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Credit risk management

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Declaration of Authorship:

I declare that I carried out this bachelor thesis "Credit risk management" independently, using only sources and literature properly marked and included in the bibliography.

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Abstract:

This bachelor thesis deals with credit risk of commercial banks. The aim of the thesis is to describe methods used to manage credit risk of the largest Czech banks and to examine the current situation in the Czech banking sector: to evaluate the level of regulatory capital, to describe risk exposures and structures of loans in the system as a whole and separately in the three selected banks. The data is drawn from statistics published by the Czech National Bank, financial results and annual reports of the individual banks. In the theoretical part, credit risk, credit risk management methods and Basel concepts are characterised. The empirical part focuses on the comparison of selected methods in the Czech banks.

Key words:

Credit risk, credit procedure, capital adequacy, Basel II, Basel III

Abstrakt:

Tato bakalářská práce se zabývá úvěrovým rizikem komerčních bank. Cílem práce je popsat metody, kterými řídí úvěrové riziko největší české banky, a také prozkoumat, jaká je současná situace v českém bankovním sektoru: zhodnotit úroveň regulatorního kapitálu, popsat rizikové expozice a strukturu úvěrů v systému jako celku a samostatně ve třech vybraných bankách. Data jsou čerpána ze statistik zveřejňovaných Českou národní bankou, finančních výsledků a výročních zpráv jednotlivých bank. V teoretické části je charakterizováno úvěrové riziko, metody používané k řízení úvěrového rizika a regulatorní koncepty Basel. Empirická část je zaměřená na porovnání vybraných metod v českých bankách.

Klíčová slova:

Kreditní riziko, úvěrový proces, kapitálová přiměřenost, Basel II, Basel III

Contents

Introduction

Providing loans represents an essential source of income of commercial banks but is also vital for the functioning of the whole economy. Without lending, one could barely imagine some economic and business activities. However, this activity entails many risks. Credit risk accompanies lending and is the most important risk of commercial banks. It represents a loss that a bank may suffer if a counterparty defaults. These defaults endanger stability of banks and may be a cause of a financial crisis. Hence, sophisticated credit risk management system can lower probability of these crises. An example of careless credit risk management can be a recent crisis in 2008 caused by American banks that were granting mortgages to applicants with low creditworthiness. As a result, the whole American economy collapsed, many banks went bankrupt and the consequences affected the whole world.

The aim of successful credit risk management is to find an appropriate ratio between risk of loss and potential profit, to determine risk appetite – to decide which risks to accept and when to be risk-averse.

This bachelor thesis aims to survey the financial situation in the Czech banking sector and to assess the selected Czech banks in terms of credit risk: to evaluate level of regulatory capital, describe risk exposures and structures of loans in the system as a whole and separately in the three selected banks. Next, the goal is to describe banks' approaches to credit risk management.

The thesis focuses on credit risk in relation to loans provided by banks and other financial institutions, not on credit risk arising from operations with derivatives or investments.

The text is divided into five chapters. In the first chapter, principles of lending and types of loans are described. The second chapter characterises credit risk and categories of credit risk as this risk may occur in different forms, for example, in balance sheet or off-balance sheet items. Next, the formula of expected loss calculation is explained. Accurate calculations help to reduce the impact of potential losses on the bank's operations and are therefore vital for credit risk management.

Credit procedure is described in the third chapter: where do banks obtain information about counterparties and how do they evaluate them. Different methods are used for

different types of counterparties – scoring is preferred for individuals, rating for large enterprises. Next, this chapter focuses on the measures used as guarantees and alternative sources of income in case of a debtor's default and, finally, what are the ways of control of credit risk since credit procedure is not finished by granting a loan, but regular monitoring, provision-making or setting limits are elements that cover the whole credit risk management process.

The fourth chapter deals with standards set by Basel Committee on Banking Supervision (BCBS), so called Basel. Loans make up most of the assets of banks' balance sheet and therefore the capital adequacy requirements, calculated as a ratio of capital to risk-weighted assets, regulate credit risk and help to improve stability of banks.

The last chapter focuses on the Czech banking sector. First, the situation in the sector as a whole is described, followed by the analysis of the largest Czech banks: Česká spořitelna, a.s., Československá obchodní banka, a.s. and Komerční banka, a.s. Using financial results and annual reports, this chapter analyses the most significant changes and current structures of loan portfolios, internal operations and processes: how do the banks evaluate clients, classify receivables, calculate provisions or collateral, what are the most common types of collateral, etc. Finally, what are the approaches used for calculations of capital requirements and whether the banks comply with these requirements.

1 Credit activity of commercial banks

Financial intermediation involves movement of cash from surplus to deficit units. This includes lending, which is one of the primary functions of commercial banks. Loans are relatively low in liquidity and risky; however, represent the main item of banks' assets, providing them with income. Basic sources of income are interest payments, where interest rates correspond to liquidity, credit risk and maturity. Every bank tries to maximize profit and therefore a volume of loans. Hence, in order to have adequate capital in relation to provided loans, a certain minimum level of capital is required by a regulator.

Loans can be distinguished by different criteria, e.g. by financing entities, purpose, maturity or collateral.

By entities, we distinguish instruments for:

- financing business activities (corporate financing instruments)

- financing of small business entities and private persons (retail financing), main instruments: mortgage and consumer credit

- financing of SMEs (small- and medium-sized enterprises)

- project financing

- financing of financial institutions

- financing of the public sector and governments. [1]

Differentiation of a counterparty is important for determining specific procedures and requirements for different types of clients. In case of individual (or small credit exposures – e.g. consumer credit), a portfolio approach (less individual) is applied, while in case of large credit exposures – companies etc., great emphasis is placed on evaluation and continuous monitoring of a client (individual approach). For large exposures, internal and external credit ratings are used, scoring is preferred for small exposures. [2]

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[1] MEJSTŘÍK, Michal, PEČENÁ, Magda and TEPLÝ, Petr. *Bankovnictví v teorii a praxi: Banking in theory and practice*, p. 332–335.
[2] JÍLEK, Josef. *Finanční rizika*, p. 19.

On the chart of the monetary statistics from March 2019 published by the Czech National Bank, we can see that loans to households prevail on the Czech market, followed by non-financial corporations.

Figure 1: Loans to private sector (CZK billions) and annual growth of loans to non-financial institutions and households (%)
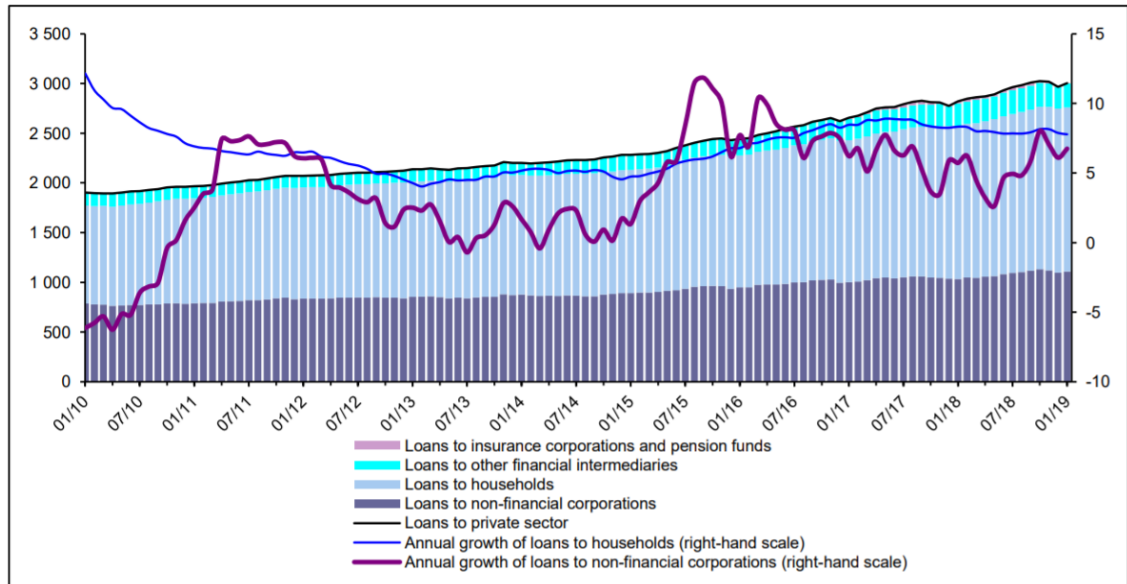
Source: CNB, Monetary statistics, March 2019

2 Credit risk and its characteristics

In banking sector, risk is described as a degree of probability of an adverse effect and its financial aftermath. This degree is expressed quantitatively through mathematical, statistical and analytical tools.

Financial institutions all over the world are exposed to many types of financial risks. These risks can be categorized as *credit risk* (probability of counterparty default), *market risk* (change of exchange rates, interest rates, equities and other commodities), *liquidity risk* (loss of ability to meet obligations in time), *operational risk* (internal processes error, human error, fraud) and *systemic risk* (endanger of stability of the whole financial market).[3]

Credit risk is the oldest and the most important of all financial risks. In general, credit risk is the likelihood of counterparty default or unwillingness to perform. In other words, it represents a loss in case that contracts are not repaid along with an adequate award for this risk – interest payments.

Credit risk management is one of the most developed risk management segments of banks as this risk cannot be eliminated completely. Banks must be clear about risks they are willing to accept and measures that will be taken to monitor and reduce them. Risk measurement and monitoring systems must accurately and on time capture banks' total credit exposure. These systems must also set out how to monitor banks' exposures to related groups and to evaluate all significant sources of credit risk.

2.1 Types of credit risk

Credit risk is dependent on quality and structure of balance sheet assets and off-balance sheet transactions. We divide credit risk by these categories: *direct credit risk*, *large credit exposure risk*, *credit risk equivalent exposure* and *settlement risk*.[4]

- *Direct credit risk* is the most significant component of credit risk. It represents risk of a counterparty default on traditional balance sheet items. This risk lasts

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[3] CHORAFAS, Dimitris N. *Risk management technology in financial services: risk control, stress testing, models, and IT systems and structures*, p. 24.
[4] JÍLEK, Josef. *Finanční rizika*, p. 16.

throughout a credit relationship, nevertheless, increases proportionally with a loan maturity in general. Counterparty is also an important element and clients are therefore divided by banks into certain categories and their creditworthiness is assessed according to this category. Risk of default is, for example, higher in companies with below-average profitability and occasional payment difficulties, while risk of default in businesses with above-average return on capital is lower.

- *Credit equivalent exposure* occurs in off-balance sheet items such as documentary credits or derivatives. Credit equivalent is calculated as a product of nominal value and a conversion factor. Banks should recalculate credit equivalent's market value at regular intervals – the obtained market value may be lower than the expected or predetermined one.

- *Large credit exposure risk* is a risk of loss from excessive exposure to individual clients, groups of clients and related parties or economic sectors. In order to avoid excessive credit exposure, credit risk management departments set credit limits in accordance with rules of a regulator and supervisor. Capital Requirements Regulation (Regulation No 575/2013) is currently in force and sets limit in respect of one debtor or an economically linked group of debtors: net credit exposure of a credit institution or investment firm cannot exceed 25 % of its eligible capital.[5]

- *Settlement risk* occurs when a client does not settle his obligation to a bank (fully or partially) at the time of settlement or any time thereafter. A bank is exposed to a loss of resources and profit in case of a credit default of a client or security issuer. Risk of loss is determined by comparing market value of a credit or security and a price in a contract at the time of default. This risk is dependent on two factors: the *volatility* of a market price of a security and the *length* of a period between negotiation and settlement (or non-settlement) of a transaction. Frequent reassessment of a client and collateral (e.g. pledge) are one of the facilities for at least partial elimination of the risk.[6]

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[5] Article 395, Regulation (EU) No 575/2013.
[6] POLOUČEK, Stanislav. *Bankovnictví*, p. 306–307.

2.2 Credit risk elements

All banks try to find a suitable ratio between exposure to risk and potential profit. In credit portfolio models we define *expected* and *unexpected loss*.

The expected loss is characterized by higher frequency and lower impact. Thanks to the higher frequency, it can be estimated by statistic methods and therefore covered by profits or allowances. In contrast, the unexpected loss is high impact/low frequency and can result from changing risk environment or from mismanagement of ELs. Unexpected losses are covered by capital.[7]

$$Resulting\ loss = unexpected\ loss + expected\ loss, \tag{1}$$

expected loss can be defined as:

$$EL = EAD \times LGD \times PD = EAD \times (1 - RR) \times PD, \tag{2}$$

where

- *Exposure at Default (EAD)* – expected exposure of a loan at the time of default. Off-balance sheet assets are converted using a credit conversion factor (CCF).

