2% in 2016; while for banks using simple methodologies this number is only 58.2%. This supports the second hypothesis for which further analysis is performed by regression calculation.

Figure 18.: The average ODI index for banks using and not using AMA between 2008 and 2016
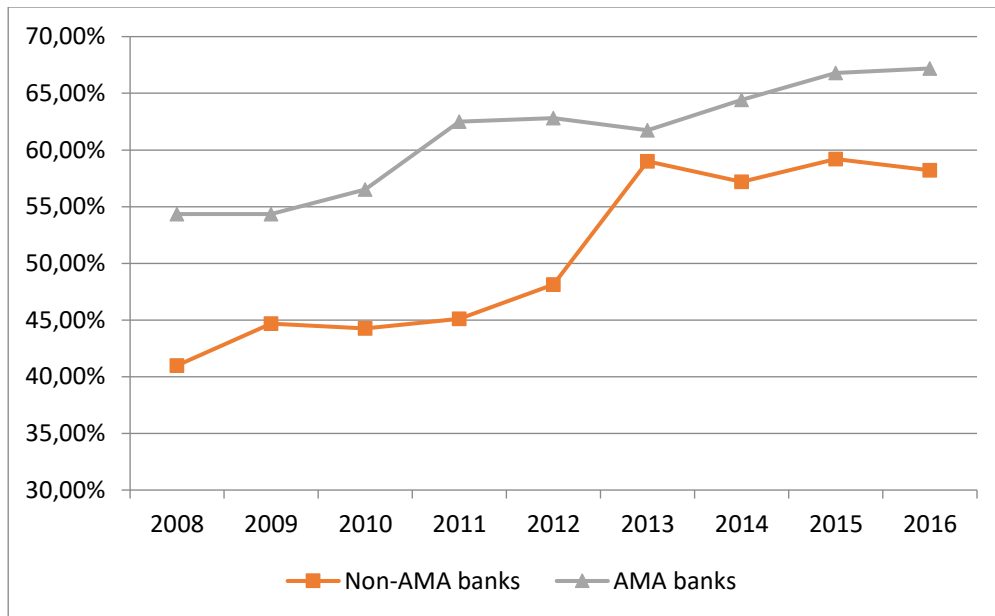


Source: by author

### 4.4.1. Evaluation of Hungarian banks

After the aggregated analysis of Visegrad Four's data let's examine separately the Hungarian banks' risk and annual report quality and content. Appendix 4 contains the most important data of the selected banks.

Following the order applied during the presentation of the method, first we see the content elements. Figure 19 shows the average scores gave for certain point of views of evaluation in case of every examined Hungarian bank.

Figure 19.: Average scores for the content of risk reports along the five dimensions studied (2008-2016)
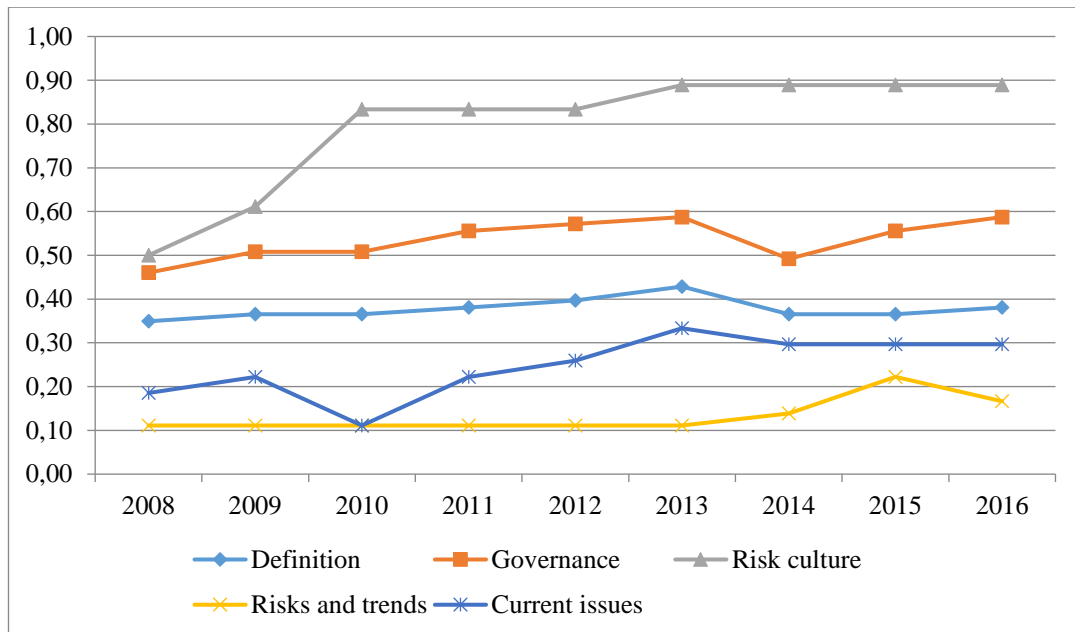


Source: by author

We can see on the graph that, similar to the V4 aggregated data, the risk reports first and foremost show advantageous picture regard to the risk culture and governance. Its reason presumably is the recruitment of the regulatory endeavour concerning the responsible governance, banks found the releasing document convenient as its root to demonstrate their effort made at this area to correspond to the supervisory expectations. We mention as deficiency within the category the relationship between the defence lines (regional managers, internal control, compliance, and risk management), the description of the division of labour and the education system established in favour of the development of risk awareness.

The deficiency of reports can be highlighted here as well in respect to concrete contents. We discovered that banks basically do not release anything about their factual risks, their trends, the potential dangers, and they pay just little attention to the newly appearing risk types. A positive example is Erste Bank, where the outsourcing risks appear too, or Raiffeisen Bank, whose report mentions the risks hidden in the product development process.

Figure 20.: Average scores for the combined content of risk and annual reports along the five dimensions examined (2008-2016)
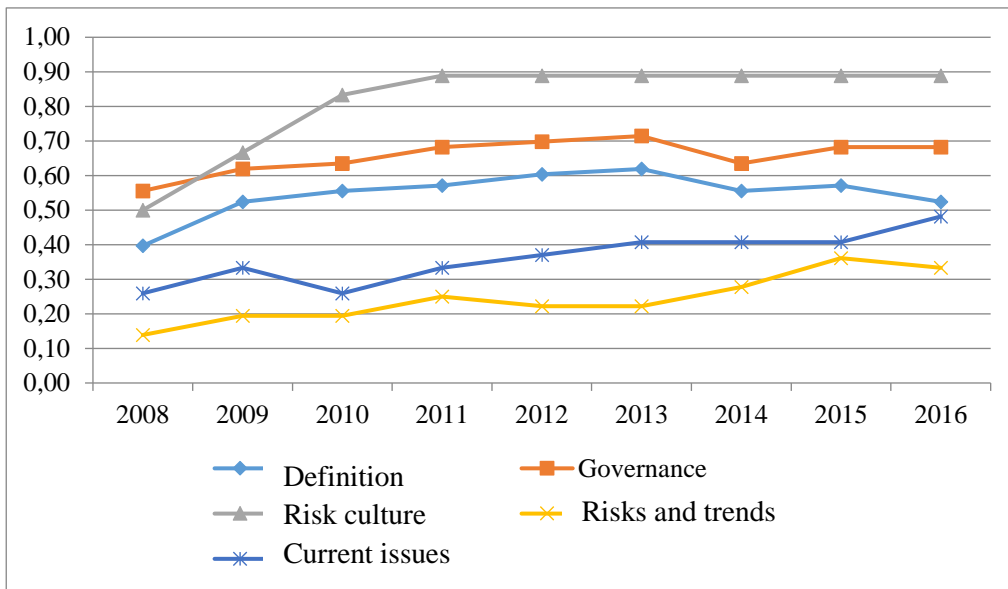
If we examine the content scores together with the annual reports, we do not experience change in order, furthermore the risk culture and the governance dominates them. The information announced about factual risks somewhat augmented, but is still vanishing.

Figure 21 shows the evolution of the Oprisk Releasing Indexes sorted by banks one by one.

Figure 21.: Oprisk Disclosure Index based on risk reports, broken down by bank between 2008-2016
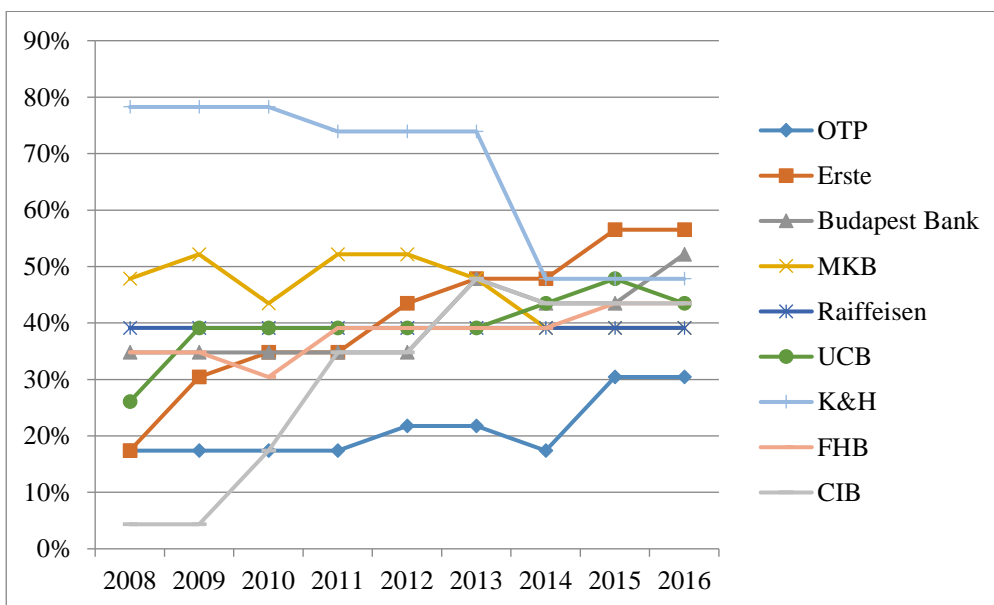


Source: by author

The value of ODI in case of certain banks became more homogeneous, started from very different levels until 2016, but it still has a standard deviation between 30,4-56,5% in this way too. In the background of the notable standard deviation in the beginning, there are things like the relating regulation granted only broad frames, so allegedly the banks interpret it really differently about which topics, how many details should they write in the report. We observed that the wording of the reports in many cases do not change for years which confirms the slow convergence. The reports of Raiffeisen Bank are the best examples for it. At the same time, it is visible that with the peak of foreign currency loan problems (2009-2012) parallels broadened the content of the reports. In the background of the convergence it may be that the banks look up each other's reports and they define the content based on them. We can see some outliers on the graph. The evaluation of OTP Bank worsened from 2013 to 2014 because parts about the control environment and about the operational risk management's integration to bank processes were avoided from its report. On the other hand in 2015, the business continuity planning process and the description of the report system appears in the report. The content of K&H's report also changed during this period. While in the beginning the reporting of the bank risk was exceptionally detailed and informative, in 2014 several elements were eliminated from the document, for example the definition, the categorization, the integration into bank processes, the relationship with the other defence lines (internal control, compliance) of operational risks and the presentation of the education concept.

If we examine the same graph for the risk and annual report together then we get a more advantageous picture (Figure 22).

Figure 22.: Oprisk Publication Index based on risk and annual reports, broken down by bank between 2008-2016
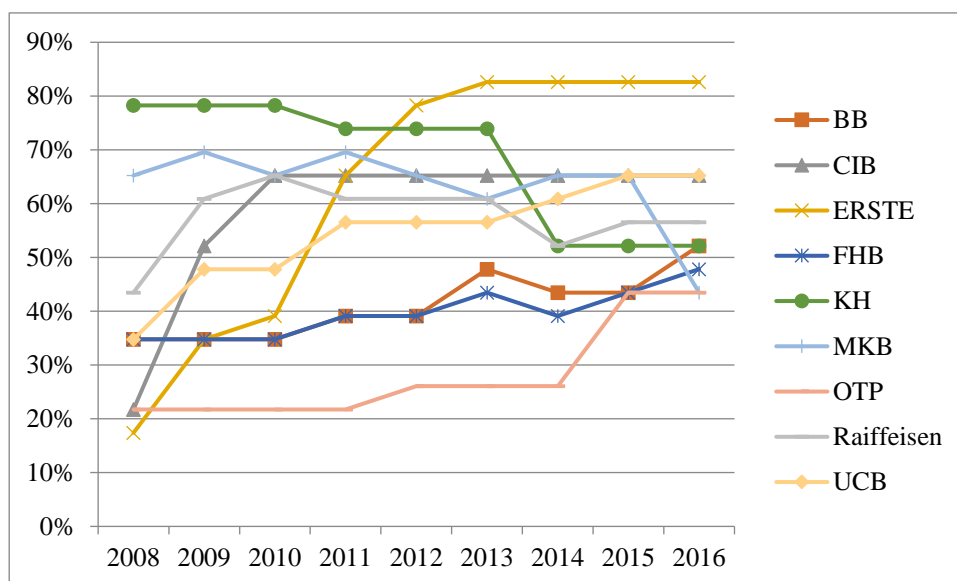
The most outstanding deviation is observed in the case of Erste and CIB. At Erste, the annual report contains the definition and categorization of operational risk and what's more important, it gives information about specific operational risks with considerable effects and mentions the reputational risk. The difference at CIB is given by mentioning the operational risk, the interpretation of the external loss data, the marking of the number and sum of operational risk loss events and it reports the network of relations of internal control, compliance and risk management, which is communicated in the annual report.

The Unicredit and Erste apply the AMA methodology from the middle of 2009, while the FHB from 2012 and OTP from 2013. After the implementation at each of the four banks, the disclosures improved. In case of Unicredit the ODI index got better by 13 percentiles, at Erste it is 17, at FHB it is 4,3, only at OTP an immediate amelioration cannot be detected after the installation of AMA.

It is worth examined whether there is a difference between banks that uses the advanced measurement approaches (AMA) and other financial institutions, or whether the implementation of AMA caused a change in the content elements of reports. In 2016 in the case of the four AMA banks (OTP, FHB, Unicredit, Erste) the ODI index on

average is 59,8%, while in case of banks using the simple method, the average value is 44,3%.

Figure 23.: Development of ODI indices based on risk and annual reports for AMA and non-AMA banks (2008-2016)
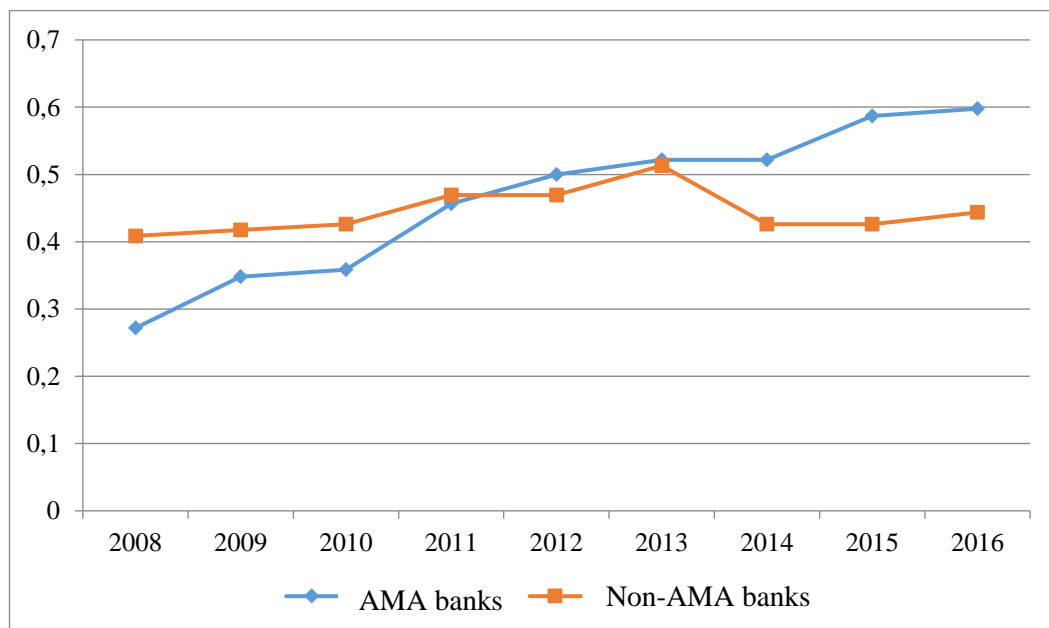


Source: by author

By Figure 23, we can say that in case of banks applying the advanced measurement approaches, the value of ODI index, configured for the content of reports, is constantly growing and after 2011 it is permanently higher than the others' using simpler methodology.

According to the result of two-sample t-test[8] (p=0,16121) at Hungarian banks the calculated average value, based on the ODI index risk and annual reports, does not show a significant deviation in the two groups (AMA and not AMA) if we consider the whole period. Later we look up the same interrelation for the V4 countries with regression analysis. There the deviation between the two groups will be significant.

---

[8] With the two-sample t-test we examine if the average of each probability variable of the two samples significantly differs from each other or not. The condition of the test's applicability that the variance of the two samples do not differ significantly from each other and we check it with F-test. In this instance with t-test we examined that if in case of banks using AMA the average values of ODI indexes significantly differs or not from the average value of ODI indexes of those banks who do not applies AMA

In the article of Zeghal and Aoun (2016) in the end of their observed period, in 2009 the average value of the releasing index concerning every risks were 57,6% volt.

Following the content point of views, we examine the correspondence to the quality requirements as well (Figure 24). This time only the risk reports are parts of the analysis. In the aspect of Quality Index, the banks' risk reports have a standard deviation of 33,3-60,6%. In the American research the average value concerning every risk was 38% in 2009.

Figure 24.: Quality Index based on Risk Reports 2008-2016
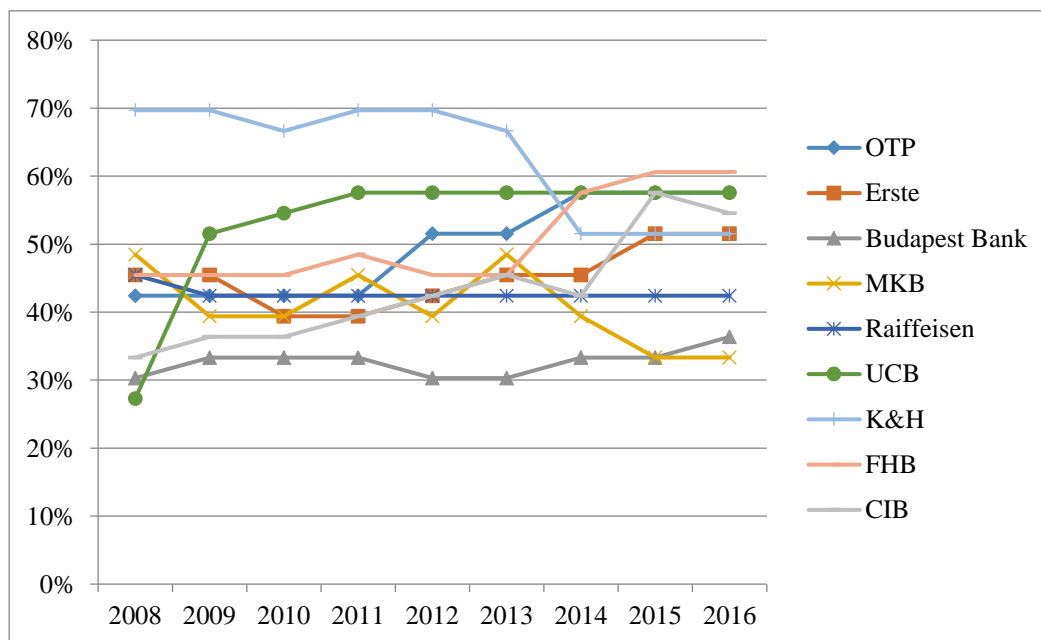


Sourve:by author

The average of Quality Indexes shows a constant increase. To 2016 it reached the 49,6% as we can see on Figure 25.

Figure 25.: Quality Index average based on Risk Reports 2008-2016
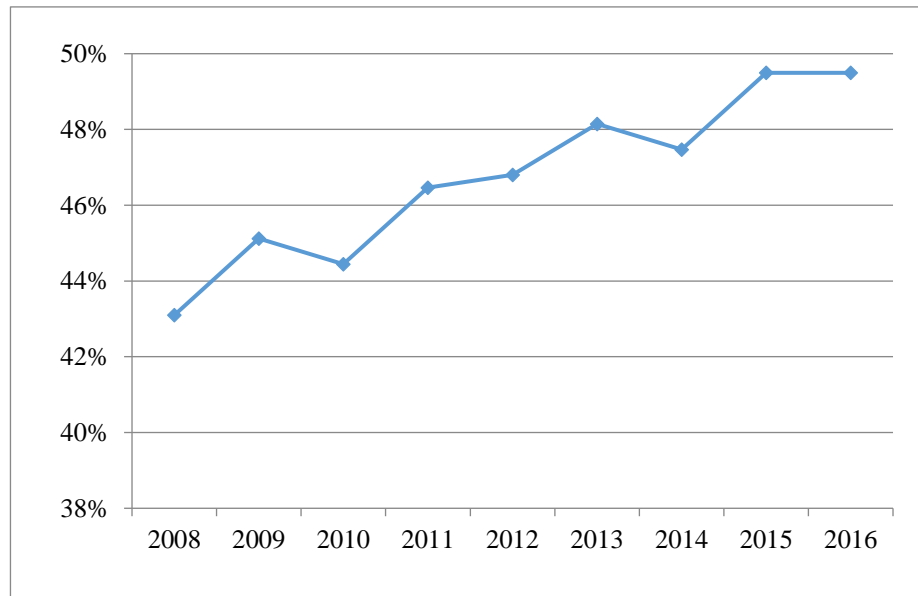


Source: by author

If we examine certain banks, we can observe many mistakes in the reports whose correction would only need attentiveness; in exchange it would appreciably improve the pictures showed to the external partners. There was institution where one year's risk report were absent from the web site. We could notice a case where the text of the parent bank was altogether transferred: non-Hungarian wording, spelling errors, or just two-sided English text proofing to mention only the most extreme cases. Over the formal faults, we met data granted inaccurately or wrong. We informed the concerned banks about most of the disclosed deficiencies, the correction was completed in several cases.

Regarding the result of the analyses, we consider that it might be practical to make common the risk reports' chapters about the operational risk based on the question lists occurred in the Appendices.

It worth analyse how much the average value of two indexes move together in the examined period. In case of the two indexes – while on of them examines content, the other examines quality point of views – we can notice great covariance. Their correlation is high; it shows us a value of 0,93 if we just examine the risk reports, and it is 0,86 with examination the risk and annual report together.

## 4.4.2. Regression analysis

The objective of this chapter is to test the hypotheses, which were set up previously, with panel regression methodology regard to the factors influencing OKI and MI indicators considering all 23 analysed banks of the V4 countries. The following table shows overall those variables what we use during the modelling as explanatory variable.

Table 12.: Explanatory variables and their source used for the regression analysis

| Explanatory variables | Measurement | Code | Source |
|---|---|---|---|
| Size of the bank | Natural logarithm of total assets | lnTotalasset | Annual report |
| Profitability | Return on assets | ROA | Annual report |
| Capital adequacy | Equity/Total assets | Leverage | Annual report |
| Duality of the CEO and the board president position | Dummy variable. 1, if the CEO and the president of the board is the same person, 0 otherwise. | CEO | Annual report |
| Independence of board | The ratio of independent (not working as a chief at the bank) board members in proportion to the membership. | BoardIndep | Annual report |
| Size of board | Number of board members | Boardsize | Annual report |
| Operational risk capital calculation methodology | Dummy variable: 1, if the bank uses AMA methodology, 0 otherwise. | AMA | Annual report |

Source: by author

We summarized all of the independent variables occurring in the model in Table 12.

We run the panel regression based on the following regression models:

$$\text{ODI}_{i,t} = \beta_0 + \beta_1 \text{lnTotalasset}_{i,t} + \beta_2 \text{ROA}_{i,t} + \beta_3 \text{Leverage}_{i,t} + \beta_4 \text{Board size}_{i,t} + \beta_5 \text{Board independence}_{i,t} + \beta_6 \text{CEO}_{i,t} + \beta_7 \text{AMA}_{i,t} + \varepsilon_{i,t}$$

$$(3)$$

and

$$\text{OQI}_{i,t} = \beta_0 + \beta_1 \text{lnTotalasset}_{i,t} + \beta_2 \text{ROA}_{i,t} + \beta_3 \text{Leverage}_{i,t} + \beta_4 \text{Board size}_{i,t} + \beta_5 \text{Board independence}_{i,t} + \beta_6 \text{CEO}_{i,t} + \beta_7 \text{AMA}_{i,t} + \varepsilon_{i,t}$$

$$(4)$$

where i mark the given bank, t marks the year.

Based on the Hausman test, in case of all of the two regression equations, the „fixed effect" model has the best fitting so we run the calculus with this. Table 13 shows the result of the models from Equation (3) and (4).

Table 13.: Result of the panel regression concerning Equation (3) and (4)

| | Dependent variable: ODI index | | Dependent variable: OQI index | |
|---|---|---|---|---|
| | Beta | p | Beta | p |
| CEO | 0,0023 | 0,974 | 0,1217* | 0,004 |
| BoardIndep | -0,0566 | 0,623 | 0,0293 | 0,661 |
| Boardsize | 0,0186† | 0,052 | 0,0009 | 0,878 |
| Levarage | 0,0235** | 0,002 | 0,0168*** | 0,000 |
| ROA | 0,0162 | 0,444 | 0,0057 | 0,646 |
| AMA | 0,1674*** | 0,000 | 0,0782*** | 0,000 |
| ln(totalassets) | 0,1121* | 0,004 | 0,1057*** | 0,000 |
| _cons | -0,8678† | 0,013 | -0,7376*** | 0,000 |

*† p<0.1;     * p<0.05;     ** p<0.001;     *** p<0.0001*
Source: by author (Stata software)

Grounded in the results above, our three hypotheses (H2, H3 and H4) were verified by the regression model. Basically, the size of the institution (based on the natural logarithm of total assets), the leverage and the fact that the institution chooses AMA

methodology for the capital accumulation after the operational risks affect positively the risk disclosure of the biggest banks of the V4 countries from the aspect of contents or quality. In case of all of the three variables, the tables introduces a p value under 0,05.

The results do not show relationship between the indexes connecting to the disclosures and the value of ROA so the H5 hypotheses cannot be justified that the disclosure of the biggest banks of V4 countries is influenced by the profitability in any direction.

Regarding the structure of the board, its size influences positively the contents elements of the disclosures if we define the confident interval at 90%. We cannot consider the size of the board as significant from the point of view of the quality of the disclosures. Similarly, the ratio of the external members inside the directorate is not significant in any of the regressions. However, the quality of disclosures is influenced positively if the CEO and the board president is the same person. But the regression analysis does not confirm that it is a relationship between the contents of the reports and the duality of the CEO and the board president position.

Based on these results we do not accept the H6a, H6b and H6c hypotheses.

All in all we can say that in contrast with the regulatory expectation and interest, the releasing reports contains just a few information's about operational risks. Although the operational risk disclosures became more informative since 2008, the factual data stay hidden from the external inquirers. Despite the fact that the operational risk is the second most considerable risk regarding the bank capital and that the regulation impose more serious requirements against the banks in these situations, it is not handled as a priority in reports. Our experience is that the reports are short of speech and only focus on the exposition of the risk and risk management in general and on the revelation of managers. The great loss events, the structure of the risk exposure, the trends and the challenges do not get a place in the reports.

In other words, our conclusion harmonizes to a great extent with the conclusions of the BCBS (2014) concerning the disclosure. We can get a picture of with what method the banks calculate their capital and also those they apply a large scale of methods of the risk management with the management's complete commitment, but the concrete form of its realization is typically not introduced. The reports provide just a few information about the actual losses, remarkable events and about the bank's expectations. We can call the „new risks" poorly treated (in professional circles they generate large quarrels

and they are practically hardly measurable) like the conduct, model or reputational risk. On the whole, the banks prioritise the adequacy with the regulatory expectations and additionally they do not consider the reports as a relevant informational basis relating the operational risks, even though when they analyse the risk classification, one of the most important source of information is its risk report. In our view, it does not have financial, rather rational causes. The banks observing their rivals do not really want to provide surplus information on their risk exposure above the minimal supervisory requirements.

Though in case of operational risk, the future applicable capital calculation methodology will be simpler and more standardized, the challenges and the importance of the risk will not change. Because of conduct and reputational considerations, we formulated the necessity of these provisions below:

- Over the description of risk management framework, the description of the factual risk factors must get an emphasized role.
- The report must contain the analysis of the change of the risk factors, their comparison to the previous year and the tracing of trends.
- The relationship among the internal control, compliance and risk management must be a part of the report.
- The tools of education and development of risk culture must be demonstrated.
- In the exploration of further deficiencies, certain banks can be helped by the questions occurring in the appendix which cover the regulatory requirements.

Taking into account these perspectives above would not only mean the reinforcement of the market discipline, but the determinate expression of that the given institution operates with risk awareness, keeping in mind the viewpoints of the responsible governance.

### 4.4.3. Cluster analysis and multidimensional scaling

After the regression analysis, we are examining what groups the 26 analysed banks can be divided into and how the relationship among certain banks compared to each other might be shown virtually, based on the variables examined. The clustering and the

multidimensional scaling are done by the data from 2016 as well. The descriptive statistics of the variables used during the analyses are introduced in this table below:

**Table 14.: Descriptive statistics of the variables used for the cluster analysis**

|  | Minimum value | Maximum value | Mean | Standard deviation | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| OKI index | 30,43% | 82,61% | 61,71% | 14,71% | -0,462 | -0,575 |
| MI index | 30,30% | 72,73% | 54,08% | 11,96% | -0,223 | -0,675 |
| TotalA | 1.500,67 | 64.851,28 | 19.655,30 | 15.174,83 | 1,230 | 1,519 |
| TotalE | 98,94 | 7.396,07 | 2.132,11 | 1.824,25 | 1,277 | 1.262 |
| NetI | -21,65 | 659,37 | 244,23 | 220,44 | 0,787 | -0,888 |
| Levarage | 0,065 | 14,00 | 6,72 | 5,10 | -0,436 | -1,566 |
| ROA | -0,014 | 2,027 | 0,79 | 0,66 | -0,066 | -1,425 |
| AMA | 0 | 1 | 0,42 | 0,504 | 0,331 | -2,055 |

Source: by author (SPSS software)

The table shows the variables' minimum and maximum value, mean, standard deviation and the bias from the normal distribution. Each variable are worth examine one by one, paying special attention to outlying values which are able to influence the analysis. The result of the study is contained in Appendix 5.

*4.4.3.1.    The methodology and result of the cluster analysis*

During the cluster analysis, we classify the 26 banks based on the following indexes: the OKI, evaluating the content of the reports, the MI, determining the quality of the report, the TotalA i.e. total assets, showing the size of the bank and the ROA, indicating the bank profitability. For the cluster analysis, two methodologies are used; the hierarchical cluster analysis and the K-means cluster analysis. Since we chose scale variables for the interpretation, each of the two methodologies can be used.

**Hierarchical cluster analysis**

As the number of our observations are low (26), the hierarchical cluster analysis can be applied. From methodological aspect, for the measurement of the distance we choose

the quadratic Euclidean distance, we standardize the valuables; finally we use the Ward's Method out of the clustering methodologies.