- *Loss Given Default (LGD)* – share of an asset that is lost if borrower defaults. It can be also defined as (1-RR), where RR is Recovery Rate. The LGD and RR are expressed as percentages of the EAD.

- *Probability of Default (PD)* – likelihood of a default over particular time horizon (usually one year). PD may be derived from internal, external rating, scoring models, etc.[8, 9]

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[7] CHORAFAS, Dimitris N. *Risk management technology in financial services: risk control, stress testing, models, and IT systems and structures*, p. 25.
[8] SAITA, Francesco. *Value at risk and bank capital management*, p. 67, 68.
[9] WITZANY, Jiří. *Credit risk management and modelling*, p. 78–81

Figure 2: Loss distribution (expected and unexpected loss) of credit risk
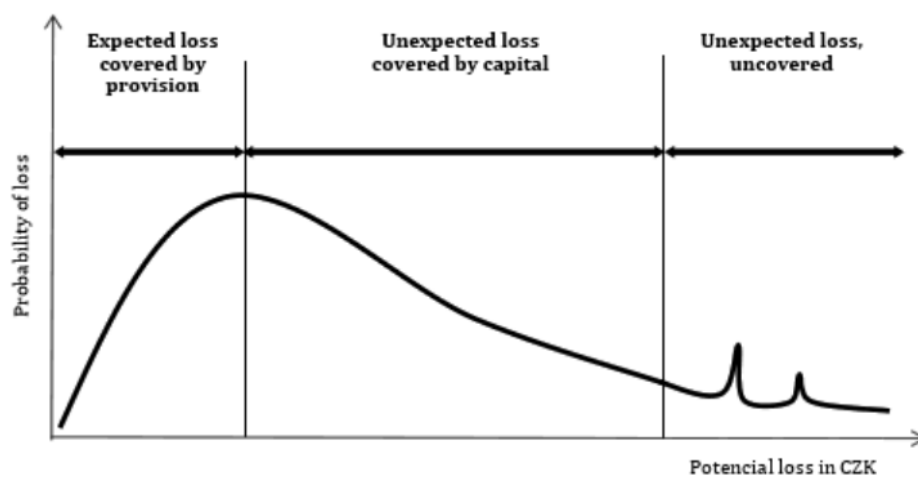
Source: MEJSTŘÍK, Michal, PEČENÁ Magda and TEPLÝ, Petr. Bankovnictví v teorii a praxi:
Banking in theory and practice, p. 177

3 Credit risk management

Credit risk management process has specific elements in different banks, but the purpose is always the same: to decide which risks is a bank willing to accept and which measures will be taken for monitoring and reduction of these risks.

The goal of credit procedure is to approve or reject a loan application. Those applicants who do not meet requirements are rejected due to a higher probability of default than a credit provider is willing to accept. The key is to assign a credit grade on a predetermined scale which indicates the probability of default. According to this, loan pricing is set up. It all works on a collective basis where credit losses should be covered by collected credit margins.

Credit risk management process can be divided into the following steps:

1. identification of credit risk,

2. credit risk measurement,

3. measures to limit credit risk,

4. control of credit risk.

3.1 Identification

Identification means distinguishing credit risk from other financial risks, detection where and how this risk arises. Credit risk can result from:

- *Client risk* – client will be exposed to such an economic situation that he will not be able to meet his obligations to a bank.

- *Country risk* – economic entities in a particular country will not be able to fulfil their foreign obligations for some common political, economic or other reason.

- *Concentration risk* – a situation when a bank concentrates loans of one type of clients who are exposed to the same economic and risk characteristics.[10]

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[10] KAŠPAROVSKÁ, Vlasta. *Řízení obchodních bank: vybrané kapitoly*, p. 74, 75.

3.2 Measurement

The aim of credit risk measurement is to determine and qualify possible losses. Result of the measurement process is established creditworthiness of a client and inclusion of a credit transaction into a certain risk category. Client's creditworthiness represents an ability to repay a debt and thus fulfil all commitments to a bank, it also affects various parameters: interest rate (the riskier client, the higher risk premium for the interest rate), bank's security requirements (the riskier counterparty, the higher requirements on security) or a way and frequency of monitoring (frequency and depth of control grow with increasing risk). Many methods help banks to correct assessing of credit risk, for example, scoring, rating or credit models.[11]

To evaluate a client's creditworthiness, banks analyse various financial, juristic and economic characteristics, credit analysis examines both financial and non-financial factors. These include industry, competitive position, financial risks, management risks, loan structure, documentation issues, etc. Information can be obtained from various sources such as

- information directly from a client (usually via a form),

- bank's internal information (if a client has already arranged a bank account or another loan),

- information from registers of credits (CCR, BRKI, SOLUS, NRKI),

- information from rating agencies,

- information obtained from other banks (if a bank does not get information from registers or rating agencies, it may contact other banks).[12]

Registers of credits

Banks may use external information from registers of credits when evaluating a counterparty's creditworthiness. These registers pool information on clients' commitments and payment discipline – banks are obliged to report changes in credit

[11] KAŠPAROVSKÁ, Vlasta. *Řízení obchodních bank: vybrané kapitoly*, p. 76, 77.
[12] FIGHT, Andrew. *Credit risk management*, p. 3.

relationships (granting a loan, loan repayment, default) and have the right to require information about other debtors. Sharing of this information widens the range of instruments applicable in credit risk management area.

The Central Credit Register (CCR) began its operations in 2002 after the CNB decided to strengthen the banking sector's stability in 2000. The CCR collects information on credit commitments of legal entities and individual entrepreneurs. Participants of the Register are banks and branches of foreign banks that operate in the Czech Republic. The participants update the database on a monthly basis. The Register also cooperates with foreign registers and participates in data sharing within some EU countries (Germany, Austria, Italy, France, etc.) and gets information on foreign clients financed in the Czech Republic and Czech clients financed abroad. At the beginning of 2018, the CCR reported more than 630,000 debtors.[13, 14]

The Banking Register of Client Information (BRKI) is operated by the Czech Banking Credit Bureau (CBCB), which is owned by five founding banks (Česká spořitelna, Československá obchodní banka, Moneta Money Bank, Komerční banka, UniCredit Bank Czech Republic and Slovakia). The BRKI began its operations in 2002. This Register collects data only from 25 participants who have access to clients' current debt situations and four-year historical records.[15]

3.2.1 Scoring

Scoring is used to assess the creditworthiness of private persons and small business entities (retail financing). This analysis is easier than rating, however, is sufficient for retail financing where rating is unnecessary and too expensive. It may not be so deep and evaluation system is more standardised. Scoring is based on a statistical analysis of clients who are required to provide relevant data such as age, marital status, education, occupation, number of years of employment, regular income, and so on. For evaluation of small enterprises are assessed: legal form and business field of the company, share capital, total assets, liquidity, ROE, ROA, etc. Purpose of a loan also plays an important

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[13] MEJSTŘÍK, Michal, PEČENÁ, Magda and TEPLÝ, Petr. *Bankovnictví v teorii a praxi: Banking in theory and practice*, p. 358–361
[14] Financial market supervision report, 2017, part 4.9, CNB.
[15] MEJSTŘÍK, Michal, PEČENÁ, Magda and TEPLÝ, Petr. *Bankovnictví v teorii a praxi: Banking in theory and practice*, p. 360–363

role. Each bank sets its standards, for example, either annual or monthly income, either net or before-tax income is considered.[16]

Credit scoring by use is divided into:

- *Application scoring*, which is used to evaluate new clients. Data used is the same as already mentioned above (income, marital status or business field, liquidity, etc.).

- *Behavioural scoring* is used to continuously evaluate existing clients – when a bank decides whether to increase its exposure to a client, or for marketing purposes (when planning to launch a new product – to estimate whether a client remains or not). Data comes directly from the bank's internal sources (account movements and balances, amount and type of loans, current volume of unpaid debts, …).[17]

The table in Attachment 1 demonstrates an example of scoring of a private person. For each section, a client receives points and each section is given a different weight, which depends on a type of a credit instrument, size and maturity of a loan. Differences may also be between regions in the country. Result is a sum of points that determines a client's overall creditworthiness.

Altman Z-Score is another example of scoring. This model is used for assessing companies where the goal is to distinguish between a solvent and a bankrupt company. Business status is expressed by one number which determines a probability that a firm will go bankrupt within a two-year period. As Z-Score increases, the probability of bankruptcy decreases and vice versa.[18] The score is calculated from equation

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5, \tag{3}$$

where

$$X_1 = working\ capital/total\ assets,$$

[16] BLAHOVÁ, Naďa. *Rizika bank a jejich regulace*, p. 93
[17] THOMAS, L. C., EDELMAN, David B. and CROOK, Jonathan N. *Credit scoring and its applications*, p. 157
[18] BLAHA, Zdenek Sid, ed. *Risk management techniques: their use and applicability in the banking sector of the Czech Republic*, p. 24.

$X_2 = retained\ earnings/total\ assets,$

$X_3 = earnings\ before\ interest\ and\ tax/total\ assets,$

$X_4 = market\ value\ of\ equity/total\ liabilities,$

$X_5 = sales/total\ assets.$

If a resulting number is less than 1.8, a probability of default is high. If a score lies between 1.81 and 2.99, an ability to repay cannot be accurately estimated and a resulting score above 2.99 means a high probability of meeting the obligation.[19]

3.2.2 Rating

Rating is used to evaluate large counterparties (in corporate financing, financing of financial institutions, etc.) where a detailed credit assessment and individual approach are needed. Result of client's rating is an evaluation of his creditworthiness and risk class classification. Each class determines the level of risk to which a bank is exposed in relation to a particular client.

The fundamental rating tool is credit analysis that assesses a client's financial situation and its development, business field, position on a market, entry barriers or input and output prices. Each of these factors has a different weight – the highest weight is usually attributed to a client's financial situation, which can be analysed via dozens of financial analysis indicators: return on assets, equity and sales, cash position ratio, current ratio, inventory turnover ratio, etc.

Rating may be long- or short-term (creditworthiness within one year), local or international, rating of a corporate entity, rating of a bank or country rating – different indicators are used for evaluation of a bank and, for example, a manufacturing company. Qualitative indicators of a company evaluation include strategy, quality of management, organizational structure, client profile, competitive environment, technological changes or cyclicality; the quantitative factors are liquidity, cash flow analysis, financing options, assets, revenues, trend in sales, etc. On the other hand, indicators used to evaluate a bank

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[19] CIPRA, Tomáš. *Riziko ve financích a pojišťovnictví: Basel III a Solvency II*, p. 11

include structure of assets and liabilities, market position, foreign exchange market activities, credit exposure, capital adequacy or return on assets and equity.[20]

Depending on who generates a rating, we distinguish *internal* (generated by a bank itself) and *external* rating (by rating agencies).

Most external ratings are expressed in letters (AA, BBB+, C, etc., where grade A represents the highest creditworthiness, by contrast, C-D grades indicate a high probability of default). Rating agencies must comply with strict regulatory rules. These rules were intensified as a result of crises at the end of the 20th century, and even stricter requirements were set after the 2008 financial crisis when many banking institutions (such as Lehman Brothers) went bankrupt. These banks provided loans to clients with low creditworthiness and secured these loans with toxic CDO assets that received high rates from rating agencies. The best-known rating agencies are Standard & Poor's, Moody's and Fitch Ratings, in the Czech Republic it is the Czech Rating Agency. The table in Attachment 2 shows long-term and short-term rating scales.

3.2.3 Credit models

Credit models help to calculate a probability of loss from a loan. Input parameters include probability of default, exposure at default, loss given default, rating data, etc. According to what is considered a credit event we divide models into *default mode models* and *mark-to-market models*.

For *default mode models*, a credit event is considered a default of a debtor. Thus, at the end of a reporting period (usually one year), a debtor is classified into one of two states: default or no-default. Therefore, if there is no default, it is not assumed that a loss occurs. A debtor's position is fixed and, unless he goes directly to default, does not change – the disadvantage of these models is that they do not consider a possibility of migration between rating categories. In these models, default of each borrower is independent. Default mode models are used more in retail portfolios that include a large number of low probability default debtors. The best-known default mode model is CreditRisk+.[21]

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[20] BLAHOVÁ, Naďa. *Rizika bank a jejich regulace*, p. 95–97.
[21] BLAHOVÁ, Naďa. *Rizika bank a jejich regulace*, p. 100–102

Mark-to-market models deal with how a change in a debtor's credibility affects a change in the amount of possible loss. These models consider a credit event any change in rating (decrease but also increase) – they work, unlike default mode models, with the possibility of migration within rating categories. Hence, a credit event may occur even if a bank does not suffer a loss. Rating is an important basis for this analysis. As a result, a bank obtains a migration matrix, which indicates a probability of move from one rating grade to another (for example, the probability that an A-rated client will move to BBB within one year). CreditMetrics is an example of mark-to-market models.[22, 23]

3.3 Measures to limit credit risk

Risk of loss may be reduced by various security methods, insurance and so on. These measures serve as an alternative source of a bank's income and help to limit credit risk.