The dendrogram obtained is the following:

Figure 26.: Dendrogram of the banks' cluster analysis – Hierarchical cluster, Ward's Method
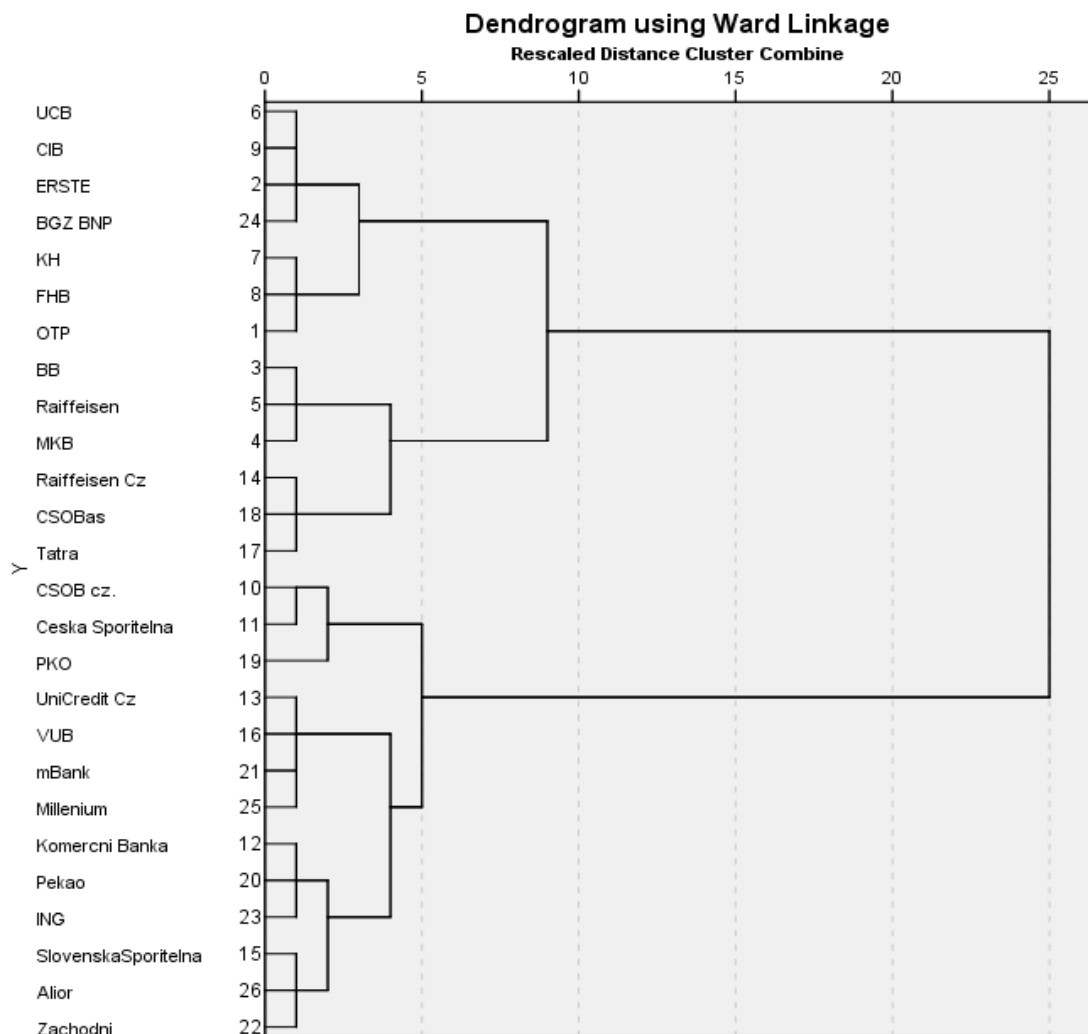


Source: by auther (SPSS software)

What the dendrogram shows is that on a 40% distance level (10 rescaled distances) there are only two clusters. Later, it can be likened to clustering done by the other methodology.

For determining the number of clusters, let's examine the internal distance between them, and see where a greater jump can be seen, because it is not worthy completing

additional concentrations there. (Kovács, 2014, page 60). Appendix 6 contains the table which demonstrates the distance among clusters.

The number of clusters by rule of thumb k ≤ (n/2) might be 2 or 3 in this particular case. If we illustrate the value of Coefficient included in the table, i.e. the internal distance among the clusters, we can try to look for that certain point where we see a greater jump on Figure 34. At step 23, the first jump can be seen, so the number of clusters is 26-23=3 (number of observations – number of steps belonging to the jump).

Figure 27.: Hierarchical cluster analysis, internal distance between clusters
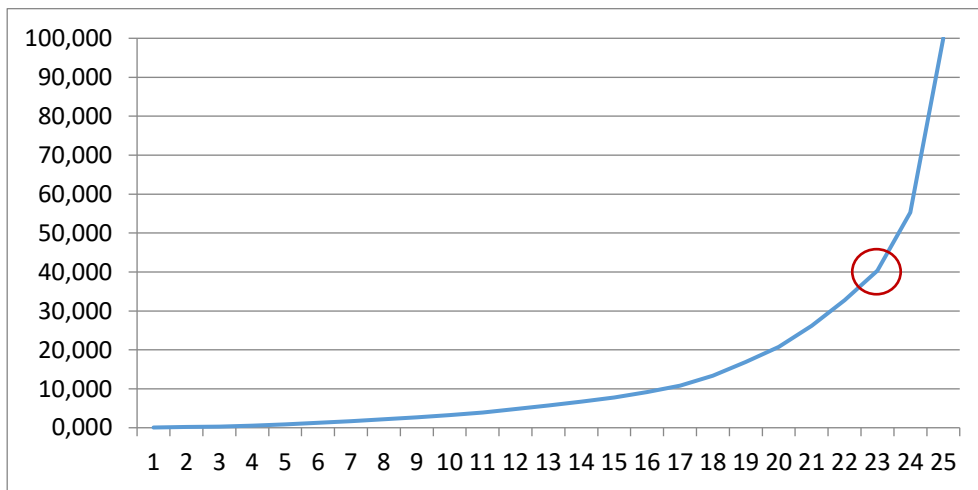
So 3 clusters should be chosen for the analysis. With this cluster number, their special feature is saved and potentially analysable.

Table 15.: Hierarchical cluster analysis – special features of clusters

| Ward's Method | | OKI index | MI index | Total assets (mEUR) | ROA |
|---|---|---|---|---|---|
| 1 | Mean | 60,25% | 57,58% | 10202,49 | 0,026 |
| | Item number | 7 | 7 | 7 | 7 |
| | Standard deviation | 13,38% | 6,31% | 7261,59 | 0,041 |
| | Minimum | 43,48% | 51,52% | 1500,97 | -0,014 |
| | Maximum | 82,61% | 69,70% | 23009,23 | 0,112 |
| 2 | Mean | 43,48% | 37,88% | 8064,81 | 0,537 |
| | Item number | 6 | 6 | 6 | 6 |
| | Standard deviation | 9,91% | 5,67% | 3294,66 | 0,580 |
| | Minimum | 30,43% | 30,30% | 3201,62 | 0,005 |
| | Maximum | 56,52% | 45,45% | 11984,20 | 1,115 |
| 3 | Mean | 70,90% | 59,67% | 30094,74 | 1,319 |
| | Item number | 13 | 13 | 13 | 13 |
| | Standard deviation | 7,82% | 9,61% | 14542,87 | 0,314 |
| | Minimum | 56,52% | 45,45% | 13889,06 | 0,958 |
| | Maximum | 82,61% | 72,73% | 64851,28 | 2,027 |
| Total | Mean | 61,71% | 54,08% | 19655,30 | 0,790 |
| | Item number | 26 | 26 | 26 | 26 |
| | Standard deviation | 14,71% | 11,96% | 15174,83 | 0,663 |
| | Minimum | 30,43% | 30,30% | 1500,97 | -0,014 |
| | Maximum | 82,61% | 72,73% | 64851,28 | 2,027 |

Source: by author (SPSS software)

The following clusters can be identified based on this table:

1. Cluster: small sized banks with average report quality and very low profitability (or disadvantageous banks)
2. Cluster: small sized banks with sub average report quality, but with profitability
3. Cluster: great sized banks with report quality above the average, profitability and high quality content.

*K-means cluster analysis*

The K-means cluster analysis can be done for scale variables, which is fulfilled by our examined ones in this instance. During the non-hierarchical clustering procedures it is needed to add a cluster number.

For the determination of the cluster number, we use the Elbow Method. (Kovács, 2014).

After standardizing the variables, we run the cluster analysis for cluster number 2. As it can be seen from table ANOVA, every variable's empirical significance level is under 0,05, so none of these is need to be left out from analysis.

Table 16.: K-means cluster analysis (in case k=2)

| ANOVA (in case of cluster number 2) | | | | | F | Sig. |
|---|---|---|---|---|---|---|
| | Cluster | | Error | | | |
| | Mean Square | df | Mean Square | df | | |
| Zscore(OKI) | 10,709 | 1 | ,595 | 24 | 17,983 | ,000 |
| Zscore(MI) | 8,329 | 1 | ,695 | 24 | 11,990 | ,002 |
| Zscore(TotalA) | 12,934 | 1 | ,503 | 24 | 25,727 | ,000 |
| Zscore(ROA) | 14,117 | 1 | ,453 | 24 | 31,130 | ,000 |

Source: by author (SPSS software)

Because of the already mentioned rule of thumb, the number of clusters only can be 2 or 3, so we complete the analysis for the case of 3 clusters.

Table 17.: K-means cluster analysis (in case k=3)

| ANOVA (in case of cluster number 3) | | | | | F | Sig. |
|---|---|---|---|---|---|---|
| | Cluster | | Error | | | |
| | Mean Square | df | Mean Square | df | | |
| Zscore(OKI) | 7,709 | 2 | ,417 | 23 | 18,503 | ,000 |
| Zscore(MI) | 7,934 | 2 | ,397 | 23 | 19,984 | ,000 |
| Zscore(TotalA) | 8,176 | 2 | ,376 | 23 | 21,747 | ,000 |
| Zscore(ROA) | 6,053 | 2 | ,561 | 23 | 10,796 | ,000 |

Source: by author (SPSS software)

By the F-test, like previously, none of the variables should be left out from analysis. For the more spectacular application, the cluster Elbow Method, – which aims at

determining the appropriate cluster number – we run the cluster analysis in the case of 4 clusters as well.

After all, we accomplish the comparison of the group averages with the help of one-way ANOVA tables and calculate the ratio of external and total squares of deviation.

Figure 28.: Cluster Elbow
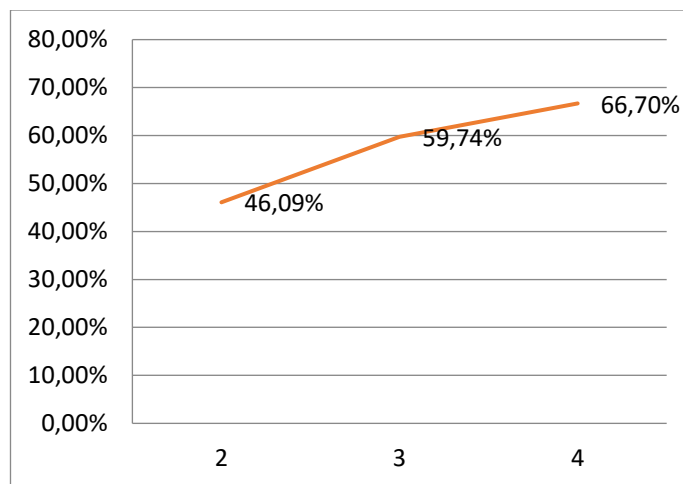


Source: by author

We can see in Figure 28 that the cluster elbow appears in case of choosing 3 groups which coincide with the 3 groups chosen during the hierarchical cluster analysis. So again we select the 3 cluster solution which allows the comparison of the results of the Ward's analysis and the K-means cluster analysis.

Table 18.: K-means cluster analysis – special features of clusters

| Cluster Number of Case | | OKI index | MI index | Total assets (mEUR) | ROA |
|---|---|---|---|---|---|
| 1 | Mean | 43,48% | 37,88% | 8064,81 | 0,537 |
| | Item number | 6 | 6 | 6 | 6 |
| | Standard deviation | 9,92% | 5,67% | 3294,66 | 0,580 |
| | Minimum | 30,43% | 30,30% | 3201,62 | 0,005 |
| | Maximum | 56,52% | 45,45% | 11984,20 | 1,115 |
| 2 | Mean | 61,66% | 55,92% | 12588,17 | 0,422 |
| | Item number | 11 | 11 | 11 | 11 |
| | Standard deviation | 10,97% | 6,96% | 6988,39 | 0,555 |
| | Minimum | 43,48% | 45,45% | 1500,97 | -0,014 |
| | Maximum | 82,61% | 69,70% | 23503,92 | 1,235 |
| 3 | Mean | 73,91% | 62,63% | 36019,90 | 1,409 |
| | Item number | 9 | 9 | 9 | 9 |
| | Standard deviation | 6,88% | 9,09% | 13456,47 | 0,337 |
| | Minimum | 60,87% | 48,48% | 14825,37 | 0,958 |
| | Maximum | 82,61% | 72,73% | 64851,28 | 2,027 |
| Total | Mean | 61,7057% | 54,0793% | 19655,30 | 0,790 |
| | Item number | 26 | 26 | 26 | 26 |
| | Standard deviation | 14,71% | 11,96% | 15174,83 | 0,663 |
| | Minimum | 30,43% | 30,30% | 1500,97 | -0,014 |
| | Maximum | 82,61% | 72,73% | 64851,28 | 2,027 |

Source: by author (SPSS software)

The following clusters can be identified based on this table:

1. Cluster: small sized banks with sub average report quality and lower profitability than the average

2. Cluster: small sized banks with average report quality and very low profitability (or disadvantageous banks)

3. Cluster: great sized banks with report quality above the average, profitability and high quality content

Table 19.: K-means cluster analysis – Deviation from cluster centers

| **Final Cluster Centres** | | | |
|---|---|---|---|
| | Cluster | | |
| | 1 | 2 | 3 |
| Zscore(OKI) | -1,23940 | -,00310 | ,83006 |
| Zscore(MI) | -1,35463 | ,15416 | ,71468 |
| Zscore(TotalA) | -,76380 | -,46571 | 1,07840 |
| Zscore(ROA) | -,38264 | -,55491 | ,93332 |

Source: by author (SPSS software)

The Final Cluster Centres table (Table 19) shows that, compared to the average from the aspect of certain variables, where the banks are situated in the given cluster. The table helps the naming and evaluating of the clusters.

We can compare the clusters composed by the 2 analyses. The 1st cluster of the hierarchical cluster analysis matches the 2nd cluster of the K-means cluster analysis and it is the 2nd cluster of the K-means' 1st cluster.

The difference between the two analyses that some banks transferred from 'above average report quality' to average. The sub average group contains the same banks in the two analyses. In the following two tables, by making the clusters comparable, the classification of the banks (based on the results of the two analyses) can be seen. (Figure 29 and 30).

Figure 29.: Comparison of the clusters composed by the hierarchical cluster analysis

| 1. claster (average) | 2. claster (below-average) | 3. claster (above-average) |
|---|---|---|
| •OTP (HU)<br>•ERSTE (HU)<br>•UCB (HU)<br>•KH (HU)<br>•FHB (HU)<br>•CIB (HU)<br>•BGZ BNP (PL) | •BB (HU)<br>•MKB (HU)<br>•Raiffeisen (HU)<br>•Raiffeisen Cz (CZ)<br>•Tatra (SK)<br>•CSOBas (SK) | •CSOB cz. (CZ)<br>•Ceska Sporitelna (CZ)<br>•Komercni Banka (CZ)<br>•UniCredit (CZ)<br>•SlovenskaSporitelna (SK)<br>•VUB (SK)<br>•PKO (PL)<br>•Pekao (PL)<br>•mBank (PL)<br>•Zachodni (PL)<br>•ING (PL)<br>•Millenium (PL)<br>•Alior (PL) |

Source: by author

Figure 30.: Comparison of the clusters composed by the K-means Methodology

| 1. claster (average) | 2. claster (bellow-average) | 3. claster (above-average) |
|---|---|---|
| •OTP (HU)<br>•ERSTE (HU)<br>•UCB (HU)<br>•KH (HU)<br>•FHB (HU)<br>•CIB (HU)<br>•BGZ BNP (PL)<br>•VUB (SK)<br>•Millenium (PL)<br>•Alior (PL) | •BB (HU)<br>•MKB (HU)<br>•Raiffeisen (HU)<br>•Raiffeisen Cz (CZ)<br>•Tatra (SK)<br>•CSOBas (SK) | •CSOB cz. (CZ)<br>•Ceska Sporitelna (CZ)<br>•Komercni Banka (CZ)<br>•UniCredit (CZ)<br>•SlovenskaSporitelna (SK)<br>•PKO (PL)<br>•Pekao (PL)<br>•mBank (PL)<br>•Zachodni (PL)<br>•ING (PL) |

Source: by author

It can be seen from the results that among the banks with 'above average report quality', none Hungarian banks are included, the vast majority of Polish banks can be found among the bests in the aspect of providing reports with the highest quality.