3.3.1 Security

A bank usually requires guarantees that serve as an alternative source of income if a debtor is unable to comply with a loan repayment. We distinguish *personal* or *material* and *accessory* or *abstract* collateral.

In case of *accessory* collateral (e.g. pledge), collateral depends on an existence of a secured claim; this collateral, therefore, exists as long as a claim is in place and cannot be used to secure other debt. *Abstract* collateral does not depend on an existence of a secured claim and can be used again to secure any new debt (e.g. guarantees received on bills of exchange).[24]

Personal collateral means that, in addition to a debtor, a third party guarantees a bank to repay a loan (e.g. personal suretyship).

Material collateral gives a bank rights to certain assets of a debtor. At a theoretical level, the assumption is that borrowers with low credit risk are willing to offer higher-quality collateral, which can also help to get a more favourable interest rate. On the other hand, borrowers with high credit risk offer lower collateral – they do not expect a loan to be

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[22] MEJSTŘÍK, Michal, PEČENÁ, Magda and TEPLÝ, Petr. *Bankovnictví v teorii a praxi: Banking in theory and practice*, p. 747.
[23] WITZANY, Jiří. *Credit risk management and modelling*, p. 121
[24] KAŠPAROVSKÁ, Vlasta. *Řízení obchodních bank: vybrané kapitoly*, p. 77, 78.

repaid and a possibility of a lower interest rate does not motivate them. In banking practice, the situation is the opposite. A bank assumes that it can adequately assess counterparty and accordingly requires collateral – the higher credit risk, the higher the required collateral.[25]

Material security is possible by virtually any property: inventory, buildings, motor vehicles, valuables like paintings, jewellery, etc. Requirements for collateral of movable assets are a possibility of storage (it should be possible to store the item in a bank or at a third party, e.g. museum or gallery) and a subject of guarantee should be insured against devaluation. Conditions for accepting an item as collateral may be quite specific for some items – for instance, a deed needed to enable usage of a subject (technical vehicle certificate). In addition to movable assets, collateral may be an agreement for example on deductions from wages or other income. Different types of collateral can be combined.[26]

In the Czech Republic, security through real estate lien is the most frequent way to secure a loan (mortgage). Debtor's own but also someone else's property (with an owner's consent), business properties (farm building, land, warehouse) may be pledged. Due to significant real estate price fluctuations, long-term loans are provided only to a portion of an estimated property price, a value of a property is estimated by a bank's specialist or an independent expert.[27]

3.3.2 Insurance

Insurance may be another alternative to reduce a risk of loss arising from a counterparty's default. One option is credit insurance which is arranged not by a client, but directly by a bank itself. Credit insurance covers financial losses in an event of a counterparty default. Price of this insurance is influenced by characteristics of a loan, agreed participation of a bank, etc.[28]

A client may arrange insurance against an inability to repay a loan. An insurance company accepts risk and agrees to pay an insured debt in specified cases like incapacity for work (due to disease or injury) or permanent disability. This insurance is non-life but covers a risk of death as well. However, these insurance products usually contain lot

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[25] POLOUČEK, Stanislav. *Bankovnictví*, p. 308.
[26] POLOUČEK, Stanislav. *Bankovnictví*, p. 376, 377.
[27] POLOUČEK, Stanislav. *Bankovnictví*, p. 377, 378
[28] DUCHÁČKOVÁ, Eva. *Pojištění a pojišťovnictví*, p. 203, 204

of exceptions and are often more of a supplement to other main insurance products or may be offered together with a loan.[29]

In some cases, a bank requires its client (individual person) to arrange a risk life insurance. This type covers a risk of death – in the event of a policyholder's death, an indemnity would cover the client's commitment to a bank.[30]

3.4 Control of credit risk

Credit risk management does not include only client analysis and risk minimization tools. Control by regular monitoring of a client's creditworthiness, review of a quality of receivables or set of credit limits complete the process of successful management of credit risk.

3.4.1 Monitoring

A change of a client's financial situation may have an impact on an ability to repay a loan. Therefore, it is in a bank's interest to review this situation regularly. The earlier identification of a problem, the higher chance of a loan repayment. Monitoring serves as a protection of a lender's position and helps to solve future problems in time.

Frequency of monitoring depends on a counterparty. Large personal loans should be subjected to an annual review. If a temporary problem occurs, some restructuring of a repayment programme can be set. But if a difficulty appears to be permanent, stricter measures must be taken (e.g. execution). Corporate financing requires deeper analysis than personal loans. Banks use their internal records (e.g. account balances and movements on a clients' accounts) but some information is provided directly by a debtor, for instance, financial statements or information about significant changes in a company.[31]

Monitoring includes identifying development trends of a bank's receivable (whether a client pays, pays in time, etc.), however, attention should be also paid to development of external conditions (macroeconomic and microeconomic impacts). These include,

[29] DUCHÁČKOVÁ, Eva. *Pojištění a pojišťovnictví*, p. 184, 185
[30] DUCHÁČKOVÁ, Eva. *Pojištění a pojišťovnictví*, p. 147, 148
[31] ROUSE, C.N. *Bankers' lending techniques*, p. 39, 40, 48, 90, 91, 129–132.

for instance, tax changes that may affect borrower's ability to pay or, in case of manufacturing enterprises, changes in demand and supply in the concrete sector.[32]

3.4.2 Review of receivables and provisioning

Banks regularly review quality of receivables arising from financial activities (credits granted, receivables arising from financial leasing or deposits, etc.) and classify each receivable to one of these categories:

I.   receivables without default

    A.   standard receivables

    B.   watch receivables

II.   receivables with default

    A.   substandard receivables

    B.   doubtful receivables

    C.   loss receivables.[33]

A receivable is regarded as *standard* if principal or interest and fees are being paid properly, none of them is past due more than 30 days and there is no reason to have doubts about full repayment. Principal or interest and fees of *watch* receivables are being paid with some partial problems, but they are not more than 90 days past due, a probability of full repayment is still high. Full repayment of *substandard* receivables is uncertain but repayment in part is highly likely, principal or interest and fees are not more than 180 days past due. A receivable is regarded as *doubtful* if principal or interest and fees are being repaid with some problems, but not more than 360 days past due, repayment in full is highly unlikely and repayment in part is possible. Full repayment of *loss* receivables is impossible, repayment may be only in part to a very small extent, bankrupt has been

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[32] KAŠPAROVSKÁ, Vlasta. *Řízení obchodních bank: vybrané kapitoly*, p. 78.
[33] Section 79–82, Decree No. 163/2014 Coll. on the performance of the activity of banks, credit unions and investment firms.

declared towards an obligor or principal or interest and fees are more than 360 days past due. [34]

Banks can choose one of these approaches to provision calculation:

- *Discounting of the expected future cash flows*: provisions are calculated as a difference between book value of a receivable and present value of expected future cash flows, discounted by an original internal rate of return.

- *Coefficients*: difference between a receivable's principal (increased by interest and fees) and a receivable's protection taken into account by a bank; multiplied by a coefficient

    - min. 0.01 but lower than 0.2 in case of a watch receivable

    - min. 0.2 but lower than 0.5 in case of a non-standard receivable

    - min. 0.5 but lower than 1.0 in case of a loss receivable,

    - 1.0 in the of a loss receivable.

- *Statistical models* are used to calculate provisions to large portfolios of individually insignificant receivables. A bank must have long time series relating to these receivables and establish provisions based on statistical estimates of losses arising from these portfolios. Appropriateness and correctness of a statistical model and its parameters must be regularly verified. [35]

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[34] Section 81, 82, Decree No. 163/2014 Coll. on the performance of the activity of banks, credit unions and investment firms.
[35] Section 86–89, Decree No. 163/2014 Coll. on the performance of the activity of banks, credit unions and investment firms.

Table 3: Classification of client receivables in the Czech banking sector

in CZK billions	Receivables (total)			Allowances (total)		
	2016	**2017**	**% change**	**2016**	**2017**	**% change**
Non-default	**2951.3**	**3113.5**	**+5.5**	**9.9**	**8.9**	**-10.8**
Standard	2874.3	3048.8	+6.1	7.0	6.5	-7.7
Watch	77.0	64.7	-16.0	2.9	2.4	-18.2
Default	**152.8**	**130.4**	**-14.7**	**75.0**	**64.1**	**-14.5**
Substandard	46.1	38.7	-16.0	12.7	11.2	-11.8
Doubtful	22.9	11.1	-51.6	5.5	5.0	-8.6
Loss	83.8	80.6	-3.8	56.7	47.9	-15.6
Total	**3104.1**	**3243.9**	**+4.5**	**84.9**	**73.0**	**-14.0**

Source: CNB, Financial market supervision report 2017, customized

A new loan classification system by IFRS 9 has been in use since 1 January 2018. This standard is based on the concept of expected credit losses (forward-looking – the previous IAS39 standard was based on the concept of losses incurred) and should create conditions for a well-timed provision calculation at adequate volume. By 31 January, higher provisions were created, especially for non-default loans (increase by 8 %, CZK 5 billion). On the other hand, provisions for non-performing loans fell by 2.2 pp. In all cases, the coverage rate seems to be sufficient. Under the new IFRS 9 standard, loans are classified into three categories by credit risk stage: Stage 1 (no significant increase of risk), Stage 2 (significant increase), Stage 3 (credit loss or impairment).[36]

3.4.3 Internal credit limits

Credit limits are determined and approved by top management of a bank since it is impossible to decide about every single applicant. Limits do not allow a bank as a whole to expose itself to excessive credit risk and part of responsibility is given to sales managers.

Generally applied limits are the following:

- *Limits to individual clients and to economically connected client groups.* A bank must, in any case, respect capital requirements for risk exposure that are determined by the regulator. In addition to these limits, individual limits for defined risk categories of clients can be created.

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[36] Financial stability report 2017/2018, p. 50–52

- *Sectoral limits.* As there is evidence that entities from same industry or sector are sensitive to similar influences (e.g. economic cycle), therefore, there is a sectoral analysis made by a bank itself or by an external rating agency. In this analysis, current situation and expected development in a particular sector are monitored in terms of the economic cycle, competition in industry, sensitivity of an industry to technical and technological innovation, sector dependence on export or import, etc.

- *Country limits.* These limits may be set for countries but also for regions. Due to the current globalizing environment, the importance of these limits continues to grow. Banks operate in a number of countries in the form of subsidiaries and branch offices. As in the previous case, a bank uses its own or external rating to determine the risk of a country. In this case, economic, political and other factors such as country traditions, level of a banking system and so on are evaluated.[37]

By setting credit limits, a bank implements a loan portfolio diversification, which means that different segments are affected by different risk factors. Hence, if there is a problem within one type of borrower (and increase of likelihood of default), it should not affect other types of clients.