### 4.4.3.2. *Multidimensional scaling*

The multi-dimensional scaling methodology provides the opportunity to display twenty-six selected banks along multiple factors, but in two dimensions. Our variables on which we have performed scaling are the followings: ODI and OQI indicators, which measure the quality and content of the report, total assets, total equity, net income, equity/total assets ratio and ROA. Thus to see as a whole, it is desirable to see the values showing the size of the banks, their profitability and their leverage and to see the quality of disclosure.

The obtained graph indicates the „distance" of certain banks after the combination of the point of views examined.

Figure 31.: Representation of banks along the new, composed dimensions
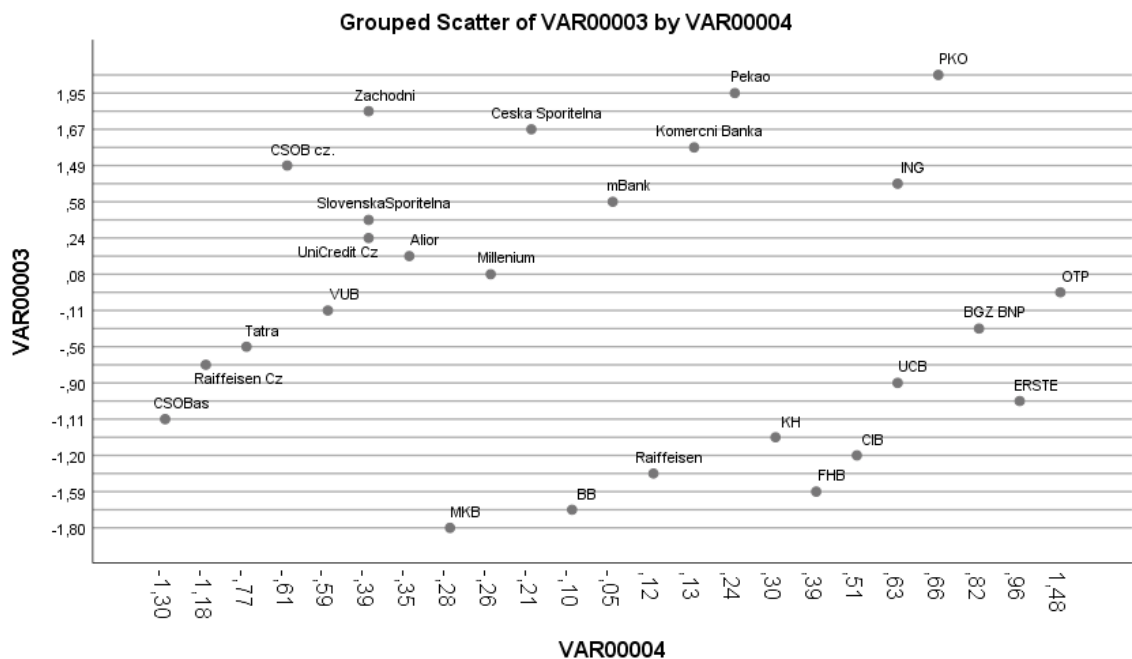


Source: SPSS software

On Figure 31 the two furthest banks are the Polish PKO and the Slovakian CSOB a.s

Figure 32.: Fitting of the model
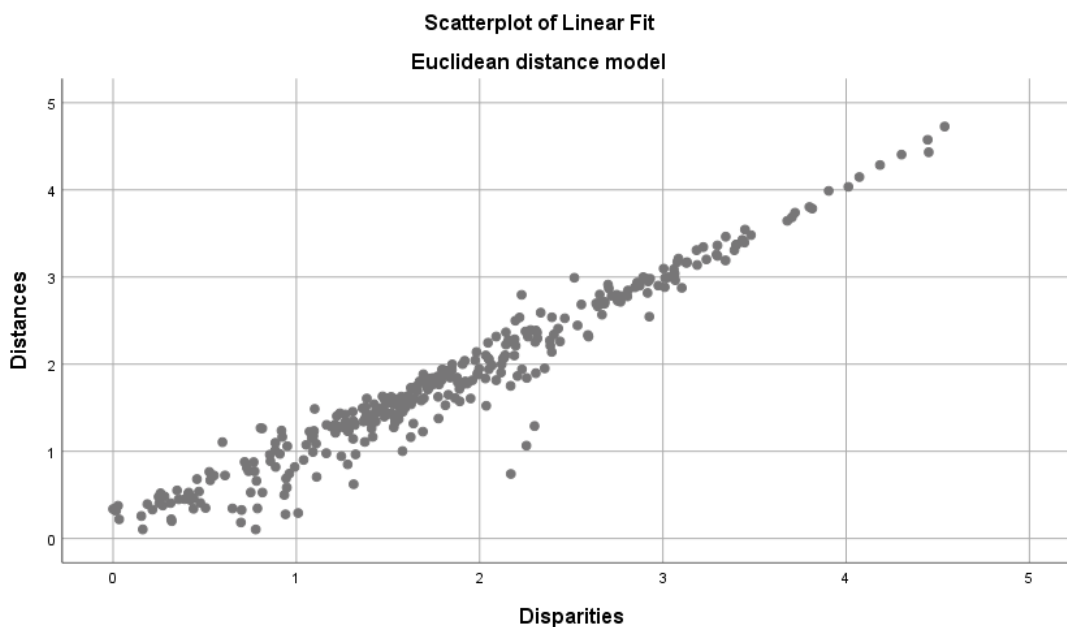


Source: SPSS software

We used interval adjustment for the examination besides the two values showing the goodness of the model:

Stress = 0,10989 (below 0,2 the value is acceptable, this covers medium fitting)

RSQ = 0,94486 (value near 1 covers a good fitting)

We do not choose a higher order (ratio) model, because even with this way the fitting is only medium.

Let's see what the two newly generated dimensions cover and how is their relationship with our original variables. Appendix 5 contains the values from the correlation between the two new, generated variables and the original variables.

VAR00003 measures all of our original variables, while VAR00004 correlates negatively with the ROA and the Leverage variables. So our second constituted dimension is not too profitable and gives higher value to banks operating with lower equity/total assets.

Summarizing the result we have divided the banks into three groups during the cluster analysis: average, below-average and above average banks related to reporting quality. None of the Hungarian banks was among the banks publishing reports with above average quality. The banking systems of each country are not homogeneous; within each cluster we can find banks from different countries.

Based on the examined viewpoints the two farthest banks are the CSOB a.s. and PKO Bank. The PKO Bank can be considered an outlier observation based on both its total assets and own equity. However, we did not withdraw from the study due to the low number of items.

It can be clearly observed that the players of the Hungarian banking sector are located in the lower right part of the chart on the basis of multidimensional scaling; they are the least profitable banks with lower equity / total assets.

## 5. THE RISK APPETITE FRAMEWORK – QUALITATIVE SURVEY OF THE DOMESTIC BANKING SECTOR[9]

This piece of research focuses on the topmost brick of the operational risk pyramid, the risk appetite framework (Figure 33).

Figure 33.: Elements of the Operational Risk Pyramid that are involved in the "Risk Appetite Framework - Qualitative Survey in the Domestic Banking Sector" (highlighting the relevant elements in blue)
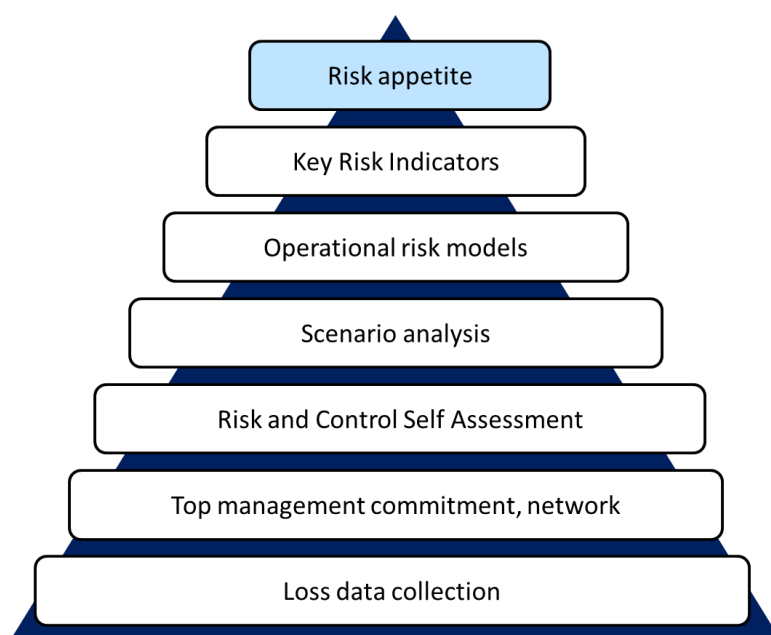


Source: by author

Starting from the early 2000s – mostly as a result of the implementation of the Basel II capital agreement – banks have continually developed and refined their risk management procedures. Just to mention a few: the creation of internal models, the expansion of considered risk types and the development of internal control systems all served to increase of risk-awareness. The economic crisis of 2008 spawned a new era in this field, as its monumental losses were often attributable to a lack of transparency and the inability of banks to properly assess risk – including the failure to identify and quantify risks as well as to develop satisfactory lines of defence. The combination of these effects generated changes which helped the more effective management of

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[9] The research was done with dr. Gabriella Lamanda.

institutional and system-level risk, both on the side of regulators and banks. Aside from radical additions, such as the Basel III regulations concerning capital and liquidity, or the legislations tightening private lending, there were other notable steps which represented a fine-tuning towards risk-aware behaviour. For example, such was the establishment of guidelines concerning 'responsible internal management' (EBA GL 44), the audit of which was initiated by the European Banking Authority in Fall 2016. The European Central Bank (ECB), as a regulatory body, asserted the evaluation of banks' risk governance systems, as one of its priorities for 2016. The new EBA guidelines (EBA, 2017/a), released in 2017 and having come into power on 2018 June 30, includes the result of this evaluation along with an assertion of responsible corporate governance. Furthermore, risk management and control systems have become one of the foci of the Supervisory Review and Evaluation Process, or SREP (ECB, 2016a). The central element of these systems and supervisory audits is the Risk Appetite Framework (RAF). Therefore, what we see is that in the last 1-1,5 years is that the need for the establishment of RAF, as a pivotal ingredient of responsible corporate governance as effective risk management, has greatly increased. This is despite the fact that the term, risk appetite, itself is fairly new. The most important document of European bank regulation, Basel III (BCBS, 2017), gives no guidelines for defining it, or the characteristic of the framework. Yet, regulators demand that members of the banking sector employ RAF in the case of all risk types (MNB, 2018).

In this chapter, following a brief theoretical summary, we investigate how domestic banks view the RAF. How do they interpret 'risk appetite' and in relation to what risk types can they define it? It is an important question, what risk factors and risk types, the involved experts see as most critical in the current operating environment, since this greatly impacts the motivations for developing the RAF. We strove to understand what potential merits the RAF may have as well as what variables might obstruct its implementation. We establish our answers to these questions, by employing qualitative research methods, using the summary of an interview series and a survey.

## 5.1. RISK APPETITE FRAMEWORK (RAF)

Alix (2012) argues that in the years preceding the financial crisis, even the largest institutions viewed risk appetite, as an 'issue' under the jurisdiction of the Chief Risk Officer (CRO). However, the 'issue' reaches farther than the domain of risk management. It has to be an integral part of the bank's risk strategy, which intuitively requires the involvement of the entire management. Risk appetite is the translation of strategic goals to the operative level of risk management, which can be successful only in the presence of a strong risk culture. Creating the appropriate risk culture is a task of the management. But, what does "appropriate risk culture" mean? How can its validity be grasped? These are difficult questions to answer. The prioritisation of ethical/fair banking, in which it is made clear for every member of the organization, which risk are unwanted and to be avoided, and which are the improper business practices, can be highlighted.

According to the ICAAP document risk appetite is the amount of risk, which and organisation is ready to take on, and is capable to tolerate. Risk appetite may vary between group members, in which case their individual introduction may be appropriate (MNB, 2018, V.1.5.2.). The FSB (2013) defines the RAF so: "The overall approach, including policies, processes, controls, and systems through which risk appetite is established, communicated, and monitored. It includes a risk appetite statement, risk limits, and an outline of the roles and responsibilities of those overseeing the implementation and monitoring of the RAF. The RAF should consider material risks to the financial institution, as well as to the institution's reputation vis-à-vis policyholders, depositors, investors and customers. The RAF aligns with the institution's strategy." (FSB 2013:2). The literature is divided on what the key features of the framework are. 'Risk appetite', 'risk limits' and 'risk capacity' are typically included in the definition. However, from a practical standpoint, the method of implementing 'risk tolerance' into the framework poses a problem. There are types of risk (e.g. operational risk), for which institutions do not have an appetite, but the continuation of business and profitable operating require their taking. Therefore, in the case of risk appetite and tolerance, the synonymous use of the words – as the employment of too many terms generally – can cause problems for effective task execution.

Figure 34.: Hierarchy of key concepts in RAF



**Risk Capacity:** The maximum risk that an institution can tolerate without significantly compromising its equity, liquidity, reputation or regulatory compliance.

**Risk Appetite:** Shows what type and extent of risk the institution's management is willing to take consciously in order to achieve the Bank's long-term strategic goals while taking into account the organisation's risk capacity.

**Risk limits:** Limits which help risk diversification and give the frame of risk concentration and in the same time function as an early warning system.

**Risk Exposure:** Shows the actual level of risk assumed by the bank.

Source: based on Lamanda – Tamásné (2015)

The term 'risk exposure' can be interpreted both in a gross and net (correcting with deductible items) sense, as well as on a calculable, aggregated level or broken down for organizational units, business branches or risk types. Since, the last 3-4 decades of risk management practice has been characterised by the increasing importance of 'limits', it is not surprising that they gained an important role in expressing risk appetite. Their necessity is unquestionable, as they assure back-testing, and it is through them that we can assess the validity of our risk measurement. However, they are no magic cure for all risk problems. They are not interpretable for all risk types, for example reputational or strategic risk. In these cases, strong risk culture has an outstanding role. Risk limits – as can be seen from the above definition – have a dual purpose. They progress risk diversification, and they function as a sort of early signalling system, noting when and what level of intervention is necessary. We believe that in the case of risk appetite, emphasizing 'awareness' (conscious risk taking) is important, as the bank's management makes decision, in knowledge of its self-set yield and the corresponding risk. Furthermore, the optimal risk management system can be interpreted only in the context of risk-reward processes. Based on the above, we consciously emitted 'risk

tolerance', which many guidelines do not use at all (e.g. (FSB, 2013) and (EBA GL 44)), from our illustration. This was done primarily to avoid problems of lacking transparency due to minimal differences between the terms and troublesome interpretation, stemming from the excessive terminology. Moreover, based on Alix (Alix, 2012) it can be asserted, that appetite, unlike tolerance, expresses the active role of the institution, or that it is its own business and risk management decision that before the bank's risk profile. Even though we most agree with the FSB's (2013) approach, we would still like to give a definition of risk tolerance, based on the literature. According to Lamanda – Tamásné (2015), risk tolerance shows the bank's range of movement between the consciously accepted and maximally acceptable levels of risk exposure, or in other words between its appetite and capacity.

The essence of RAF is that we constantly trace exposures and limits, and their connection to each other and risk appetite, within a system created, formalised and documented using the above described terminology. For this to function as intended, this system needs to be tied to a smoothly running auxiliary reporting and information system, which can notify the involved staff and management about limit breaches. Based on these notifications the responsible parties can generate solutions along set criteria (ECB 2016).

The RAF – whether we consider risk appetite or limits – includes qualitative and quantitative elements. Clearly, not all risks can be quantified, but measurability is a key criterion, as it gives a more solid grounding to objective approaches and ensures back-measurability (IIA 2016). Ensuring that in the construction of the RAF, we do not rely overly on 'simplified interpretations' is especially important. Proclamations such as: "In our operation we strive to adhere to Basel norms" or "We will do all we can to ensure that internal fraud does not occur" are necessary, but not sufficient for making RAF effective as a control function.

For some – typically public – institutions, publically accessible RAFs can be found. These usually contain an accounting of main risks and their corresponding limits. The University of Edinburgh evaluates legislation violations (compliance risk) and reputational costs as non-acceptable risk factors, while the research, in terms of innovation, operates with serious risk appetite, in order to achieve its strategic goal – becoming an attractive and defining member of the higher education market (UoE,

2016). The Office of the Comptroller of the Currency (OCC), which acts as the Banking Authority in the USA, has its own version of the RAF. From this we can gather the risks critical to the sector's prudent functioning (which is the OCC's primary goal), and their evaluation. As part of this evaluation, the OCC asserts which risks and to what extent can, and have to be taken up in order to meet objectives (OCC, 2016).

## 5.2. SURVEYS

One of the conclusions drawn in the wake of the 2008 crisis was that the board members of many banks often were not satisfactorily experienced in the banking sector and did not possess the knowledge necessary to be able to understand the ever-more complex business models of their institutions. Moreover the negligence of risk management, and the lacking power of CROs and risk managing bodies, were also typical shortcomings (FSB, 2013b). A survey conducted by the FSB in 2011 with 36 participating – mostly so-called G-SIFI [10] – banks and security traders, includes recommendations, some of which aim to strengthen the power of the risk management field, and contain stricter expectations for the constitution and required experience of bank directory boards.

Deloitte, one of the Big Four, collected and analysed the risk appetite related legislation, proposals, work-files and proclamations of the notable regulatory organizations overseeing financial intermediaries (these organizations include: the FSB, BCBS and the Australian, Canadian, German and English authorities). Based on this, it can be noted that since the financial crisis, creating a strong risk culture to support prudent operation, and as a part of this establishing an RAF, has been garnering increased attention. Since 2013 the EU mandates that the banks' remuneration policy must be in synch with their risk appetite. Setting non-financial (e.g. operational risk) risk related risk appetites have also been emphasized (Deloitte, 2014).

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[10] G-SIFI: Globally Systematically Important Financial Intitutions. The globally critical institutions from a systemic risk viewpoint. Each November the FSB publishes a list of those institution which, due to their stressed role in the intermediary system, command of significant market shares, and weight in the financial markets, have to create a so-called 'systemic risk capital puffer'. E.g. Wells Fargo, Societe Generale, Deutsche Bank, etc.

Following the crisis there have been a growing number of articles scrutinizing the connection between bank attributes – for example capital transfer or profitability – and internal governance (most importantly the attributes of directory boards: size, experience), using a scientific approach. The results are quite branching, depending the article studied time interval and geographical area. Srivastav and Hagendroff (2016) give a good account of the related articles.

As we can see, in the past years the demand for creating RAFs has increased, but no significant progress have been made in institutions. This conclusion is supported by several surveys, such as (ECB, 2016b) (KPMG, 2016) and (CBoI, 2014).

To summarise these surveys, the following challenges and problems are characteristic of banking practice:

- lack of unified taxonomy
- non-satisfactory inter-organizational communication
- lack of embedment into corporate culture and operative processes
- lack of concordance with the business model
- unresolved integration of difficult-to-measure risk types into the RAF
- problems of the limit and monitoring systems

The keynote survey of the Central Bank of Ireland, may point to another problem, which could prove challenging in the Hungarian banking sector too. If strategy is set by the parent organization, the subsidiaries' competence in this field is limited, meaning the RAF related competence of local governance can also be strongly affected (CBoI, 2014).

In conducting our research we reviewed the risk reports of the 9 domestic big banks, published in the 2008-2016 period. Based on this review process it can be seen that often the same information repeats itself year after year in these reports. While in 2008 only two of the banks mentioned risk appetite, in 2011 seven of them released information on the base elements of their risk strategy. The same is true in 2016. Two Hungarian-owned banks (OTP and FHB) have not mentioned the RAF in their reports.

In relation to risk appetite it can is true that:

- there is at least one big bank which does not employ the term 'risk appetite';

- no institution employs the term 'risk tolerance';
- all institutions employ limit systems, especially in the case of market and partner risks;
- all banks have a risk strategy;
- all banks emphasize the insurance of capital adequacy.

Even though we cannot draw deep-reaching conclusions based on the above, we can assert with reasonable certainty that, in the case of domestic banks, the RAF is an area to be further developed.

## 5.3. QUALITATIVE SURVEY

The findings of the surveys discussed in the previous chapter, as well as the shortcomings highlighted by the risk reports prompted us to – looking at the domestic financial market – conduct a more prying examination of the topic of the risk appetite framework. Our research was made up of two stages. The informational basis of the first stage was obtained through interviews, while that of the second was gathered through an online survey questionnaire, constructed based on the findings of the first stage.

### 5.3.1. Methodological background

In choosing our methodology we had to consider the purpose of our investigation, which was twofold: firstly to map, what bank departments think of risk appetite, how applicable is the methodology discussed in the literature in practice, is it implementable, and for what risk types risk appetite can be interpreted; and secondly – leaving the bounds of a specific institution – to gauge the risk appetite related knowledge and practice of members of the financial sector.

In accordance with, this the research question was different in the two stages:

I. stage (interviews)

Research question: What does risk appetite mean to the different departments of the bank, considering the types of risk the given department handles and the foreseeable variation of these risks in the coming 1-2 years?

II. stage (Online questionnaires)

Research question: How do members of the Hungarian financial sector interpret risk appetite, and what does it mean to them in practice?

Our theoretical goals were: discovering domestic banks' attitudes towards risk appetite, refining of the definition of risk appetite and defining the terminological framework related to risk appetite. Secondly, we would have liked to find good practices for measuring and surveying the risk appetite of certain risk types and to see if these practice show differences between risk types.

From a practical standpoint we had an opportunity, as part of our interview process, to conduct a type of educational process which might kick off the thinking of experts. Before regulatory changes are put in place, members of the bank sector can evaluate the proposal, so if the regulator wishes to implement changes or new guidelines relating to risk appetite, the study's findings can be incorporated into these.

The research is of the exploratory type; it aims to document the opinions and existing knowledge of experts. The topic itself is new, so it has only partially been incorporated into practice and it barely merits few word mentions in the bank reports. The resources we use primarily consist of bank and internal inspection networks, as we had no access to databases or other secondary sources, which could have served as a basis for quantitative research. It is due to these restrictions that we chose employ a quantitative survey methodology (Toloie-Eshlaghy et al., 2011) and, as a means of data gathering, interviews and structured questionnaires.

As a starting point for defining risk types we took the ICAAP (MNB, 2018) documentation's risk categorisation, which serves as a basis of Hungarian bank regulation. Based on this the RAF was investigated in relation to the following risk types:

- credit risk

- market risk

- operational risk

- liquidity risk

- strategic risk

- reputational risk


## 5.3.2. Connections


The focus of our research was on domestic lending institutions, primarily banks. During the first stage – in Spring 2016 – we conducted a structured survey at a domestic big bank, based on 1-1,5 hour interviews. Our aim was to gauge the bank's risk culture and attitude towards risk appetite. Because of this we placed great emphasis on the respondents' professional background and position.

We also conducted the same conversations with the risk managing, validating and business departments of a foreign-owned big bank (these interviews will be referred to as "detailed questionnaires" in the paper).

In the case of the domestic bank, we had personally known the respondents, which helped the introductory and mood-setting parts of the interviews go smoothly. After setting a time, either through phone or email, we met the selected directors in their offices and recorded their answers. In the foreign bank we managed to establish contact via phone with the directors of the departments and we agreed on the time of the recording session. In the meeting, they provided their answers on a paper questionnaire. We thought it important to ask a foreign bank in addition to a domestic one, as even though they are under the same regulation, the different demands of the foreign-owner, and the limits this places on the independence of directors, may influence their attitudes towards control functions.

Networking for the second stage, which involved online questionnaires, occurred through two channels. Firstly we targeted the 9 largest Hungarian banks based on balance sheet. We could send the questionnaire to their risk management directors, through personal contact, using email.

Our other channel was the IIA Hungary (BEMSZ)[11] , the members of which are internal bank and company auditors. We previously held several lectures and seminars for the

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[11] „The IIA Hungary, or the Belső Ellenőrök Magyarországi Közhasznú Szervezete (BEMSZ), poses as its mission making the field more accepted, supported, represented and developed in Hungary. Furthermore, it aims to spread the domestic and international expertise of audit process. It also conducts the training and certification of auditors." (BEMSZ, 2015)

Institute, so they agreed to send our questionnaire to their members in the financial sector. We approached 120 people through this channel, meaning 45 institutions. These 45 include the 9 big banks, which we chose and approached separately as well.

The decision to choose internal auditors was based on the research's first stage, as well as our precious experience. Aside from risk management, the internal auditor department handles risk comprehensively (COSO, 2014) (CIIA, 2018) and has an understanding of the involved processes. Therefore it is able to serve with useful information on the workings of RAF.

### 5.3.3. Sample selection

The primary consideration in selecting the interview subjects was to create the most fitting sample for our research question (Tongco, 2007). The most important criteria was to cover all investigated risk types, so we involved the directors of all those domestic departments which had an important role concerning one of them (MNB, 2018). In all cases, we interviewed the primary director of the department. The investigated department and their most defining risk types were the following:

• Human resources (operational risk)

• Public communication (reputational risk, which is also to be handled within operational risk)

• Risk management (strategic, credit, market and operational risk)

• Liquidity risk management (liquidity risk)

• Financial and Strategic Planning (strategic risk)

• Loan risk management (credit risk)

• Country and partner risk management (credit risk)

• Market risk management (market risk)

• Compliance (operational risk)

• IT (operational risk)

• Background operations (operational risk)

- Internal audit (operational risk)

This way all departments involved with risk are represented in the survey. Generally, departmental heterogeneity was the goal of sample selection, and we chose the level of management with the widest view on risk processes.

With the selection of the 9 big banks for the sample, we have covered the banking sector's 65-7 %, in terms of balance sheet size. Through the BEMSZ we reached the entire financial sector (including banks, insurers and financial service providers).

Out of the 120 questionnaires sent out, we received 20 answers, corresponding to a 17% answer rate. 5 of the 9 big banks responded.

In summary, in selecting our sample, we strove to reach a comprehensive mix of institutions, and departmentally we focused on risk management and internal audit. The focus of selection was to adhere to the research question.

### 5.3.4. Data collection

In the first stage data collection was done through structured interviews. This methodology was chosen to ensure both comparability between respondents and that questions could be modified to suit the respondent and situation (Solt, 1998). The questionnaire included open-ended and multiple choice questions, as well as illustrations, which were informally discussed with the respondent during the interview.

Building on the experience of these interviews, we constructed the following quick- to-complete online questionnaire, consisting mostly of multiple choice questions: https://docs.google.com/forms/d/e/1FAIpQLSdO_9um1vuFZ07EIYPFg6bUOl1OtyolHFn3JMmIsm_fdR001w/viewform?c=0&amp;w=1, and in Appendix 7.

The answer received in this questionnaire served two purposes. Firstly, they allowed us to check the correctness of our interview results, and secondly they added new insights to the research.

The questionnaire was concerned with the following topics:

1. question group: Risk and risk management

a. Which risk types and specific risks the respondent's views as relevant or significant for their institution?

b. How can a well-functioning risk management system be described?

2. question group: Risk appetite

a. How does the respondent interpret and how much does he use the terminology of RAF?

b. For which risk types and how can risk appetite be measured?

3. question group: Constructing the RAF

a. What methods should be employed, when constructing the RAF?

b. What are the dangers, obstacles and benefits of implementing the RAF?

In our analysis we could rely on the data of 13 interviews, 3 detailed questionnaires and 20 online questionnaires.


### 5.3.5. Data analysis

During the evaluation of the interviews, in case of certain questions we likened the answers one by one and the key words were highlighted from them, and we analysed the most important message of each interviews and formulated it in a sentence. After all we sorted the answers out from the interviews per risk types and we compared against each other, separately. The analysis of multiple choice questions is much easier; statistics which helped the visualisation (median, frequency distribution) were also used.

In case of surveys, the majority of closed, multiple choice questions helped the data processing. For their analysis we used statistical methods in favour of the more convenient interpretation of the results. We sorted separately the incoming answers according to the classification of the completing organization; the analysis was done that way as well. Answers arrived in to the free text field were observed and evaluated one by one. Finally, every survey was additionally evaluated too, with a different aspect, according to what kind of overall view it shows about the given institution.

### 5.3.6. Validity of the research

In the first phase, we complete the survey with selecting a domestic and a foreign-owned bank and with a data collection methodology based on structured interviews. During the interviews, we covered all risks and examined one organization fully at a time so the answers arrived from the same organizational and risk culture. The bank is special at the Hungarian market regarding its size or its ownership structure so we must handle carefully our conclusions later. That is why the results of interviews are first of all used to make the on-line survey truly professionally well-grounded, make them give informative responses and make them perceptive. We did the same with the three interviews conducted at the foreign-owned bank, mentioned as a detailed questionnaire.

In case of the second, survey phase, the bias can be caused by the fact that it is hardly ascertainable from how many different institutions the answers arrived in, only the type of the institution is certain. The anonymity of the survey does not make possible the separation of the respondents per institution. At the same time, because of the intensely different nature of the answers – regarding either the institutional classification, either the given specialization, even the anomalies about the responses concerning the risk appetite framework – we can confidently state that an answer surely arrived from every categories given.

Selection and special request of the 9 large banks carry also a validation problem by magnifying the opinion and practice of the market operators during the analysis. As the representativeness is not an expectation in case of a qualitative examination, the interpretation of the results is the key of the distortions' elimination.

The information's accumulated during the research are eligible, through the entire cross-sectional examination of a large bank and through interviews made at an area of risk management of a foreign-owned bank, to give an image about the different professional fields' attitude towards the risk appetite framework and the possible mode of certain risk types' inclusion in framework too. Furthermore, the knowledge related to risk appetite of the Hungarian financial sector's operators, the usage or non-usage of this control function is outlined as well.

### 5.3.7. First phase of the research

The structured interview, applied in the first phase of the research, contained more questions where the respondents had to formulate their own experiences and opinions. We summarize the results below following the three mains blocks.

The previous year the operational environment of banks significantly changed. Certain risks reinforced which challenged the institutions to complete new defiance or even requirements from the bank's side. The first pillar risks – especially the credit and the operational risk – remarkably increased in the past few years. Besides the reputational risk and the conduct and legal risks, which can be interpreted as a „subset" of operational risk, are those areas where a considerable change can be experienced by institutions, but the liquidity, country and strategic risk were mentioned by others too. As a result, the risk management systems of banks came into focus, also the promotion and development of their efficient operation. In case of these two institutions, they marked the forward-looking and provocative nature, the methodological corroboration, the comprehensiveness and the transparency as the key characteristic of the risk management system.

In case of each of the two institutions, they handle the establishment of RAF as a priority. On the other hand we can say that concerning the mode and form of the establishment and the main pillars of the framework, there is not an obviously followable or exemplary guidance which makes the task of the banks more difficult. In case of a foreign institution, the guidance of the parent bank is authoritative but the adaptation of the local particularities to the system is (was) not trouble-free. The domestic bank builds itself literally from the bases using the existing risk management frames. The foundation of the risk appetite framework is the formulation of a common language, whose substance is that the same terms should be used with the same content by the co-workers of the institution. Related to definition and interpretation of RAF's key words, we can say that they basically matches the definitions given by us or appearing in the broadly available literature, if we regard the risk strategy, the appetite and the limits.

As the result of the first round survey, generally speaking, the majority of the respondents consider the establishment of the framework feasible as the combination of

top down and bottom up methods. Those opinions are dominating according to which the risk appetite should be determined per risk types and at aggregate level as well. Each respondent emphasized that the numerical expression of the risk appetite is important because they can ensure the follow-up and the transparent monitoring only this way. At the appetite's qualitative forms of expression – for example at the revelations – the undertaken risk is not or just hardly appreciable. At the same time, they drew attention that there are risks (for example reputational risk) where it is heavily solvable, so in this case the revelations indicating zero tolerance have a significant role in expressing the risk appetite.