3.4.4 Recommended limits on secured retail loans

Considering a growing volume of secured real estate loans and growing residential property prices in the expansion phase of the financial cycle, the CNB issues a Recommendation on the management of risks associated with the provision of retail loans secured by residential property. This Recommendation contains recommended limits for selected macroprudential tools and a set of other rules. It applies to retail loans secured by residential property provided to individuals and to consumer credit provided to individuals who have a retail loan secured by residential property. The recommended limits relate to the loan-to-value (LTV), debt-to-income (DTI) and debt service-to-income (DSTI) ratios. [38]

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[37] KAŠPAROVSKÁ, Vlasta. *Řízení obchodních bank: vybrané kapitoly*, p. 79, 80.
[38] Section 1, 2, Recommendation on the management of risks associated with the provision of retained loans secured by residential property

Loan to Value ratio is calculated as

$$LTV = \frac{amount\ of\ the\ secured\ loan}{value\ of\ the\ pledged\ property} \times 100\ (\%) \tag{4}$$

and should not exceed 90 %. New retail loans secured by residential property provided in any given quarter with an LTV of 80–90 % should not exceed 15 % of the total amount of retail loans secured by residential property.[39]

Debt to income ratio

$$DTI = \frac{client's\ total\ debt}{client's\ net\ annual\ income} \tag{5}$$

should not exceed 9. A ratio higher than 9 is acceptable only for loans provided in the current calendar quarter, representing a maximum of 5 % of the total amount of retail loans secured by residential property provided in the previous calendar quarter, only in justified cases (when there has been identified and documented a high probability of a loan repayment).[40]

Debt service to income ratio is calculated as

$$DSTI = \frac{average\ annual\ expenses\ from\ client's\ total\ debt}{client's\ net\ annual\ income} \times 100\ (\%). \tag{6}$$

It should not exceed 45 %, a ratio higher than 45 % is only acceptable for loans provided in the current calendar quarter, representing a maximum of a 5% limit of the total amount of retail loans secured by residential property provided in the previous calendar quarter, only in justified cases.[41]

A bank or another credit provider should assess with increased attention those loan applications of clients whose DTI ratio exceeds 8 and DSTI ratio exceeds 40 %.[42]

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[39] Section 3–5, Recommendation on the management of risks associated with the provision of retained loans secured by residential property

[40] Section 3–5, Recommendation on the management of risks associated with the provision of retained loans secured by residential property

[41] Section 3–5, Recommendation on the management of risks associated with the provision of retained loans secured by residential property

[42] Section 3–5, Recommendation on the management of risks associated with the provision of retained loans secured by residential property

4 Credit risk regulation: capital adequacy

Regulatory tasks are usually performed either by central banks (the Czech Republic, the Netherlands, France, etc.) or by a special financial authority. The ground rules are set by the Basel Committee on Banking Supervision (BCBS). These rules serve as recommendations and are transformed by the European Union through directives that are adopted into national legislation by many countries (including the Czech Republic).[43]

4.1 Basel I

In 1988, global standards for regulating the capital adequacy were stated by the Basel Committee on Banking Supervision (BCBS). This document known as Basel I introduced standards for regulating internationally active banks. The goal was to set such capital requirements so that banks were able to cover unexpected losses from their capital. It would be unfair if the losses were to be paid from clients' sources – potential losses should be covered by resources from shareholders, not clients. Capital adequacy requirements should neither be too low nor too high – high requirements would incur high costs and reduce the opportunity for banks to create profit. Basel I set a ratio of a minimum capital and risk-weighted assets (RWA):[44]

$$CAD = \frac{CAP}{RWA} \geq 8\,\%, \tag{7}$$

where:

CAD – capital adequacy

CAP – capital

RWA – risk-weighted assets, $RWA = \sum w_i \times A_i$

w_i – i-th risk weight (0 %, 20 %, 50 % or 100 %)

A_i – i-th asset

[43] MEJSTŘÍK, Michal, PEČENÁ, Magda and TEPLÝ, Petr. *Bankovnictví v teorii a praxi: Banking in theory and practice*, p. 216, 217

[44] CIPRA, Tomáš. *Riziko ve financích a pojišťovnictví: Basel III a Solvency II*, p. 311–313

Capital consisted of two components: *Tier 1 (core capital, going concern)* and *Tier 2 (supplementary capital, gone-concern capital)*. Core capital comprised of common shares issued, share premium and published reserves from post-tax retained earnings. Supplementary capital included other reserves and subordinated debts. Tier 1 had to be at least 50 % of a bank's capital, so the proportion of Tier 2 was smaller than or equal to Tier 1.[45]

A disadvantage of Basel I was that assets were assigned a risk weight by the type of counterparty rather than by the counterparty's ability to repay – all receivables secured by a state (OECD Member State) received automatically 0% risk weight, which was not appropriate.[46]

4.2 Basel II

Basel I was updated to Basel II in 2004 when a more risk-sensitive approach was introduced. Banks are allowed (with a consent of a regulator) to measure their capital requirements more accurately with a new method that is commensurate with their risk profiles and capabilities. Overall, there are three methods: a standardised approach, an internal ratings-based (IRB) approach and an advanced IRB approach (AIRB).

The standardised approach is the simplest but the least sensitive since parameter values are given and cannot be customized. The concept is the same as in Basel I, however, with some changes: a spectrum of risk weights is extended – a risk weight can be up to 150 % and risk weights are based on ratings by ECAIs (External Credit Assessment Institutions), eligibility of such ratings is approved by a regulator.[47]

The more advanced approaches (IRB and AIRB) must be approved by a regulator. These approaches allow banks to use their own internal estimates of credit risk components; IRB approach enables own estimates only of PD (probability of default), components LGD (loss given default), EAD (exposure at default) and maturity rely on supervisory estimates. On the other hand, under the advanced IRB banks estimate all parameters themselves. Hence, it is challenging for a bank to meet all the criteria to obtain permission to use the AIRB. Nevertheless, the resulting spectrum of risk weights showed a more

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[45] KABELÍK, Karel. *Banking regulation: trends & impacts*, p. 33, 34
[46] BLAHOVÁ, Naďa. *Rizika bank a jejich regulace*, p. 33
[47] CIPRA, Tomáš. *Riziko ve financích a pojišťovnictví: Basel III a Solvency II*, p. 319

detailed and sensitive resolution of individual weights in the advanced approaches (especially AIRB) compared to the standardised approach, which makes the capital requirement of AIRB lower and therefore easier to reach.[48, 49]

The minimum capital adequacy ratio remained at 8 % and Tier 2 limit to maximum 100 % of Tier 1 remained as well.

Basel II did not meet its main objective (i.e. to promote soundness and safety in the financial system). For example, Basel II lowered a risk weight for mortgages, which motivated banks to provide more of these instruments and influenced significantly the financial crisis in 2008. Moreover, Basel II favoured big international banks and global competition was, therefore, lowered.[50]

4.3 Basel III

In response to the 2008 financial crisis, banking regulation was broadened. Basel III was issued by CBCS in 2011 through two legal documents: *Capital Requirements Directive IV (CRD IV)* and *Capital Requirements Regulation (CRR)*.[51]

Objectives of Basel III include requirements for higher quality, constituency and transparency of regulatory capital which consists of several components:

- Tier 1 capital is further subdivided into

    - *Common Equity Tier 1 capital* (CET1 capital), which includes common shares issued, share premium, retained earnings, accumulated other comprehensive income and statutory funds.

    - *Additional Tier 1 capital* (AT1 capital), which includes preferred shares and other instruments issued by a bank that are eligible for AT1 but do not meet the criteria for CET1.

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[48] KABELÍK, Karel. *Banking regulation: trends & impacts*, p. 34, 45, 46
[49] WITZANY, Jiří. Credit risk management and modelling, p. 21, 22
[50] MEJSTŘÍK, Michal, PEČENÁ, Magda and TEPLÝ, Petr. *Bankovnictví v teorii a praxi: Banking in theory and practice*, p. 270, 271
[51] MEJSTŘÍK, Michal, PEČENÁ, Magda and TEPLÝ, Petr. *Bankovnictví v teorii a praxi: Banking in theory and practice*, p. 272, 273

- Tier 2 capital includes share premium resulting from an issue of instruments in Tier 2 capital, other reserves, subordinated debts, certain allowances, etc.[52]

The minimum capital requirement remains at 8 % but the composition has changed: ratio for Tier 1 capital is set at 6 % (with at least 4.5 % in CET1). The remaining 2 % shall be held in Tier 2 capital. Moreover, Basel III introduces capital buffers (stipulated by CRD IV):

- *Capital conservation buffer* must consist of the highest quality CET1 capital and should ensure that a financial institution is able to cover losses in a crisis period. If the capital conservation buffer is drawn down, a bank must limit its discretionary distributions of earnings (dividend payments, staff bonus payments etc.). Requirements for this buffer are set by national supervisors – in 2014, the CNB introduced in a single standard of 2.5 % of RWA.

- *Countercyclical capital buffer* should be increased in periods of credit growth and drawn down in periods of cyclical decline, which prevents banks from behaving cyclically. The countercyclical buffer should increase the resilience to the risks associated with the financial cycle – credit supply should be maintained throughout the cycle. The rate can be set up to 2.5 % of RWA, in the Czech Republic is set by the CNB and is currently 1.25 %. However, the countercyclical capital buffer will increase to 1.5 % from 1 July 2019, to 1.75 % from 1 January 2020 and to 2 % from 1 July 2020.[53]

- *Systemic risk buffer* is designed to prevent major banks from destabilizing the system and increasing systemic risk. Destabilization by one of these institutions could have negative effects on the international or domestic financial systems. This buffer can be set up to 5 % by a designated authority. In the Czech Republic, this capital buffer is applied to several banks: Česká spořitelna 3 %, Československá obchodní banka 3 %, Komerční banka 3 %, UniCredit Bank Czech Republic and Slovakia 2 % and Raiffeisenbank 1 % of RWA.

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[52] Basel Committee on Banking Supervision. *Definition of capital disclosure requirements – consultative document*, p. 11, 12
[53] CNB, CNB keeps mortgage limits unchanged, cnb.cz

- *Capital buffer for global or other systematically important institutions* only applies to systematically important financial institutions (SIFIs). We distinguish two forms of SIFIs:

    - G-SIIs are global systematically important institutions. These institutions may be required to create this reserve up to 3.5 % but at least 1% of RWA. Where both systemic risk buffer and capital buffer for G-SIIs are set, the higher of the two should be applied.

    - O-SIIs are other systematically important institutions that may have an obligation to have an extra capital buffer in a range of 0–2 % of RWA. [54, 55, 56]

Figure 3: Basel accords – capital requirements
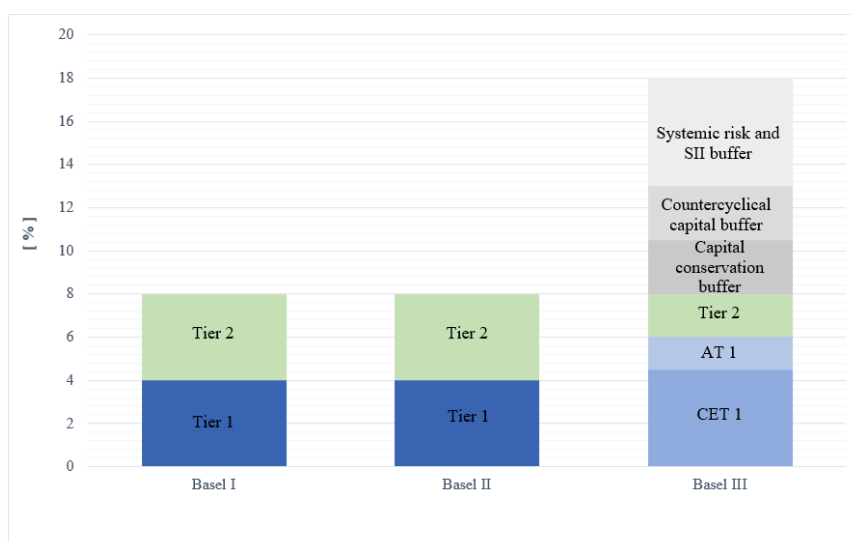
Source: author's calculation

[54] Section 79–83, 90, Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013
[55] CIPRA, Tomáš. *Riziko ve financích a pojišťovnictví: Basel III a Solvency II*, p. 331, 332
[56] BLAHOVÁ, Naďa. *Rizika bank a jejich regulace*, p. 52, 53

5 Credit risk management in Czech banks

In the Czech Republic, risk management is affected by Decrees, Acts, Recommendations and Directives issued by the CNB and EU that help not only to regulate the risks of banks but also to strengthen the stability of the entire financial system. Moreover, banks have to comply with stricter capital adequacy requirements (Basel III) since the CNB has set a countercyclical capital buffer rate to 1.25 % valid from January 2019.[57]

However, according to the statistics, the increase of capital requirements had no significant impact on domestic banks as they had been well capitalized. During 2017, regulatory capital rose by CZK 31 billion and in the following year increased again by almost CZK 22 billion.[58]

Table 4: Regulatory capital of the Czech banking sector

in CZK billions	2016	2017	2018	2017/2018 change (%)
Tier 1	**427.7**	**457.7**	**480.3**	**4.9**
CET1	415.0	444.4	467.0	5.1
AT1	12.6	13.3	13.3	0.0
Tier 2	**13.0**	**14.0**	**13.3**	**-5.0**
Total capital	**440.7**	**471.7**	**493.6**	**4.6**

Source: CNB, Time series database – ARAD, customized

In 2017, capital of systematically important banks exceeded the capital requirements by 3.2 pp and of other banks by 6.8 pp. Regulatory capital consists mainly of Tier 1 capital, which represents 97 % of the total capital ratio, and the majority of Tier 1 accounts for CET1 capital, so, the quality of capital is very high. The Czech banking sector also has an adequate capital buffer to absorb relatively strong shocks and maintain its capital adequacy above the minimum level.
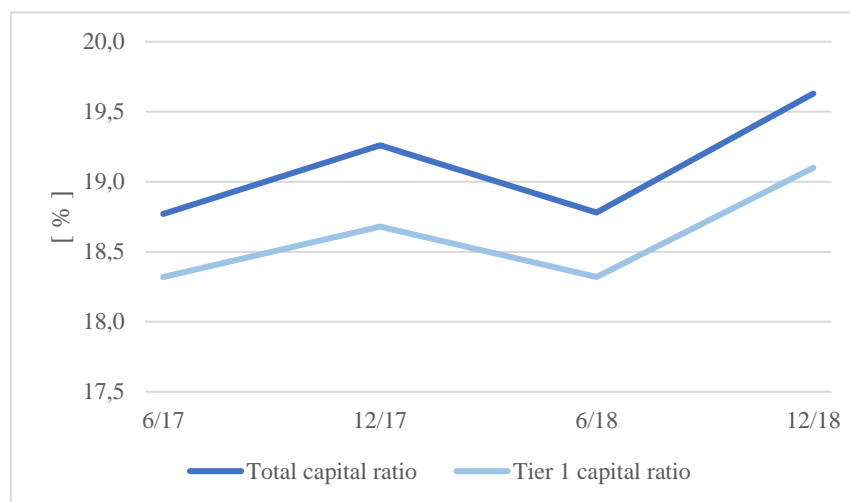
The total capital ratio rose by 0.3 pp Y/Y, especially due to an increase in capital and a decrease in aggregate risk weights. The structure of exposures changed – the most significant change was the growth in banks' exposure to the CNB (total exposures reached almost CZK 1 trillion in 2017 mainly due to specific market conditions before the exit

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[57] CNB, Provision of a general nature I/2019.
[58] ARAD, Basic indicators of the financial market.

from the CNB's exchange rate commitment and thereafter also on account of a rise in the CNB's two-week repo rate).[59, 60]

Figure 4: Total and Tier 1 capital ratios of the Czech banking sector

Banks apply either a standardised approach (STA) or advanced methods using their own internal risk-rating models (IRB) to calculate risk-weighted exposures to credit risk. IRB methods predominate in domestic banks.