Such an important question, relating the introduction of the risk appetite framework, to consider its potential pitfalls. We can make the implementation of the framework smoother if we get prepared for these situations. The greatest challenges are the following:

- Promoting the apprehension of the complicated, complex conceptual structure
- Different type risks' quantification, additivity and reduction to a common denominator
- Extraction of the data needed
- Adequate internal communication of the RAF's introduction
- Realization of integration to daily decisions which means an entire cultural change which takes a huge amount of time from the part of the organisations who are busy anyway, even without this
- Acceptance of RAF with the business areas
- Continuous monitoring of action plans' pursuance which appears as a result of the consequences of the limits and limit violations

The respondents, as the benefit of the RAF – over the regulatory compliance –, highlighted the possibility of the „trade-off" between certain risk types, the clearer management requirements, the process of making some activities' riskiness transparent and the augmentation of the risk awareness.

Based on the experiences of interviews and the detailed survey, we composed a shorter, on-line questionnaire whose results are elaborated further in the following subsection.

### 5.3.8. Results of on-line survey

The questionnaire was answered by 20 persons whose majority (11 persons) is an operator of the banking sector. 6 people are an operator of other financial intermediary (cooperative credit institutions, banks, insurers) and 3 respondents are advisor. Based on the responses, in case of banks, we could lean on at least 5 different institutions' answers, while in case of other financial intermediaries; we could lean on 6 different answers.

The majority of the respondents, in case of banks, are compliance officers/internal auditors, beside them 1-1 respondents are working at compliance or business area. In case of other intermediaries, except 2 persons, co-workers of the monitoring area filled in the survey.

Regarding the evaluation of the risks, undoubtedly the credit risk was marked as a determining risk by the respondents. Moreover, the two other first pillar risk – the market and operational risk – are considered as significant during the operation of the institutions. According to the majority of the respondents, in the next 1-2 year period, the regulatory/political risks (for example the fast and notable change of the regulatory environment) and the migration of experts (for example the difficulty of keeping those employees who possess critical skills) means the most important threat. The cyber risk is in the first place in international surveys; here it appears among the top ten risks. They consider also the destruction of the portfolio's quality, the negative macroeconomic prospects and the so-called conduct risk deriving from improper business practices as remarkable risk factors. Interesting that only the operators of the bank indicated the cyber risk in their answers. From nine risks, deemed to be the most significant, six belong to the circle of operational risks. (Figure 36).

Figure 35.: Risks, threats
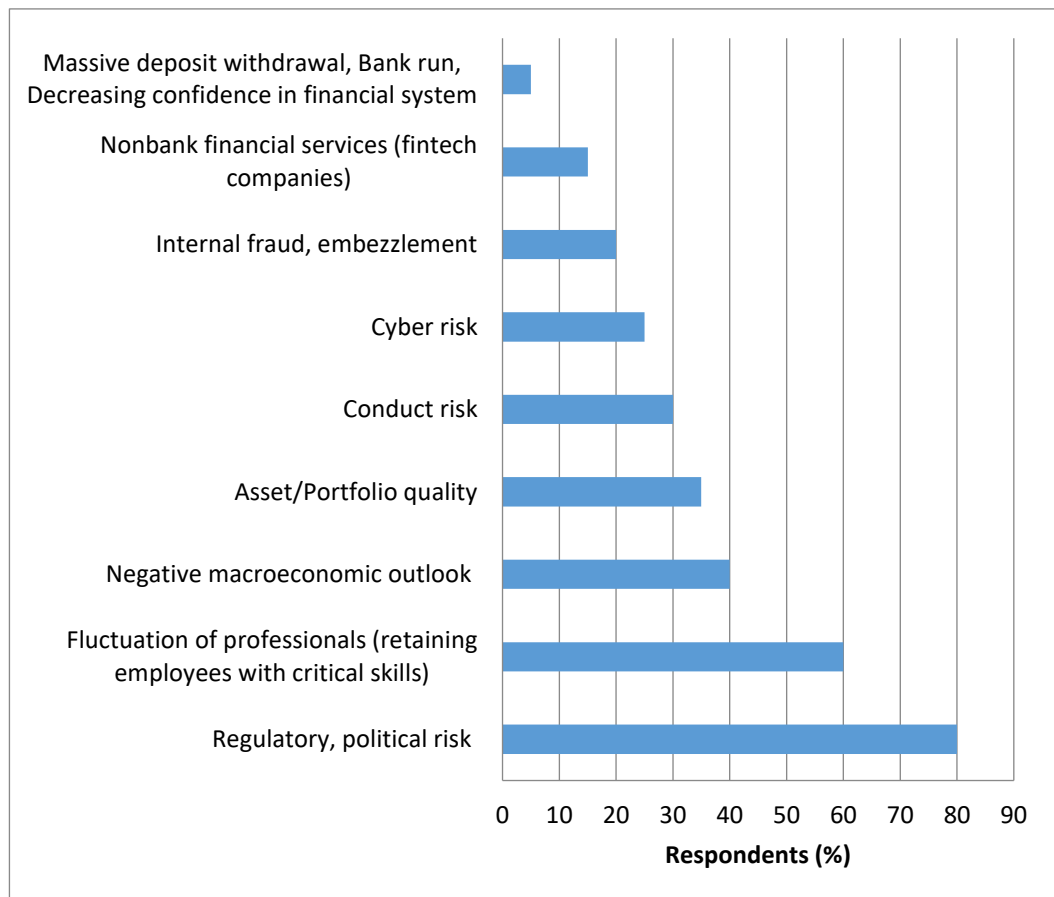
Based on the answers, six criteria of a well-functioning risk management system are the following:

- Corroborated by methodologies and data
- Transparent
- Forward-looking and has a proactive feature
- Corresponds with the purpose of the business areas
- Built in the decision-making processes
- Forms part of the daily routine

These criteria characterize the risk management systems of the „represented" institution, in case of a substantial part or all of the respondents. On the whole, it can be said that the banking sector's risk management systems harmonise more with the criteria above.

The second group of questions of the survey required the known and approved definition of risk appetite from the respondents. The answers were too general in many cases and the blending of terms was typical. For example the difference between the risk appetite and the capacity often fades. Many responses refer to that the respondents consider the defining of the risk appetite as conceivable in aggregated level and first of all, in a qualitative form. It can be highlighted as a positive aspect that in some cases, the assignment of risk appetite to „business decisions, successes" appeared. On the whole, the definitions given by large banks capture the essence of the risk appetite the most. As the evaluation of the in-depth interviews and the extended survey, there the responses were materially closer to academic formulation than in case of the on-line survey.

Less than the half of the respondents – from this, only 4 large bank's respondent – signalled that its institution possessed risk appetite framework. Each interviewees where RAF is existing – presumably started off of own experience – wrote that the establishment of the framework can happen by combining the top down and bottom up methodologies.

Since the unified taxonomy is essential precondition of the aim to let the RAF is a truly efficiently operating system, so we regard the opinions and reviews by practicing experts, about the definitions used in academic literature, as indispensable. Besides, it is worth keeping in mind that one of the keys of the RAF's success is to be represented by the governance and to be communicated at every level of the organization. So relevant question is how the terms above communicated or whether they communicated or not inside the institution or whether they incorporate to the daily practice or not. The results – considering the answers of just the large banks – are demonstrated by Figure 37, extended with the first phase's responses.

Figure 36.: RAF taxonomy in case of the large banks participating in the survey
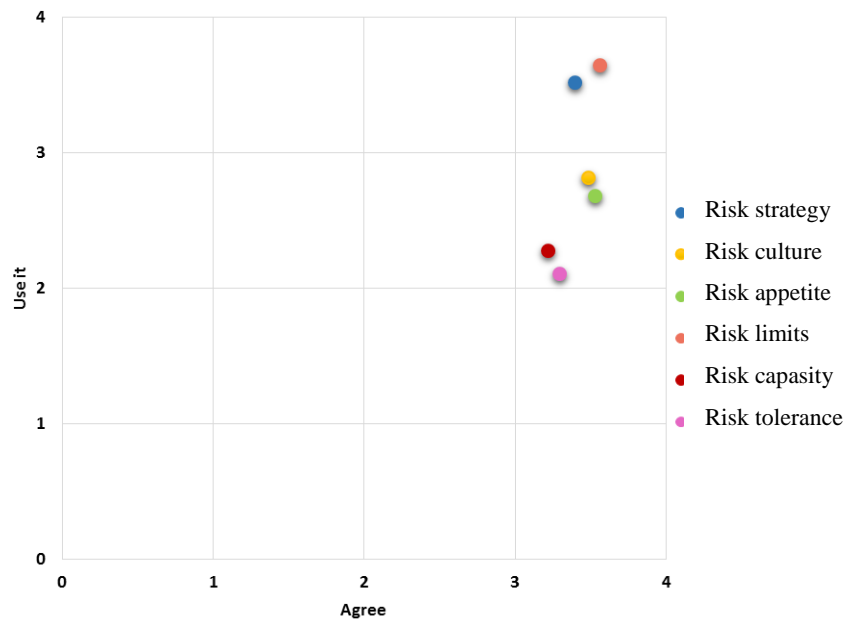


Source: by author

In summary we can conclude that the responder large banks agree to a great extent with the definitions given by us, and in proportion to the entirety of the respondents they handle the key terms of the risk appetite framework more consciously, as a concept.

In the introduction, the problem in relation to the risk tolerance term formulated by the literature is completely justified by the primer research. More respondent signalled that expressions tolerance and appetite are used as synonyms in case of the operational risk or model risk.

Although the RAF's fundamental concepts do not integrate into the daily practice entirely, the fact that the institution thinks about the risk appetite is welcomed. The construction of a well-functioning risk appetite framework, influencing really the risk awareness, is a long process, because – as mentioned before – it needs the change of the organizational culture. One of the first steps is that the key concepts start to come up in the language usage of the organization.

Dominating part of the respondents see the establishment of the risk appetite framework feasible in case of first pillar risks only. Every competent interviewee marked the credit

risk, 13 persons indicated the market risk (7 persons with bank background among them), and 10 persons indicated the operational risk (6 persons with bank background among them). In case of these risks, the most relevant „measure" are the level of risk capital, the expected loss and the magnitude of the losses suffered, and in case of the market risk, the volatility of the profit or revenue are highlighted as well. As in case of surveys cited previously, we also experienced that the strategic and the reputational risks can be interpreted as black spots. The majority of respondents consider the establishment of the RAF with two risks as impracticable or they view only at the revelations demonstrating zero tolerance as appropriate apparatus for this purpose. The following table shows in case of which risk type, which measuring instrument is considered as applicable by the respondents.

Table 20.: Measuring methodology applicable in case of each risk types

| | Credit risk | Market risk | Operational risk | Legal/Compliance risk | Liquidity risk | Reputational risk | Country risk | Strategic risk |
|---|---|---|---|---|---|---|---|---|
| Risk capital | √√√ | √√√ | √√√ | √ | √√√ | | √√√ | √√√ |
| Expected loss (self-assessment) | √√√ | √√ | √√√ | √√√ | √√√ | √√ | √√ | √√√ |
| Unexpected loss (self-assessment) | √ | √ | √√ | √√ | √ | √ | √ | √√ |
| Loss amount | √√ | √√ | √√√ | √√ | √√ | √√ | √√ | √√ |
| Volatility of profit or income | | √√√ | √ | | √√ | | √ | √ |
| Zero tolerance management statements | | | √ | √√ | √ | √√√ | | √ |

Source: by author

The third group of questions of the questionnaire related on RAF design deals with the potential benefits and blocking factors of implementation. Half of the respondents believe that a risk appetite framework should be developed both by type of risk and overall risk portfolio (aggregate level). Seven respondents suggest that a well-functioning RAF can only be imagined by risk type and three respondents can imagine it only at aggregate level. Considering only the banks' responses it is surprising to us that 5 respondents agree with the design by type of risk and 3-3 respondents with the

other two design forms. The proportions are similar in the first-round survey, all three approaches have supporters, and there is no clearly supported form.

The main challenges clarified in the interviews and in the extended questionnaire were not assessed by the respondents as we expected. Problems that were considered more significant were data retrieval, employee engagement and workforce management while the other options were not judged to be a complicating factor in the development of RAF. This conclusion is reached even if we evaluate only the responses with banking background and only the answers of those who have the RAF. The range of challenges will be increased if we only consider the responses of risk managers. According to them, the lack of uniform taxonomy, the difficulty of aggregating data and the involvement of business areas are the obstacles.

The potential benefits of RAF were assessed by respondents as shown in Figure 38.

Figure 37.: Relative returns on RAF implementation (4-grade scale)
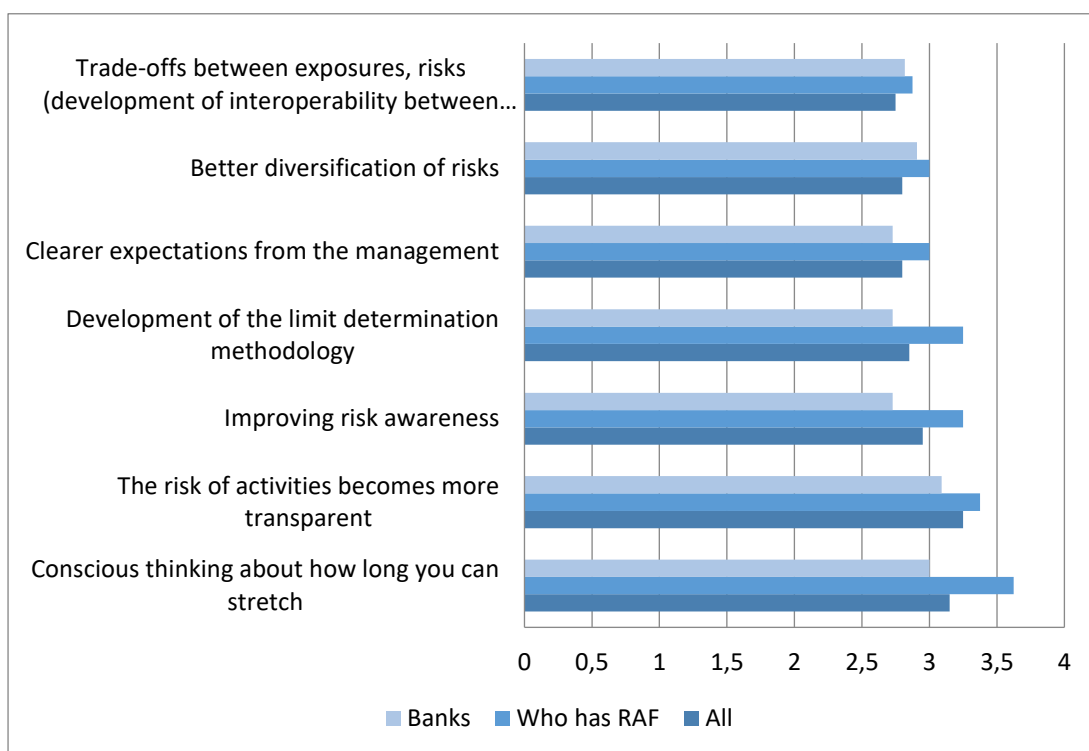


Source: by author

As the risk appetite links the strategy to risk management activity, in other words the business and profitability aspects to controlling and prudential roles, so the support of business areas for the success of RAF is essential. One-third of respondents believe that business areas are more likely to consider RAF to be a strong control, and another one-third, including respondents from business side, think that the business leaders consider it a useful tool. We believe that with effective communication and strong risk culture we have the opportunity to interpret the risk appetite framework not as a barrier to activity and profitability decreasing factor within the organization but as an opportunity. In this case the benefits outlined above can be exploited.

The idea of revising and narrowing the approaches to calculating capital requirements – mainly related to operational risk – have emerged in the last two years. In the same time new and novel supervisory priorities and survey participants also suggest that bank practices that represent responsible governance, such as the development of a risk appetite framework, will play an outstanding role in the coming years.

## 5.4.   CONCLUSIONS

Regulatory changes over the past few years and social expectations towards financial institutions have strengthened the commitment to risk-conscious and responsible corporate governance. Responsible corporate governance includes conscious thinking about risks and incorporating risk management practices into the daily routine. The introduction and operation of a risk appetite framework also serves this purpose. The surveys quoted in this chapter and our own research based on interviews and questionnaires show that the RAF has been set up in the financial sector, but there are few institutions where it really – as an integral part of the internal control system – works. Professionals' responses have shown that all institutions find it useful to implement this framework, in particular because of the increasing the transparency of risk-taking activities, increasing risk awareness, diversifying risk-taking and clearer management expectations. However, the design is inhibited by several factors. One of the major obstacles is the difficulty of introducing new conceptual frameworks with uniform content, the organizational burden and the methodological and data deficiencies. A further result of our survey is that it is worth starting the development of

the risk appetite system with the first pillar risks, because these are the risks where banks have sufficiently developed risk management tools and methods that can serve as the basis of the RAF.

Further research is needed on how banking risk capital and risk appetite can be linked, especially in the light of radical regulatory changes that significantly transform banking capital calculation practice.

## 6. CONCLUSION AND FURTHER DIRECTION OF RESEARCH

The topic of the dissertation is the change of the bank sector's operational risks, its trends, regulation, management, prediction and disclosure during the period after the recession.

The dissertation summarizes three studies which are different in their focus, methodology and type of database applied, with the purpose for examining the theory and practice of operational risk management on as many fronts as we can.

In the first part, we outlined the regulation changes related to operational risks, and the uncertainty which can be experienced from the regulator, supervisor and experts. Regard to the capital calculation, we move towards the simpler methodology, but at the same time the method which does not follow the bank's risk profile, which goes together with a considerable augmentation of the capital requirement in case of European banks. During the introduction, the advanced methodology got a great many critics, on the other hand, it has an undoubted merit that it made banks establish a broad risk management system with large effort and made them improve the risk awareness of their organization. At the moment, the direction of the constructed qualitative framework's further development is uncertain. From the experiences of supervisory examinations the following conclusion can be drawn: the loss prevention, improvement of control functions concentrating on the risk management's range – with special emphasis on the formation of risk appetite framework – and some highlighted risks, for example cyber risk, need additional efforts from the banks.

Out of the mentioned researches, the first is the empirical research based on the SAS Global Data loss database, in which we aimed for the uncover of country-specific factors and for the examination of previously tested factors in the literature. We got the results and these show that the standard of living and the GDP are determining furthermore, however the new variable introduced by us, the freedom of press substantially contributes on the interpretation of the differences among countries. Those operational risks carrying sensitive information's like frauds, corruption, process errors do not become public every time and do not get into the group of available information. The most important consequence of our examination is that the models using public

databases distort significantly so they must be adjusted by the freedom of press or with indicators with the similar contents. This result is especially essential for banks that often use public data to estimate their risk, without considering their distortive effects. The model risk was added to the ten most significant bank risks this year. Our research draws attention to a potential model risk and suggests solution for its avoidance.

In the focus of the second research, there are the bank risk and the part concerning operational risks in case of V4 countries' the biggest banks. We examined and evaluated the quality and the contents elements of the reports with the methodology of contents analysis. We analysed the trends observable from the 2008-2016 period and the differences among certain countries based on the resulting indexes. For the exploration of the factors influencing the contents and the quality of the disclosure reports, we made a regression analysis whose result reveals that the higher total assets, higher total equity/total assets and the introduction of advanced measurement approach of capital calculation causes a refined risk report with higher quality. By the result of the comparison between countries, the Polish banks' risk reports stand out above all others in the region, having regard to the contents or the quality.

The alteration of the capital calculation methodologies projected to 2022 and the introduction of SMA methodology may have significant impact on the risk reports while the relevance of operational risks does not decrease. We argue, based on the research that the regulatory requirements in relation to the disclosure and its contents must be determined more precisely and must be reinforced. The market operators – banks and regulators as well – must dedicate greater attention in favour of the inclusion in the disclosure report of the great loss events, the trends, the outstanding risk types, the trainings introduced for elevate the internal risk awareness and the cooperation among the sections which perform control function.

Finally, by an interview research conducted by us in 2016 and by a following questionnaire survey, we give an image about the domestic practice of the formation of the risk appetite framework and we formulated the deficiencies and critical points. As a summary of the answers, one may say while the potential benefits of the implementation of the risk appetite framework are incontestable, the domestic banks typically do not have a broad framework, embracing all risks. Over the regulatory compliance, the implementation of this framework contributes the augmentation of the

risk awareness and makes a greater diversification of risk-taking possible. At the same time, the deficiency of the taxonomy, the fact that the extraction of data related to the risk awareness is unresolved and finally the difficulties about the integration to operational practice means the barrier of the framework's establishment and thus of the exploitation of benefits.

The extension of disclosure reports' content analysis to other countries or the examination of characteristics showed by certain bank groups can mean a further line of research. Other inquiries may give an answer to the questions whether there is differences and if yes, why in the risk management practice of institutions attached to one bank group. After 2022, the effect of SMA methodology's introduction will be worth analysing, especially from the aspect that what changes will occur in the financial institutions' practice, whether it helps the management of new risks emerging during the digitalization and how it changes the banks' creation of capital.

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Risk and annual report of V4 countries from internet

Interviews

## Appendix 1.: Regions

Regions and codes

| | |
|---|---|
| USA | 0 |
| Africa | 1 |
| Canada | 2 |
| China | 3 |
| East-Asia | 4 |
| Europa | 5 |
| Middle-East | 6 |
| Ausztralia és Oceania | 7 |
| Latin-America | 8 |
| UK | 9 |
| Former Soviet states and Baltic states | 10 |
| Japan | 11 |

**Appendix 2.: Questionnaire used to analyse the content of annual and risk reports**

| Annex | Category |
|---|---|
| 1. Does the report include a definition of operational risk? | Definition |
| 2. Does the report include information about categories of operational risk events? | Definition |
| 3. Does the bank report qualitative information on its operational risk management (ORM) and control policies and practices? | Definition |
| 4. Does the bank provide information about operational risk exposure (by business line and/or event type if available)? | Definition |
| 5. Does the bank provide information on the model used to calculation of operational risk capital charge? | Definition |
| 6. Does the report contain information on the IT background of ORM processes? | Definition |
| 7. Does the operational risk management report contain information on the external database using for ORM? | Definition |
| 8. Does the bank provide information on the report line/structure of operational risk within the bank? | Governance |
| 9. Does the report include the place of the ORM function in the organisation? | Governance |
| 10. Does the bank report information on its Operational Risk Committee? | Governance |
| 11. Does the bank provide information on the control environment and control activities related to ORM? | Governance |
| 12. Does the report contain information about how ORM is integrated into the banking operations? | Governance |
| 13. Does the report include information about the relationship between ORM and other control functions (e.g. internal audit, compliance, IT security etc)? | Governance |
| 14. Does the bank provide information about trainings related to ORM function? | Governance |
| 15. Does the report contain disclosures about operational risk appetite? | Risk culture |

| | |
|---|---|
| 16. Does the bank disclose information on risk strategy, culture and governance? | Risk culture |
| 17. Does the bank provide details about extrem events? | Risks and trends |
| 18. Does the bank provide details on its future expectations and trends? | Risk and trends |
| 19. Does the bank report contain information about business continuity planning? | Risks and trends |
| 20. Does the bank disclose information on crises management? | Risk and trends |
| 21. Does the report include information on model risk? | Current issues |
| 22. Does the report include information on conduct risk? | Current issues |
| 23. Does the report contain information on reputational risk? | Current issues |

**Appendix 3.: Questions used to analyse the quality of annual and reports**

| Questions | Code | Category |
|---|---|---|
| 1. To what extent is the report sufficiently clear? | 0 = No explanation | 1.  Clear |
| | 1 = Very short description, general explanation in order to comply with regulatory requirements | |
| | 2 = Specific explanation beside regulatory requirements | |
| | 3 = Terms are explained and everything that might be difficult to understand is explained, therefore its suitable to maintan and enhance bank's reputation | |
| 2. To what extent does the presence of graphs and tables clarify the presented information? | 0 = No graphs | 3.  Meaningful to user |
| | 1 = 1 graphs | |
| | 2 = 2 graphs | |
| | 3 = More than 2 graphs | |
| 3. To what extent is the use of language and technical jargon in the report easy to follow? | 0 = Much jargon (industry), not explained | 1.  Clear |
| | 1 = Much jargon, minimal explanation | |
| | 2 = Jargon is explained in text | |
| | 3 = Not much jargon, or well explained (glossary) | |
| 4. What is the size of the operational risk part of report? | 0 = No oprisk part of the report | 3.  Meaningful to user |
| | 1 = Less than 1 page | |
| | 2 = 1-2 pages | |
| | 3 =  More than 2 pages | |
| 5.  Is  any  mistake (mistype) in the text? | 0 = Several and/or serious mistakes | 1.  Clear |
| | 1 = Many, small mistakes (rather grammatical) | |
| | 2 = Small number of mistakes | |
| | 3 = No mistake | |
| 6. To what extent does | 0 = No ratios | 4. Consistent over |

| | | |
|---|---|---|
| the company present financial index numbers and ratios in the report for the purpose of comparíbility across banks and in a historical perspective? | 1 = 1 ratio | time |
| | 2 = 2-3 ratios | |
| | 3 = More than 3 ratios | 5. Comparable across banks |
| To what extent does the report provide consolidated information on capital measurement approach and the amount of operational risk capital? | 0 = No consolidated information | 2. Comprehensive |
| | 1 = Only the local data and information | |
| | 2 = Partial information about the amount and applied approach using within the Group | 3. Meaningful to user |
| | 3 = Complete information about the amount and applied approach using within the Group | |
| 8. To what extent does the company provide a comparison of the results of the current period with previous periods in the report? | 0 = No comparison | 4. Consistent over time |
| | 1 = Only with previous year | |
| | 2 = With 2-3 years | |
| | 3 = More than 3 years + description of implications | |
| 9. To what extent does the presence of the forward-looking statement in the report help in forming expectations and predictions concerning the future of the bank? | 0 = No forward-looking information | 4. Consistent over time |
| | 1 = Forward-looking information for the next year | |
| | 2 = Forward-looking information for the next 2-3 years | |
| | 3 = Forward-looking information for the next 2-3 years + description of expectations | |
| 10. To what extent are presented information | 0 = No information | 4. Consistent over |
| | 1 = 1 planned action | |

| | | |
|---|---|---|
| related to the development of operational risk function? | 2 = 2 planned actions | time |
| | 3 = More than 2 planned actions | |
| 11. To what extent is available the report? | 0 = Difficult to find | 5. Comparable across banks |
| | 1 = After longer period of searching | |
| | 2 = On the interneteasy to find | |
| | 3 = On the internet, easy to find, available in english too | |

**Appendix 4.: Data of Hungarian banks examined at the end of 2016**

| Institution | Total Assets (MHUF) | Market share in credit | Market share in deposit | Net income (MHUF) | Owner |
|---|---|---|---|---|---|
| **OTP Bank Nyrt** | 7 109 622 | 18,25% | 27,79% | 181 477 | Public Limited Company |
| **Kereskedelmi és Hitelbank Zrt** | 2 863 253 | 11,08% | 12,39% | 42 420 | KBC Bank NV |
| **UniCredit Bank Hungary Zrt.** | 2 833 640 | 9,16% | 9,35% | 40 022 | UniCredit SpA |
| **MKB Bank Zrt.** | 2 099 186 | 5,80% | 8,89% | 9 123 | State owned |
| **Erste Bank Hungary Zrt** | 2 038 492 | 7,15% | 8,23% | 31 738 | Erste Group Bank AG |
| **Raiffeisen Bank Zrt.** | 2 001 319 | 6,09% | 7,83% | 16 245 | Raiffeisen-RBHU Holding GmbH |
| **CIB Bank Zrt.** | 1 665 428 | 5,84% | 7,17% | 6 755 | Intesa Sanpaolo SpA |
| **Budapest Hitel- és Fejlesztési Bank Zrt.** | 989 269 | 4,00% | 4,20% | 9 608 | State owned |
| **FHB Jelzálogbank Nyrt. (FHB Bankkal együtt)** | 797 176 | 2,81% | 1,75% | -    13 223 | State owned |

Source: Goldbook 2016. www.mnb.hu, banking websites

**Appendix 5.: Statistical description of variables used for the cluster analysis**

*Bank and country*

Hungary's, the Czech Republic's, Slovakia's and Poland's most notable banks, concerning the total assets, are those which are still included in the study. Nine Hungarian, five Czech, four Slovakian and eight Polish banks were chosen, through which we cover the 65-83,5% of bank markets.

*Oprisk Disclosure Index – ODI*

The next three histograms show the distribution of values of the Oprisk Disclosure Index:

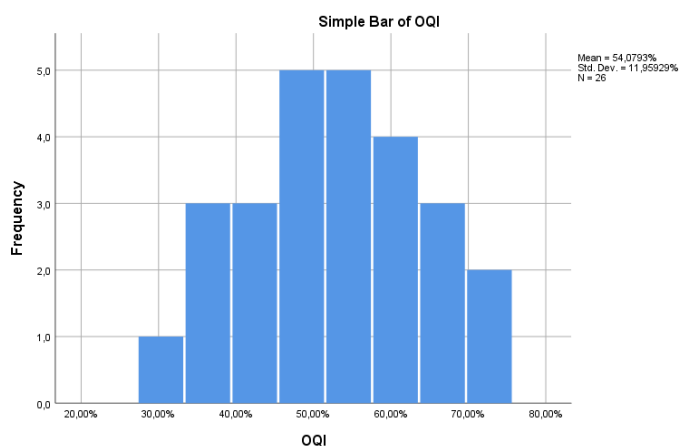Figure 38.: Histograms of the Oprisk Disclosure Index (ODI) based on the 2016 data
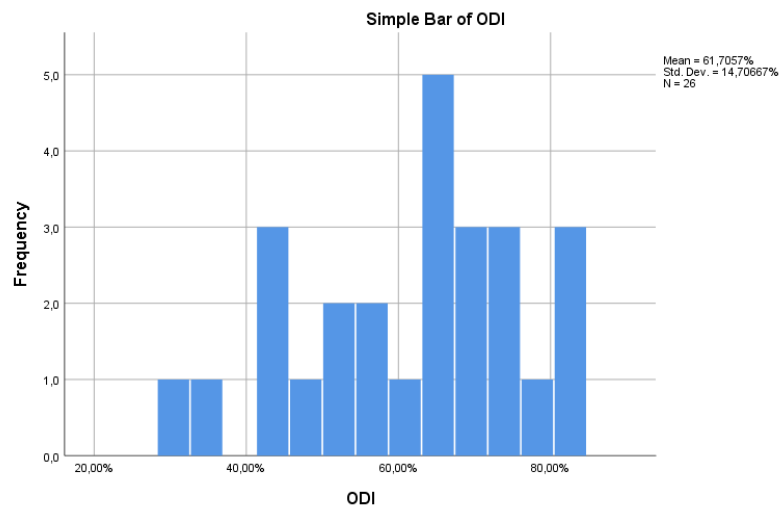


Source: by author, SPSS software

*Oprisk Quality Index (OQI)*

The following graph shows the distribution of the Quality Index's values calculated in 2016:

Figure 39.: Histogram of the Oprisk Quality Index (OQI) based on the 2016 data



Source: by author, SPSS software

*Bank data*

*TotalA*: The total asset is the variable showing the size of the bank, its value is between 1.500 és 63.350 million EUR. The next graph presents the outlier observations which indicate the Polish bank, PKO as an example.

Figure 40.: Outlier values of variable TotalA
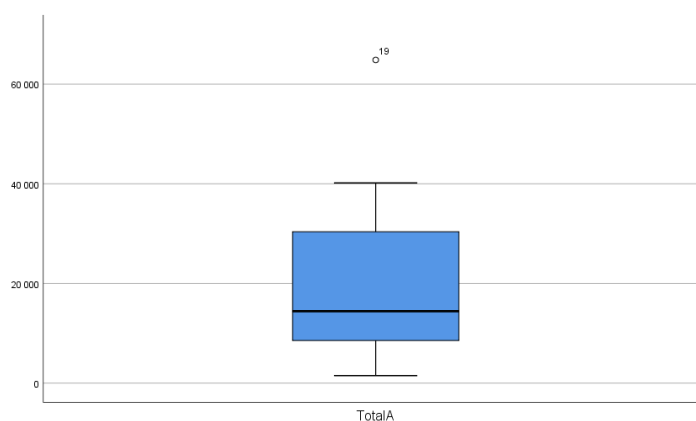


Source: by author, SPSS software

*TotalE*: It shows the value of equity of the bank, it scatters between 98 and 7.396 million EUR in our examined sample. The outlier is the PKO bank again.