Risk-weighted exposure to credit risk is a dominant component of the total risk exposure (CZK 2,081 billion at the end of 2017, which represents 84.9 % of the total risk exposure). Hence, in domestic banking sector, credit risk remains a major source of potential losses, in case of households it stagnated and decreased slightly in the non-financial corporations sector. Banking sector displayed lower ratio of non-performing loans (NPLs) to total loans in 2017: the ratio went down by 0.6 pp, reaching 3.1 % and neared the historical low record (2.6 % in 2007). Structure of NPLs improved as well – the highest-risk "loss" loans dropped slightly.[61, 62]

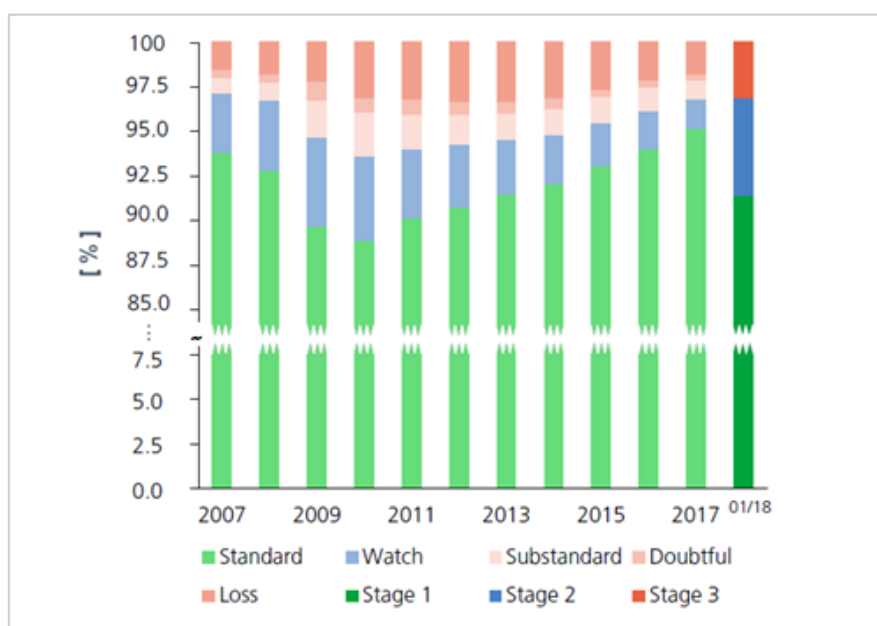---

[59] Financial stability report 2017/2018, CNB, p. 13, 15, 41, 43
[60] Financial market supervision report 2017, CNB, p. 101
[61] Financial stability report 2017/2018, CNB, p. 13, 14, 49, 50
[62] Financial market supervision report 2017, CNB, p. 102

Figure 5: Loan structure by categorisation of the Czech banking sector

Source: CNB, Financial stability report 2017/2018

The following data were drawn from the consolidated financial statements and annual reports of Czech banks.

5.1 Česká spořitelna, a.s.

Česká spořitelna, a.s. (ČS) is one of the most important banks in the Czech Republic. It occupies the first place regarding number of clients with 4.63 million and total assets (CZK 1,426 billion). ČS is the bank with very good ratings: Fitch – A, Moody's – A1, Standard & Poors – A.[63]

5.1.1 Loan structure of ČS

The volume of loans to clients increased by 9 % in 2018. Despite the rise in interest rates and real estate prices, the portfolio of retail loans grew mainly due to private mortgages (by 11.2 %). Loans to small companies rose by 8.6 % and consumer loans by 5.7 %. Demand for consumer loans continues to grow thanks to the positive development of the economy and optimistic household expectations. The volume of loans to companies and corporate clients increased as well (by 7.6 %).[64]

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[63] Česká spořitelna, a.s., Annual Report 2018, p. 2
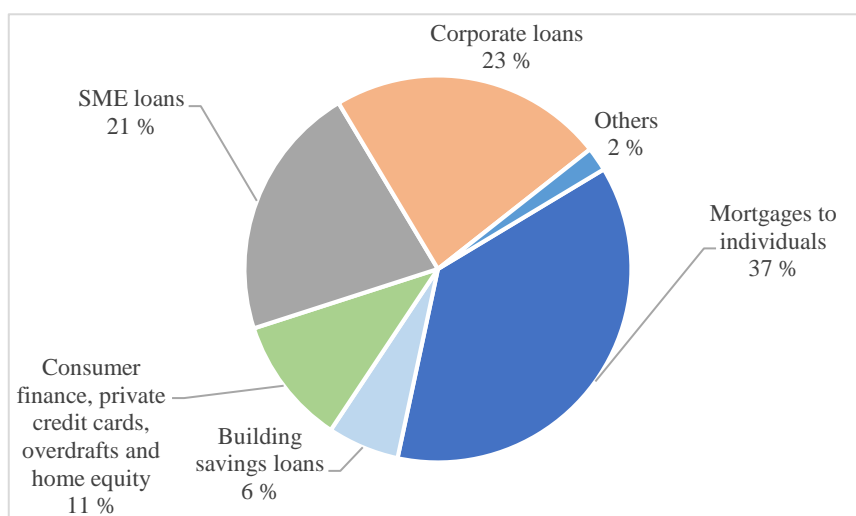[64] Česká spořitelna, a.s., Annual Report 2018, p. 27

Figure 6: Volume of loans to clients over time (in CZK billions) (ČS)
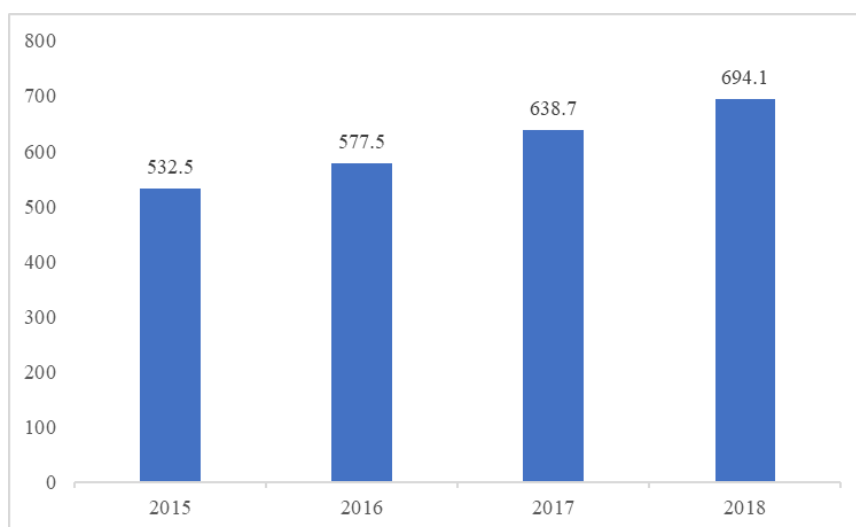
Source: Česká spořitelna, a.s., Annual Report 2018, customized

At present, customer loans are represented mainly by mortgages to individuals (37 %) and loans to large corporates (23 %).[65]

Figure 7: Loan portfolio (ČS)

Source: Česká spořitelna, a.s. FY 2018 consolidated results, customized

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[65] Česká spořitelna, a.s., FY 2018, consolidated results, p. 25

5.1.2 Credit risk management of ČS

Risk management strategy in ČS is approved by the Bank's Board of Directors. Units responsible for credit risk management are separated for corporate and retail banking (Corporate Banking Credit Risk Management and Retail Banking Credit Risk Management).[66]

The information database serves to support measurement of receivables and calculation of losses. Information is collected both internally and externally. First, the Bank uses its own portfolio information and the portfolio information of other members of Česká Spořitelna Financial Group. Second, the Bank uses information from external sources like the Central Credit Register, the Czech Banking Credit Bureau or ratings from rating agencies.[67]

Risk parameters probability of default (PD), loss given default (LGD) and credit conversion factor (CCF) are determined by the Bank itself. These parameters are used to monitor credit risk, to assess risks and to manage the non-performing loans portfolio.[68]

One of the key credit risk management tools is internal rating, which reflects a probability of a debtor's default in a subsequent one-year period. Evaluation of a client includes both financial and non-financial characteristics. For example, assessment of corporate clients includes an analysis of the strengths and weaknesses such as competitiveness and management quality; assessment of retail debtors considers mainly demographic and behavioural indicators. Next, clients are divided into two groups: performing and non-performing. For "performing" clients, the Bank uses an eight-grade scale for private individuals and a thirteen-grade scale for other clients. All "non-performing" clients are given a single grade "R" that is subdivided by reasons for defaults. The internal rating methodology is reviewed regularly (at least annually), the review is based on historical data using statistical models. In accordance with regulatory requirements, the process of the internal rating methodology validation is supervised by an independent entity. For external reporting purposes, the internal rating grades are grouped into four risk categories: low risk, management attention, substandard and non-performing.[69]

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[66] Česká spořitelna, a.s., Annual Report 2018, p. 43
[67] Česká spořitelna, a.s., Annual Report 2018, p. 44
[68] Česká spořitelna, a.s., Annual Report 2018, p. 44
[69] Česká spořitelna, a.s., Annual Report 2018, p. 44, 151, 152

The Bank breaks down receivables to retail receivables (individuals, households and small enterprises with an annual turnover of up to CZK 60 million) and receivables from corporate counterparties (SME with an annual turnover of between CZK 60 to 2,000 m, large businesses (turnover exceeding CZK 2,000 m) and public sector). Loans below CZK 5 m are classified as insignificant, including mortgages, credit card loans, overdraft and consumer loans. ČS also uses a methodology in accordance with IFRS 9 and assigns receivables to Stages 1, 2 and 3. In 2018, the transfer from Stage 1 to Stage 2 was CZK 1,825 m and from Stage 2 to Stage 1 CZK 1,715 m which shows a slight deterioration.[70]

Credit risk management methods are based on statistical models in retail and mid-size enterprises sectors, whereas regular discrete analysis is used for large individual customers. Portfolio provisions are calculated for portfolios of receivables with no impairment (based on historical experience, PD and LGD parameters), whereas provisions for receivables with identification of impairment are calculated individually. To measure the impairment of receivables with exposure exceeding CZK 5 million, the discounted cash-flow method is used, other retail receivables are determined statistically. Provisions are reassessed daily and the adequacy of the provisions is back-tested annually by comparison with actual loan portfolio losses. Back-testing covers at least 95 % of all major loan portfolios.[71]

To protect the Bank from concentration risk, exposure limits are set in respect of an individual client or group of economically related persons; these limits are defined as the maximum exposure acceptable for the Bank.[72]

The Bank protects itself also by collateral. Nominal value of collateral is derived from market prices of similar types of collateral. In some cases (if the collateral is real estate, business, asset declared as a historical monument, etc.), a price must be determined by an expert (who has a contract with the bank or works for the bank internally). Other conditions taken into account when determining a value of collateral are, for example, a possibility of realising the collateral at a particular place and time, realisation costs, any

[70] Česká spořitelna, a.s., Annual Report 2018, p. 123, 150, 151
[71] Česká spořitelna, a.s., Annual Report 2018, p. 44 150
[72] Česká spořitelna, a.s., Annual Report 2018, p. 44

insurance or pledges of receivables from insurance proceeds in favour of the Bank, etc. The most frequent collaterals are guarantees and real estates.[73]

5.1.3 Exposure to credit risk of ČS

In 2018, the volume of risk-weighted assets declined slightly compared to the previous year. However, credit risk RWA and credit risk exposure rose, a year-on-year increase was caused by a large growth of volume of loans (both retail and corporate). The non-profit loans ratio decreased and was very low by the end of 2018.[74]

Table 5: Risk-weighted assets and NPL ratio (ČS)

in CZK billions	2017	2018
total RWA	557.9	557.5
credit risk RWA	462.9	488.9
NPL ratio	2.1 %	1.8 %

Source: Česká spořitelna, a.s., FY 2018, customized

Table 6: Credit risk exposure (ČS)

in CZK millions	Total exposure (2017)	Share	Total exposure (2018)	Share
Low risk	1,083,756	92.2 %	1,347,210	89.6 %
Management attention	69,989	6.0 %	111,059	7.4 %
Substandard	6,485	0.6 %	31,291	2.1 %
Non-performing	14,688	1.2 %	14,432	1.0 %
Credit risk exposure	**1,174,918**	**100 %**	**1,503,992**	**100 %**

Source: Česká spořitelna, a.s., Annual Report 2018 consolidated results, customized

5.1.4 Regulatory capital of ČS

ČS uses the advanced IRB approach for the calculation of the capital requirement (estimates PD, LGD and EAD parameters). The Bank was assessed as a systematically important bank and thus holds a capital buffer (3 %) above the basic requirement. Still, the capital ratio exceeds the minimum level required by the CNB.[75]

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[73] Česká spořitelna,a.s., Annual Report 2018, p. 164
[74] Česká spořitelna, a.s., FY 2018, consolidated results, p. 20, 23
[75] Česká spořitelna, a.s., Annual Report 2018, p. 44, 49, 178

Table 7: Capital and capital ratios (ČS)

in CZK millions	2017	2018
Tier 1 capital	96,460	98,587
CET1 capital	88,353	90,480
AT1 capital	8,107	8,107
Tier 2 capital	3,236	3,594
Total regulatory capital	**99,696**	**102,181**
Tier 1 cap. ratio	18.0 %	18.4 %
CET1 cap. ratio	16.5 %	16.9 %
Total capital ratio	**18.6 %**	**19.0 %**

Source: Česká spořitelna, a.s., Annual Report 2018, customized

5.2 Československá obchodní banka, a.s.

Československá obchodní banka, a.s. (ČSOB) is the second largest Czech bank by total assets (CZK 1,378 billion) and by number of clients with 3.64 million. Ratings of ČSOB are very high: Moody's – A1, Standard & Poors – A+.[76]

5.2.1 Loan structure of ČSOB

With 82 %, loans and receivables represent the largest part of assets the Bank's assets. During 2018, the volume of loans of ČSOB Group (including Českomoravská stavební spořitelna, a.s.) grew by 4.7 %. [77]

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[76] Československá obchodní banka, a.s., Annual Report 2018, p. 2
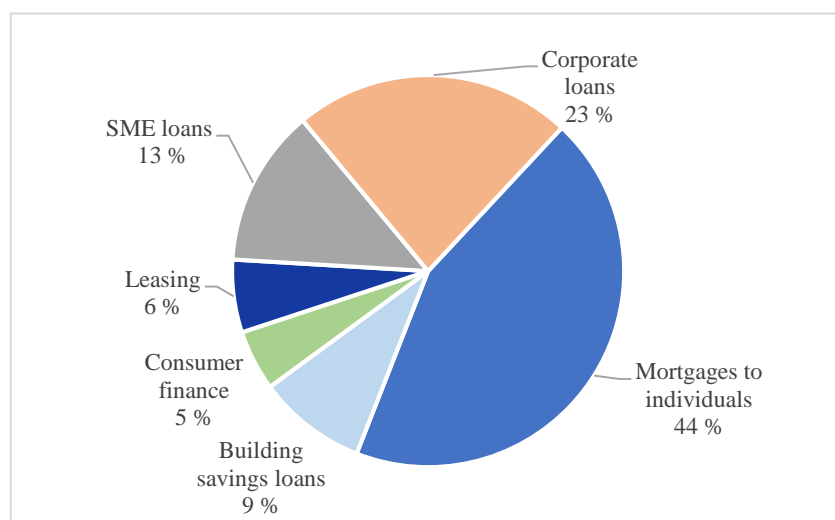[77] Československá obchodní banka, a.s., Annual Report 2018, p. 8, 17

Figure 8: Volume of loans to clients over time (in CZK billions) (ČSOB)
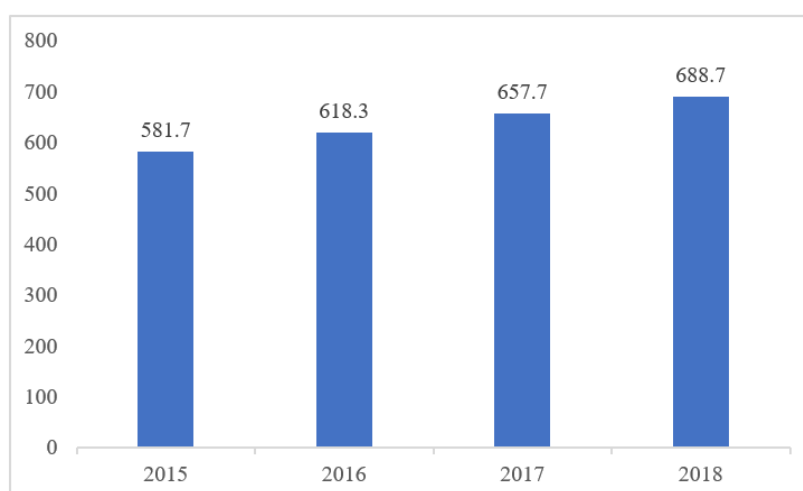
Majority of the loan portfolio is represented by mortgages to individuals (CZK 301.1 bn), in corporate segment, corporate loans prevail with CZK 157.2 bn.[78]

Figure 9: Loan portfolio (ČSOB)

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[78] ČSOB Group, FY/Q4 2018 Results, p. 20

5.2.2 Credit risk management of ČSOB

In ČSOB, Credit Risk Management department deals with credit risk. Risk and Compliance Committee was established in 2014 to advise the Supervisory Body on the risk strategy, appetite and future risk profile, and to supervise the proper functioning of the Risk Management department.[79]

For evaluation of non-retail clients, an internal rating is set individually, based on statistical models and takes into account both financial and non-financial data. The scale has twelve grades (PD 1 means the best and PD 12 the worst rating). In PD 10, the exposures are judged to be "unlikely to pay" and the obligations are not more than 90 days overdue, PD 11 represent debtors with debts 90 or more days overdue and PD 12 includes customers who are subject to a bankruptcy proceeding or have been judged to be "partly or fully lost". Retail clients are divided into 5 risk categories (Normal, Monitored, Uncertain, Doubtful and Irrecoverable). The application process is based on the usage of application scorecards (new customers) and behavioural scorecards (existing customers). In case of consumer products, the process is fully automated in most cases, whereas in case of mortgages, final decision is usually manual.[80]

The Bank establishes Loss Given Default (LGD), Probability of Default (PD) and Exposure at Default (EAD) parameters when calculating exposure to non-retail segment, risk factors are determined on an individual basis. For retail segment, exposures are calculated by statistical models developed for PD, LGD and EAD; risk factors are based on risk-homogenous sets of exposures (so-called "pools").[81]

The monitoring process of non-retail clients is either automated (small SME) or individual (corporates, large SME). A collective monitoring process is applied to small SME customers in addition to the required annual review process – failure of some requirements may be an impulse for individual monitoring. In the monitoring process of retail segment, the relevant Credit Departments investigate the development of defaults, probability of default and Credit Cost Ratios within different sub-portfolios.[82]

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[79] Československá obchodní banka, a.s., Annual Report 2018, p. 66, 68
[80] Československá obchodní banka, a.s, Annual Report 2018, p. 169, 171, 172
[81] Československá obchodní banka, a.s., Annual Report 2018, p. 169
[82] Československá obchodní banka, a.s., Annual Report 2018, p. 171, 172

For provision-making, ČSOB complies with the IFRS 9 accounting standard. The portfolio is divided into three stages (Stage 1 – performing, Stage 2 – underperforming and Stage 3 – non-performing loans). A division into a stage depends on many factors (a significant credit risk growth, whether payments of principal or interest are more than 90 days overdue, worsening of credibility of a counterparty, etc.). As of 31 December 2018, 92 % of loans were included in Stage 1, 5 % in Stage 2 and 3 % in the 3rd Stage. The expected loss is calculated on a one-year basis for Stage 1 and on a lifetime basis for Stages 2 and 3.[83, 84]

To control credit risk, the exposures to industry, client/counterparty and geographical region are monitored.[85]

Another way of control used by the Bank is collateral which depends on an assessment of credit risk of the counterparty. Market prices of all collaterals are regularly monitored. The most common types of collateral are pledges (over real estate properties – residential properties, etc.), however, cash or securities may be accepted for securities lending or reverse repurchase transactions.[86]

5.2.3 Exposure to credit risk of ČSOB

In 2018, total risk-weighted assets declined considerably, mainly due to a decrease in market risk RWA. The amount of non-performing loans climbed from CZK 15.4 billion to CZK 16.2 billion. However, this upward trend was caused by the overall credit growth since the NPL ratio changed fractionally. Credit risk exposure increased, nevertheless, this change was only minor (5.1 %).[87]

Table 8: Risk-weighted assets and NPL ratio (ČSOB)

in CZK billions	2017	2018
total RWA	402.3	383.3
credit risk RWA	313.0	312.1
NPL ratio	2.44 %	2.43 %

Source: ČSOB Group, FY/Q4 2018 Results, customized

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[83] Československá obchodní banka, a.s., Annual Report 2018, p. 181, 182
[84] ČSOB Group, FY/Q4 2018 Results, p. 15
[85] Československá obchodní banka, a.s., Annual Report 2018, p. 180
[86] Československá obchodní banka, a.s., Annual Report 2018, p. 181
[87] ČSOB Group, FY/Q4 2018 Results, p. 17, 24

Table 9: Credit risk exposure (ČSOB)

in CZK millions	Total exposure (2017)	Share	Total exposure (2018)	Share
Credits	744,031	51.6 %	784,636	51.8 %
Investment	673,697	46.7 %	702,697	46.4 %
Trading	18,100	1.3 %	21,355	1.4 %
Other assets	5,441	0.4 %	5,474	0.4 %
Credit risk exposure	**1,441,269**	**100%**	**1,514,162**	**100%**

Source: Československá obchodní banka, a.s., Annual Report 2018, customized

5.2.4 Regulatory capital of ČSOB

ČSOB uses advanced IRB approach for capital adequacy requirement calculation (estimates LGD, PD and EAD parameters). ČSOB was assessed as a systematically important bank and must hold a 3% capital buffer. The total capital ratio reached 18.0 % by the end of 2018, which means that ČSOB exceeds the minimum requirements.[88]

Table 10: Capital and capital ratios (ČSOB)

in CZK millions	2017	2018
Tier 1 capital	69,098	69,148
CET1 capital	69,098	69,148
AT1 capital	0	0
Tier 2 capital	0	0
Total regulatory cap.	**69,098**	**69,148**
Tier 1 cap. ratio	17.2 %	18.0 %
CET1 cap. ratio	17.2 %	18.0 %
Total capital ratio	**17.2 %**	**18.0 %**

Source: Československá obchodní banka, a.s., Annual Report 2018, customized

5.3 Komerční banka, a.s.

Komerční banka, a.s. (KB) is the third largest Czech bank regarding both number of clients (1.67 million) and total assets (CZK 1,060 billion). KB is the bank with very high ratings: Fitch – A, Moody's – A1, Standard & Poors – A.[89]

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[88] Československá obchodní banka, a.s., Annual Report 2018, p. 168, 197
[89] Komerční banka, a.s., Annual Report 2018, p. 2, 3

5.3.1 Loan structure of KB

In 2018, the gross volume of loans to clients rose by 4.7 % and reached CZK 634.6 billion (CZK 636.6 bn including reverse repo rates). Housing loans to individuals expanded by 4.6 %; within this total, mortgages to individuals grew by 2.3 %. The volume of consumer lending increased by 4.6 % Y/Y. Loans to small businesses rose by 4.0 % and to medium-sized and large corporates by 5.4 %.[90]