Figure 41.: Outlier values of variable TotalE
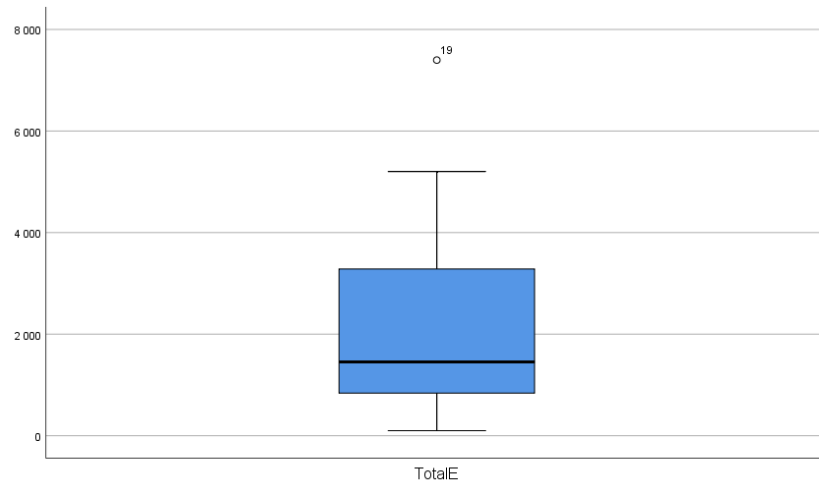


Source: by author, SPSS software

*NetI:* Net Income which is between -21 és 659 million EUR at the observed banks. The following graph does not show an outlier.

Figure 42.: Outlier values of variable NetI
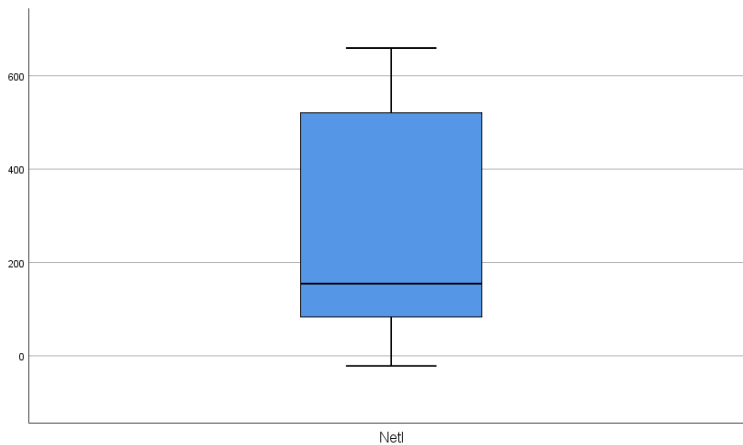


Source: by author, SPSS software

*Leverage:* Ration of total equity/total assets, it takes value between 0,06 és 14. Again, no outliers can be found.

Figure 43.: Outlier values of variable Leverage
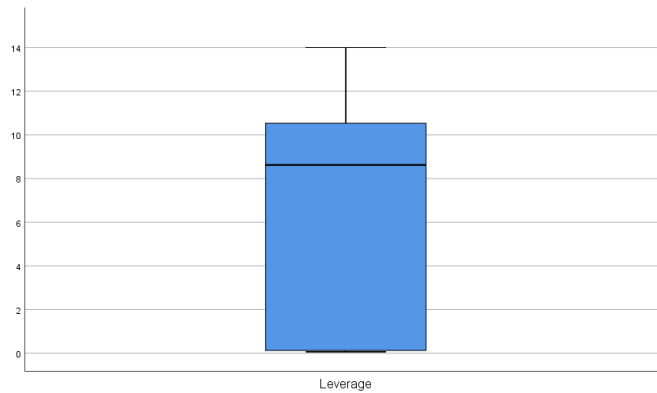


Source: by author, SPSS software

*ROA:* It shows the profitability of the bank, its value moves between -0,01 és 2,02. We still can not find an outlier element.

Figure 44.: Outlier values of variable ROA
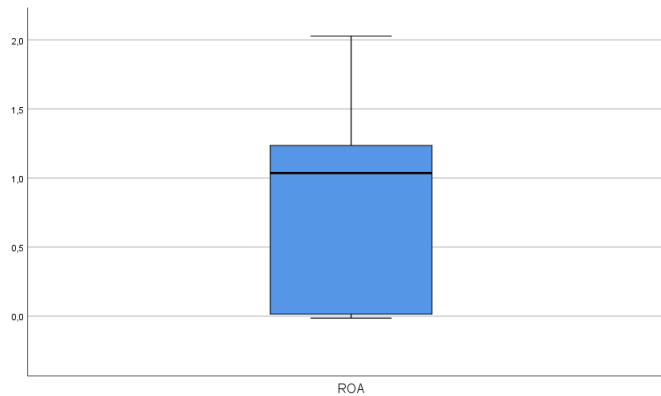


Source: by author, SPSS software

*Capital calculation method (AMA)*

The variable of capital calculation methodology can take value 0 or 1, depending on the bank's decision whether it chose the Advanced Measurement Approach – AMA or easier methodologies. If the bank selected the advanced one, then its underlying risk management system is more developed, annually monitored by the bank superivision.

# Appendix 6.: Multidimensional scaling

**Correlations**

| | | ODI | OQI | TotalA | TotalE | NetI | Leverage | ROA | VAR00003 | VAR00004 |
|---|---|---|---|---|---|---|---|---|---|---|
| ODI | Pearson Correlation | 1 | ,632** | ,570** | ,525** | ,425* | ,346 | ,314 | ,648** | ,409* |
| | Sig. (2-tailed) | | ,001 | ,002 | ,006 | ,030 | ,084 | ,118 | ,000 | ,038 |
| | N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| OQI | Pearson Correlation | ,632** | 1 | ,449* | ,487* | ,412* | ,383 | ,246 | ,597** | ,529** |
| | Sig. (2-tailed) | ,001 | | ,021 | ,012 | ,036 | ,054 | ,226 | ,001 | ,005 |
| | N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| TotalA | Pearson Correlation | ,570** | ,449* | 1 | ,968** | ,888** | ,658** | ,634** | ,949** | ,097 |
| | Sig. (2-tailed) | ,002 | ,021 | | ,000 | ,000 | ,000 | ,001 | ,000 | ,639 |
| | N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| TotalE | Pearson Correlation | ,525** | ,487* | ,968** | 1 | ,923** | ,619** | ,564** | ,932** | ,182 |
| | Sig. (2-tailed) | ,006 | ,012 | ,000 | | ,000 | ,001 | ,003 | ,000 | ,374 |
| | N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| NetI | Pearson Correlation | ,425* | ,412* | ,888** | ,923** | 1 | ,497** | ,577** | ,870** | ,178 |
| | Sig. (2-tailed) | ,030 | ,036 | ,000 | ,000 | | ,010 | ,002 | ,000 | ,383 |
| | N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| Leverage | Pearson Correlation | ,346 | ,383 | ,658** | ,619** | ,497** | 1 | ,890** | ,786** | -,427* |
| | Sig. (2-tailed) | ,084 | ,054 | ,000 | ,001 | ,010 | | ,000 | ,000 | ,029 |
| | N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| ROA | Pearson Correlation | ,314 | ,246 | ,634** | ,564** | ,577** | ,890** | 1 | ,767** | -,550** |
| | Sig. (2-tailed) | ,118 | ,226 | ,001 | ,003 | ,002 | ,000 | | ,000 | ,004 |
| | N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| VAR00003 | Pearson Correlation | ,648** | ,597** | ,949** | ,932** | ,870** | ,786** | ,767** | 1 | ,044 |
| | Sig. (2-tailed) | ,000 | ,001 | ,000 | ,000 | ,000 | ,000 | ,000 | | ,832 |
| | N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| VAR00004 | Pearson Correlation | ,409* | ,529** | ,097 | ,182 | ,178 | -,427* | -,550** | ,044 | 1 |
| | Sig. (2-tailed) | ,038 | ,005 | ,639 | ,374 | ,383 | ,029 | ,004 | ,832 | |
| | N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: by author (SPSS software)

**Appendix 7. : Hierarchical cluster analysis output table**

**Agglomeration Schedule**

| Stage | Cluster Combined | | Coefficients | Stage Cluster First Appears | | Next Stage |
|---|---|---|---|---|---|---|
| | Cluster 1 | Cluster 2 | | Cluster 1 | Cluster 2 | |
| 1 | 6 | 9 | ,063 | 0 | 0 | 14 |
| 2 | 12 | 20 | ,176 | 0 | 0 | 11 |
| 3 | 15 | 26 | ,326 | 0 | 0 | 16 |
| 4 | 3 | 5 | ,522 | 0 | 0 | 10 |
| 5 | 14 | 18 | ,882 | 0 | 0 | 13 |
| 6 | 10 | 11 | 1,281 | 0 | 0 | 19 |
| 7 | 13 | 16 | 1,717 | 0 | 0 | 12 |
| 8 | 7 | 8 | 2,184 | 0 | 0 | 15 |
| 9 | 21 | 25 | 2,666 | 0 | 0 | 12 |
| 10 | 3 | 4 | 3,213 | 4 | 0 | 21 |
| 11 | 12 | 23 | 3,940 | 2 | 0 | 18 |
| 12 | 13 | 21 | 4,786 | 7 | 9 | 22 |
| 13 | 14 | 17 | 5,686 | 5 | 0 | 21 |
| 14 | 2 | 6 | 6,716 | 0 | 1 | 17 |
| 15 | 1 | 7 | 7,755 | 0 | 8 | 20 |
| 16 | 15 | 22 | 9,180 | 3 | 0 | 18 |
| 17 | 2 | 24 | 10,803 | 14 | 0 | 20 |
| 18 | 12 | 15 | 13,351 | 11 | 16 | 22 |
| 19 | 10 | 19 | 16,921 | 6 | 0 | 23 |
| 20 | 1 | 2 | 20,734 | 15 | 17 | 24 |
| 21 | 3 | 14 | 26,188 | 10 | 13 | 24 |
| 22 | 12 | 13 | 32,738 | 18 | 12 | 23 |
| 23 | 10 | 12 | 40,341 | 19 | 22 | 25 |
| 24 | 1 | 3 | 55,290 | 20 | 21 | 25 |
| 25 | 1 | 10 | 100,000 | 24 | 23 | 0 |

Source: by author (SPSS software)

**Appendix 7.: Questionnaire on the Risk Appetite Framework**

1. Please provide the institutional classification of your workplace as follows:

   a. Large bank (total assets exceed 100 billion €)
   b. Medium bank (total assets between 1-100 billion €)
   c. Small bank (total assets less than 1 billion €)
   d. Savings cooperative, Credit union
   e. Other financial institution

   f. Insurance company
   g. Occupational Pensions
   h. Other financial intermediary

2. What is your job title or function and your position?

   ………………………………….

3. Please, evaluate how the following risks are important in your institution nowadays!
(1 – not at all important; 2 – slightly important; 3 – moderately important 4 – extremely important)

   a. Credit risk
   b. Market risk
   c. Operational risk
   d. Legal/Compliance risk
   e. Liquidity risk
   f. Reputational risk
   g. Country risk
   h. Strategic risk

4. Which will be the three most important threatens at your institution in the next few years?

   i. Asset/Portfolio quality

   j. Internal fraud, embezzlement

   k. Regulatory, political risk (change in legal environment)

   l. Massive deposit withdrawal, Bank run, Decreasing confidence in financial system

   m. Conduct risk

   n. Fluctuation of professionals (retaining employees with critical skills)

   o. Negative macroeconomic outlook

   p. Cyber risk

   q. Nonbank financial services (fintech companies)

r. Other:………….

5. Which are the three most important features of an effective Risk Management System?

      s. Supported by data and models
      t. Comprehensive
      u. Transparent
      v. Forward-looking, proactive
      w. Adaptive, able to react in time
      x. Accordance with the business goals
      y. Up-to date (with markets and operational environment)
      z. Documentation
      aa. Integrated into the decision making processes
      bb. Embedded into the operative processes of the institution
      cc. Facilitate the institution's risk awareness

  5.b. Please evaluate how the above mentioned features are typical related to your institution's Risk Management System! (1 – not at all typical, 2 – slightly typical, 3 – moderately typical, 4 – absolutely typical)

6. How do you define the risk appetite?

7. Please sign the risks where you can imagine to introduce the Risk Appetite Framework?

      a. Credit risk
      b. Market risk
      c. Operational risk
      d. Legal/Compliance risk
      e. Liquidity risk
      f. Reputational risk
      g. Country risk
      h. Strategic risk

8. Is there an established Risk Appetite Framework in your organisation?

      a. Yes
      b. No
      c. I do not know

9. How would you (by which method) develop a framework for a properly functioning risk appetite system?

    a. Top-down method (risk appetite as expected by the business strategy of the company articulated as a specific limit for the business unit)

    b. Bottom-up method (determined by the business unit as part of their risk management framework)

    c. Combination

10. Do you agree with the terminology? (1 – strongly disagree, 2 – somewhat disagree, 3 – somewhat agree, 4 – totally agree)

    a. **Risk strategy**: is a framework, expressed by the board, relates the institution's strategic objectives to its risk management priorities. It includes all relevant risk taking by the institution and the related risk management processes.

    b. **Risk culture**: is the attitudes and behaviours of an organisation's people that guarantees the suitable management of all material risks and facilitates risk-awareness both on board level and business unit level

    c. **Risk appetite**: shows the types and extent of the risks an organization consciously assumes within its risk capacity in order to achieve its strategic goals.

    d. **Risk tolerance**: shows the leeway of the company between the consciously assumed and the maximum acceptable levels of risk exposure.

    e. **Risk limits**: are closely related to risk tolerance. Their role is to promote an appropriate degree of risk diversification (i.e. to ensure that the risk undertaken is not concentrated on a single counterparty, sector, currency, etc.), and to indicate when and what level of intervention is necessary.

    f. **Risk capacity**: is the maximum risk an institution is still capable of bearing in any given circumstances without any major harm to its equity, liquidity, reputation or regulatory compliance.

11. Please evaluate how the above mentioned definitions are common/used in practice at your organisation? (1 – never use, 2 – occasionally/sometimes, 3 – almost every time, 4 – frequently use)

12. Please evaluate how the following obstacles/barriers are (could be) typical in the implementation process of RAF at your institution! (1 – not a barrier, 2 – somewhat of a barrier, 3 – moderate barrier, 4 – extreme barrier)

    a. lack of standardised taxonomy

    b. aggregating risk appetite across the organisation

    c. data availability

     d.   demonstrating relevance to the business

     e.   embedding RAF into the operative processes

     f.   integration RAF into the organisational culture

     g.   lack of management commitment/support

     h.   lack of employees commitment

     i.   overloaded employees

     j.   other

13. Do you consider that the risk appetite framework should be developed for the entire risk portfolio (aggregated level) or risk type?

     a.   Risk type

     b.   Aggregated level

     c.   Both

14. Which of the following can express the risk appetite related the risk mentioned in Q. Nr.7.?

     a.   capital requirements

     b.   earnings (profit, revenue) volatility

     c.   total losses

     d.   expected losses

     e.   unexpected losses

     f.   zero tolerance statement

     g.   other

15. Which of the following advantages are/can be realised by the implementation of the RAF? (1 – not at all typical, 2 – slightly typical, 3 – moderately typical, 4 – absolutely typical)

     a.   Conscious thinking over the risk taking

     b.   more transparent risk of processes

     c.   increasing risk awareness

     d.   developing limit systems

     e.   Clear expectations of the management

     f.   Diversification of risks

     g.   Trade-offs between exposures (reallocation of limits)

     h.   Other

16. What do you think about the reaction of business units related to implementation of risk appetite framework?

     a.   Neutral.

     b.   They would think it useful

     c.   They would think it as a strong control

     d.   No useful

     e.   other

17. Do you see that the need to develop a risk appetite framework for the next 2-year period will increase or decrease?

    a.  In parallel with the revision and eventual disappearance of internal capital calculation methods, this need will be decreased.

    b.  I do not expect a significant change in this field.

    c.  I am counting on the growth of expectations.

    d.  Other