Figure 10: Volume of loans to clients over time (in CZK billions) (KB)
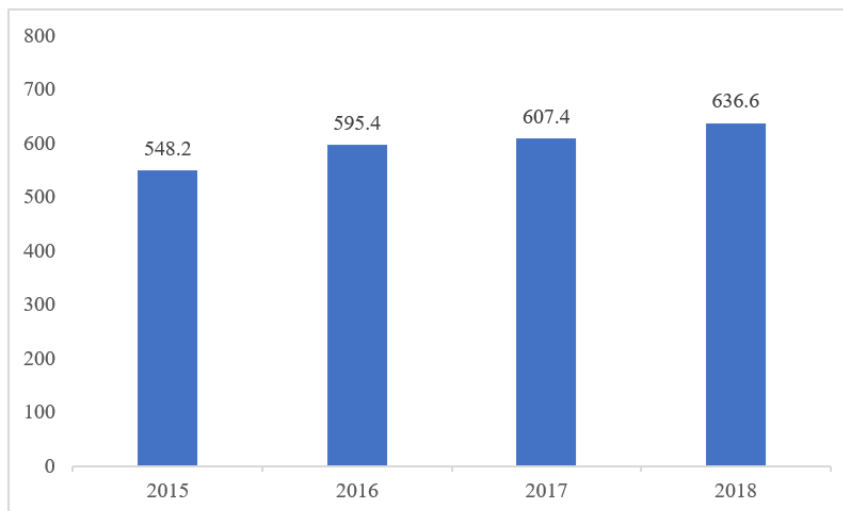
Source: Komerční banka Group, Financial results as of 2016 and 2018, customized

Figure 11: Loan portfolio (KB)
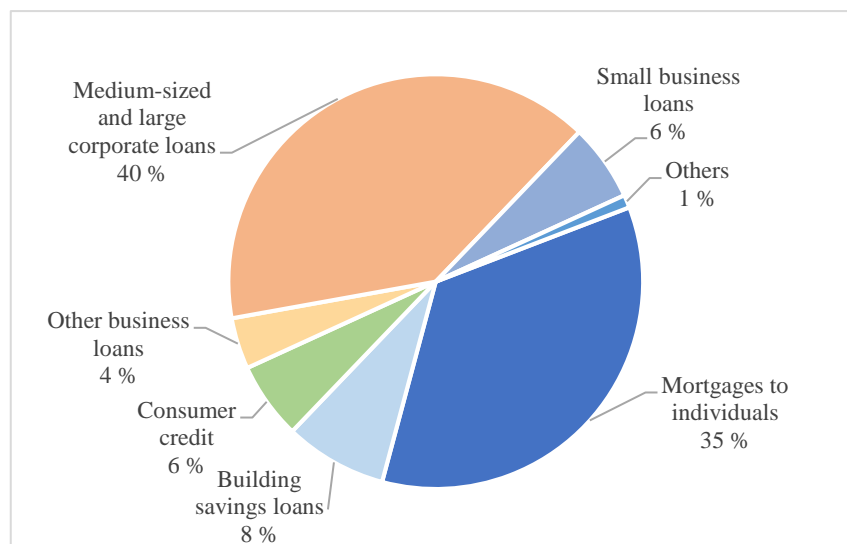
Source: Komerční banka Group, Financial results as of 2018, customized

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[90] Komerční banka, a.s., Annual Report 2018, p. 21

5.3.2 Credit risk management of KB

Credit risk management is in KB performed by the Credit Risk Management Committee that decides about credit risk management principles and their implementation. At least 50 % of all members must be present to enable the Committee to make decisions. The proposed decision must be accepted by majority of those present members having voting rights, otherwise, the decision is in the hands of the Board of Directors.[91]

For assessment of a client, KB uses quantitative (e.g. financial data, payment discipline) and qualitative (e.g. in-depth client knowledge) data and applies advanced scoring and rating models along with individual approval by competent business or risk managers. The Bank uses PD, LGD and EAD parameters in accordance with Basel III principles; these parameters are calculated by the Bank itself. All scoring, rating, and Basel models are tested at least on an annual basis. Next, receivables arising from financial activities are allocated into three categories: Stage 1, 2 (performing receivables) and Stage 3 (non-performing receivables), the Bank uses a methodology in accordance with IFRS 9 standard. In 2018, loans in Stage 1 represented majority of all loans: CZK 585.8 bn, Stage 2 CZK 33.5 bn and Stage 3 CZK 17.3 bn. [92, 93]

Allowances for receivables are created in three ways. First, provisions are calculated for the non-defaulted portfolio according to models based on expected credit losses. Second, provisions are created individually for defaulted and exceptionally performing clients, using present value of expected future cash flows (using all available information), including expected duration of the recovery process and estimated value of collateral. Finally, for the non-performing portfolio, statistical models using historical default statistics (regularly updated) are used.[94]

The Bank sets a system of internal limits (based on exposure and counterparty rating) to manage credit concentration risk. These limits cover individual counterparties, economically connected groups, collateral providers, selected industry sectors and countries.[95]

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[91] Komerční banka, a.s., Annual Report, p. 41
[92] Komerční banka, a.s., Annual Report, p. 62
[93] Komerční banka Group, Financial results as of 31 December 2018, p. 24
[94] Komerční banka, a.s., Annual Report, p. 63
[95] Komerční banka, a.s., Annual Report, p. 63

The Bank accepts collateral in various forms: residential property, commercial property, cash instruments or other collaterals. In 2018, most of the loans were collateralised by residential properties. Real estate collaterals are regularly revalued by appropriate statistical or individual techniques. If residential real estate values decrease significantly in relevant periods or regions, the Bank applies an adjustment. Development of commercial rents is also monitored. Those properties securing exposures over EUR 3 million or securing defaulted exposures exceeding CZK 10 million are revaluated individually every 3 years.[96]

5.3.3 Exposure to credit risk of KB

Thanks to low default rates and good recovery performance, the NPL ratio went down by 0.4 pp in 2018. Total risk-weighted assets and total credit exposure grew by 6.2 % compared to the previous year. [97, 98]

Table 11: Risk-weighted assets, NPL ratio and credit risk exposure (KB)

in CZK billions	2017	2018
total RWA	424.6	451.1
credit risk RWA	352.9	375.4
NPL ratio	3.1 %	2.7 %
credit risk exposure	1,137	1,208

Source: Komerční banka Group, Financial resuls as of 31 December 2018; Komerční banka, a.s., Annual Report; customized

5.3.4 Regulatory capital of KB

For calculation of the capital requirements, some entities of KB Group use the standardised approach while majority of KB Group qualified for using the advanced IRB approach. KB ranks among systematically important banks and holds a capital buffer 3 % of RWA. With the total capital ratio 18.5 %, the Bank exceeds the minimum requirements.[99]

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[96] Komerční banka, a.s., Annual Report, p. 63, 131
[97] Komerční banka Group, Financial resuls as of 31 December 2018, p. 18, 24
[98] Komerční banka, a.s., Annual Report, p. 63, 152, 153
[99] Komerční banka, a.s., Annual Report, p. 72

Table 12: Capital and capital ratios (KB)

in CZK millions	2017	2018
Tier 1 capital	76,525	80,788
CET1 capital	76,525	80,788
AT1 capital	0	0
Tier 2 capital	2,560	2,578
Total regulatory cap.	**79,085**	**83,366**
Tier 1 cap. ratio	18.0 %	17.9 %
CET1 cap. ratio	18.0 %	17.9 %
Total capital ratio	**18.6 %**	**18.5 %**

Source: Komerční banka, a.s., Annual Report 2018, customized

5.4 Summary

5.4.1 Loan structure of the banks

The loan portfolios of ČS and ČSOB consist mainly of mortgages to individuals, while the portfolio of KB is mainly represented by medium-sized and large corporate loans. The volume of loans rose in all the banks, however, the largest annual growth was detected in ČS.

Table 13: Summary of portfolios and volumes of loans

December, 2018	ČS	ČSOB	KB
loan portfolio: largest share	mortgages to individuals, 37 %	mortgages to individuals, 44 %	medium-sized and large corp., 40 %
volume of loans	CZK 694.1 billion	CZK 688.7 billion	CZK 636.6 billion
Y/Y change in vol. of loans	+9.0 %	+4.7 %	+4.7 %

Source: author's calculation based on research

5.4.2 Credit risk management of the banks

Credit risk management strategies are in the three banks built on the same principles. The banks use their own internal rating and scoring models. Clients are divided into scales by probabilities of default, separate scales are used for retail and non-retail clients. All the banks assign receivables in accordance with IFRS 9 to Stages 1–3, provisions are calculated differently for non-performing and non-defaulted portfolios or receivables with and without impairment.

The banks regularly monitor their clients and control exposures by means of limits (e.g. limits in respect of individual client or groups of economically related persons, industries, countries). The banks also reduce credit risk by collateral, the most common types are pledges (residential properties), however, cash, securities, et cetera are accepted in some cases as well.

5.4.3 Exposure to credit risk of the banks

The greatest increase in credit risk exposure was recorded in ČS, changes in other banks were not so striking. The NPL ratios are at low levels, which indicates good loan portfolios qualities.

Table 14: Summary: credit risk exposure

in CZK billions	ČS		ČSOB		KB	
	2017	2018	2017	2018	2017	2018
credit risk RWA	462.9	488.9	313.0	312.1	352.9	375.4
NPL ratio	2.10 %	1.80 %	2.44 %	2.43 %	3.10 %	2.70 %
credit risk exposure	1,175	1,504	1,441	1,514	1,137	1,208

Source: author's calculation based on research

5.4.4 Regulatory capital of the banks

The banks were assessed as systematically important institutions and must hold extra capital buffers. All the three banks hold large amounts of regulatory capital and comply with these limits. The advanced IRB approach is used in all the banks for capital requirement calculations except some KB Group entities using standardised approach. In 2018, total regulatory capital rose; moreover, the quality of capital improved owing to an increase in the highest quality CET1 capital in all the analysed banks.

Table 15: Summary of methods for capital requirement calculations, capital buffers for SIIs and capital ratios

December, 2018	ČS	ČSOB	KB
method	AIRB	AIRB	STA, AIRB
capital buffer for SIIs	3.0 %	3.0 %	3.0 %
Tier 1 capital ratio	18.4 %	18.0 %	17.9 %
CET1 capital ratio	16.9 %	18.0 %	17.9 %
total capital ratio	**19.0 %**	**18.0 %**	**18.5 %**

Source: author's calculation based on research

Table 16: Summary: regulatory capital

in CZK millions	ČS		ČSOB		KB	
	2017	**2018**	**2017**	**2018**	**2017**	**2018**
Tier 1 capital	96,460	98,587	69,098	69,148	76,525	80,788
CET1 capital	88,353	90,480	69,098	69,148	76,525	80,788
Total regulatory capital	99,696	102,181	69,098	69,148	79,085	83,366

Source: author's calculation based on research

Conclusion

The main goal of this thesis was to evaluate the financial situation in terms of credit risk in the Czech banking sector, to explore credit risk management in the largest Czech banks and to describe the level of regulatory capital and capital ratios. The purpose of this thesis was fulfilled.

First, theoretical credit risk characteristics were defined, the credit risk management process was described and capital adequacy requirements were explained. This knowledge was applied in the analysis of the three selected banks (ČS, ČSOB and KB) where loan structure, credit risk management, exposure to credit risk and regulatory capital of the banks were examined. The following conclusions can be drawn from the analysis.

The loan portfolios are represented mainly by mortgages to individuals in both ČS and ČSOB, while in KB medium-sized and large corporate loans prevail. The volume of loans increased most significantly in ČS Y/Y, which was reflected in a sharp increase in credit risk exposure of this bank.

The banks use internal rating and scoring models to evaluate counterparties and divide clients into scales by probabilities of default. Separate scales are used for retail and non-retail clients and receivables are classified in accordance with IFRS 9.

The banks have good ratings that are, besides other factors, supported by high capital ratios. Proper functioning of these banks is vital for the whole Czech economy and therefore the capital buffer for systematically important institutions must be held by all of them. Nevertheless, the banks comply with capital requirements with no difficulties, including this capital buffer.

All the results indicate that large Czech banks are stable to credit risk and should not fail in the event of a crisis thanks to effective credit risk management strategies and large capital buffers. Nevertheless, given the current economic situation in the Czech Republic (a relatively long-running upturn trend), the banks should provide loans with prudence – not to behave cyclically, and to be ready for a possible economic recession in the coming years.

Bibliography

Books

BLAHA, Zdenek Sid, ed. Risk management techniques: their use and applicability in the banking sector of the Czech Republic. Prague: Karolinum, 2008. ISBN 978-80-246-1483-0

BLAHOVÁ, Naďa. *Rizika bank a jejich regulace*. Jesenice: Ekopress, 2018. ISBN 978-80-87865-47-7

CIPRA, Tomáš. *Riziko ve financích a pojišťovnictví: Basel III a Solvency II*. Vydání I. Praha: Ekopress, 2015. ISBN 978-80-87865-24-8

DUCHÁČKOVÁ, Eva. *Pojištění a pojišťovnictví*. Praha: Ekopress, [2015]. ISBN 978-80-87865-25-5.

FIGHT, Andrew. *Credit risk management*. Oxford: Elsevier, 2004. ISBN 0-7506-5903-3

CHORAFAS, Dimitris N. Risk management technology in financial services: risk control, stress testing, models, and IT systems and structures. Burlington, MA: Butterworth-Heinemann, 2007. Print. ISBN 978-0-7506-8304-3

JÍLEK, Josef. *Finanční rizika*. Praha: Grada, 2000. Finance (Grada). ISBN 80-7169-579-3

KABELÍK, Karel. *Banking regulation: trends & impacts*. Prague: Czech Banking Association, 2014. ISBN 978-80-260-7334-5

KAŠPAROVSKÁ, Vlasta. *Řízení obchodních bank: vybrané kapitoly*. V Praze: C.H. Beck, 2006. Beckovy ekonomické učebnice. ISBN 80-7179-381-7

MEJSTŘÍK, Michal, Magda PEČENÁ a Petr TEPLÝ. *Bankovnictví v teorii a praxi: Banking in theory and practice*. Praha: Karolinum, 2014. ISBN 978-80-246-2870-7

POLOUČEK, Stanislav. *Bankovnictví*. V Praze: C.H. Beck, 2006. Beckovy ekonomické učebnice. ISBN 80-7179-462-7

REVENDA, Zbyněk. *Centrální bankovnictví*. 2., rozš. vyd. Praha: Management Press, 2001. ISBN 80-7261-051-1.

ROUSE, C.N., *Bankers' lending techniques* / C.N. Rouse. 2nd ed.. London : Les50ns Professional Publishing, 2006. vii, 300 s. brož. ISBN:0-85297-587-2

SAITA, Francesco. *Value at risk and bank capital management*. Boston: Elsevier Academic Press, c2007. ISBN 978-0-12-369466-9

THOMAS, L. C., David B. EDELMAN a Jonathan N. CROOK. *Credit scoring and its applications*. Second edition. Philadelphia: Society for Industrial and Applied Mathematics, [2017]. ISBN 978-1-61197-455-3

WITZANY, Jiří. *Credit risk management and modelling*. Ed. 1st. Praha: Oeconomica, 2010. ISBN 978-80-245-1682-0

Online sources

Basel Committee on Banking Supervision. *Definition of capital disclosure requirements – consultative document.* [online]. 2011 [cit. 2019-05-26]. Available on: https://www.bis.org/publ/bcbs212.pdf

BORNHORST, Christian. Taking Accessory Collateral in Germany (1/2). *Linkedin* [online]. 2017 [cit. 2019-04-22]. Available on: https://www.linkedin.com /pulse/taking-security-germany-part-1-accessory-collateral-bornhorst.

Capital Requirements - CRD IV/CRR – Frequently Asked Questions. *European Commission* [online]. [cit. 2019-05-05]. Available on: http://europa.eu/rapid/press-release_MEMO-13-690_en.htm?locale=cs.

CHEN, James. Credit Exposure. Investopedia [online]. 22.1.2018 [cit. 2019-05-21]. Available on: https://www.investopedia.com/terms/c/credit-exposure.asp.

CNB. Time series database – ARAD. *Czech National Bank* [online]. [cit. 2019-05-10]. Available on: https://www.cnb.cz/cnb/STAT.ARADY_PKG.VYSTUP?p_period=12&p_sort=2&p_des=50&p_sestuid=33091&p_uka=1%2C2%2C3%2C25&p_strid=BAF&p_od=201601&p_do=201812&p_lang=EN&p_format=0&p_decsep=.

CNB. Time series database – ARAD. *Czech National Bank* [online]. [cit. 2019-05-10]. Available on: https://www.cnb.cz/cnb/STAT.ARADY_PKG.VYSTUP?p_period=3&p_sort=2&p_des=50&p_sestuid=55235&p_uka=3%2C5&p_strid=BAH&p_od=201706&p_do=201812&p_lang=EN&p_format=0&p_decsep=.

CNB keeps mortgage limits unchanged. Czech National Bank [online]. 2019 [cit. 2019-05-27]. Available on: https://www.cnb.cz/en/cnb-news/press-releases/CNB-keeps-mortgage-limits-unchanged/

Česká spořitelna, a.s. *Annual Report 2018* [online]. Prague, 2019 [cit. 2019-05-12]. Available on: https://www.csas.cz/static_internet/en/Obchodni_informace-Produkty/Investovani_(Fondy_a_Financni_trhy)/Akcie_a_dluhopisy/Prilohy/2019_0010_cs_matk a_vz_2018_cz__06.pdf

Česká spořitelna, a.s. *FY 2018 consolidated results* [online]. Prague, 2019 [cit. 2019-05-12]. Available on: https://www.csas.cz/static_internet/en/Redakce/Ostatni/Ostatni_IE/Prilohy/cs-vysledky-za-rok-2018.pdf

Československá obchodní banka, a.s. *Annual Report 2018* [online]. Prague, 2019 [cit. 2019-05-12]. Available on: https://www.csob.cz/portal/documents/10710/550083/ar-csob-2018.pdf

ČSOB Group. *FY/4Q 2018 Results* [online]. Prague, 2019 [cit. 2019-05-12]. Available on: https://www.csob.cz/portal/documents/10710/460146/csob-prezentace-vysledku-4q2018-en.pdf

FAQs – the Capital Requirements Directive (CRD IV) and the Capital Requirements Regulation (CRR). *Czech National Bank* [online]. [cit. 2019-05-01]. Available on: https://www.cnb.cz/en/faq/FAQs-the-Capital-Requirements-Directive-CRD-IV-and-the-Capital-Requirements-Regulation-CRR/.

Financial Market Supervision Report 2017. *Czech National Bank* [online]. 2017 [cit. 2019-05-08]. Available on: https://www.cnb.cz/export/sites/cnb/en/supervision-financial-market/.galleries/aggregate_information_financial_sector/financial_market_supervision_reports/download/fms_2017.pdf

Financial Stability Report 2017/2018. *Czech National Bank* [online]. 2018 [cit. 2019-05-08]. Available on: https://www.cnb.cz/export/sites/cnb/en/financial-stability/.galleries/fs_reports/fsr_2017-2018/fsr_2017-2018.pdf

Kapitálová rezerva ke krytí systémového rizika. *Czech National Bank* [online]. [cit. 2019-05-04]. Available on: https://www.cnb.cz/cs/financni-stabilita/makroobezretnosti-politika/kapitalova-rezerva-ke-kryti-systemoveho-rizika/index.html.

KIELAR, Petr. Zajištění úvěru. *Stavebky.cz* [online]. [cit. 2019-04-22]. Available on: https://www.stavebky.cz/zajisteni-uveru-2/.

Komerční banka, a.s. *Annual Report 2018* [online]. Prague, 2019 [cit. 2019-05-12]. Available on: https://www.kb.cz/getmedia/374d8af5-9c81-492d-98f4-1b7ea2e28c21/kb-2018-annual-report.pdf.aspx

Komerční banka Group. *Financial results as of 31 December 2018* [online]. Prague, 2019 [cit. 2019-05-12]. Available on: https://www.kb.cz/getmedia/1ae4f9ce-fd02-4340-b1ac-636efb8e24a8/KB-4Q2018-Presentation.pdf.aspx

Monetary Statistics – March, 2019. *Czech National Bank* [online]. 2019 [cit. 2019-04-08]. Available on: https://www.cnb.cz/export/sites/cnb/en/statistics/. galleries/money_and_banking_stat/mon_bank_stat/2019/menstat_1903_EN.pdf

Provision of a general nature I/2019 on setting the countercyclical capital buffer rate for the Czech Republic No. I/2019 of 7 March 2019. *Czech National Bank* [online]. [cit. 2019-05-26]. Available on: https://www.cnb.cz/en(financial-stability/macroprudential-policy/the-countercyclical-capital-buffer/provision-of-a-general-nature-i-2019

Reuters Guide to Credit Ratings, Scales and Terms. *Reuters* [online]. 2008 [cit. 2019-04-05]. Available on: https://www.reuters.com/article/reuters-ratings-guide-idUSRATINGS20080605.

Systemically important institutions. *European Systemic Risk Board* [online]. [cit. 2019-05-01]. Available on: https://www.esrb.europa.eu/national_policy/systemically/html/index.en.html.

The capital conservation buffer. *Czech National Bank*. [online]. [cit. 2019-05-01]. Available on: https://www.cnb.cz/en/financial-stability/macroprudential-policy/the capital-conservation-buffer/index.html.

The countercyclical capital buffer. *Czech National Bank* [online]. [cit. 2019-05-01]. Available on: https://www.cnb.cz/en/financial-stability/macroprudential-policy/the-countercyclical-capital-buffer/.

Laws and decrees

Decree No 163/2014 Coll. on the performance of the activity of banks, credit unions and investment firms. Available on: https://www.cnb.cz/export/sites/cnb/en/legislation/ .galleries/decrees/decree_163_2014.pdf

Directive No 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC. Available on: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013L0036

Recommendation on the management of risks associated with the provision of retained loans secured by residential property. Available on: https://www.cnb.cz/export/sites/ cnb/en/legislation/.galleries/official_information/vestnik_2018_08_21018180_en.pdf

Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012. Available on: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013R0575

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AIRB	advanced internal-rating based
AT1	Additional Tier 1
BCBS	the Basel Committee on Banking Supervision
BRKI	the Banking Register of Client Information
CAD	capital adequacy
CAP	capital
CBCB	the Czech Banking Credit Bureau
CCF	Credit Conversion Factor
CCR	the Central Credit Register
CDO	collateralized debt obligation
CET1	Common Equity Tier 1
CNB	the Czech National Bank
CRD IV	Capital Requirements Directive IV
CRR	Capital Requirements Regulation
ČS	Česká spořitelna, a.s.
ČSOB	Československá obchodní banka, a.s.
DTI	Debt To Income
DSTI	Debt Service To Income
EAD	Exposure at Default
ECAIs	External Credit Assessment Institutions

EL	Expected Loss
EU	the European Union
G-SIIs	global systematically important institutions
IAS	International Accounting Standards
IFRS	International Financial Reporting Standards
IRB	internal-rating based
KB	Komerční banka, a.s.
LGD	Loss Given Default
LTV	Loan To Value
NPL	non-performing loans
NRKI	the Non-Banking Register of Client Information
O-SIIs	other systematically important institutions
OECD	the Organisation for Economic Co-operation and Development
ROA	return on assets
ROE	return on equity
RR	Recovery Rate
RWA	risk-weighted assets
SIFIs	systematically important financial institutions
SME	small- and medium-sized enterprises
SOLUS	the Association for the Protection of Leasing and Loans to Consumers
STA	standardised

Attachments

Attachment 1

Table A1: Scoring of a private person

Criterion		Points	Weight (%)
Age	18–21	0	10
	22–29	5	
	30–39	20	
	over 40	25	
Marital status	single	12	25
	married	40	
	divorced	0	
	widowed	15	
Number of children	0	10	15
	1–2	15	
	3 or more	0	
Period of employment for current employer	less than 0.5 year	0	8
	0.5 to 1 year	8	
	1 to 3 years	15	
	more than 3 years	35	
…	…	…	…
Final score		**X**	**100**

Source: JÍLEK, Josef. Finanční rizika, p. 30, customized

Attachment 2

Table A2: Long-term and short-term credit ratings

S&P		Moody's		Fitch		Credit quality (long-term)	Grade
Long-term	Short-term	Long-term	Short-term	Long-term	Short-term		
AAA	A-1+	Aaa	P-1	AAA	F1+	Highest quality	Investment grade
AA+		Aa1		AA+		Substantial payment capacity	
AA		Aa2		AA			
AA-		Aa3		AA-			
A+	A-1	A1		A+	F1	High payment capacity	
A		A2		A			
A-	A-2	A3	P-2	A-	F2		
BBB+		Baa1		BBB+		Adequate payment capacity	
BBB	A-3	Baa2	P-3	BBB	F3		
BBB-		Baa3		BBB-			
BB+	B	Ba1	Not prime	BB+	B	Payment capacity vulnerable to adverse changes	Speculative grade
BB		Ba2		BB			
BB-		Ba3		BB-			
B+		B1		B+		Payment capacity not sufficiently protected against adverse change	
B		B2		B			
B-		B3		B-			
CCC+	C	Caa1		CCC+	C	There is a possibility of default, repayment relies on positive conditions	
CCC		Caa2		CCC			
CCC-		Caa3		CCC-			
CC		Ca		CC			
C		C		C			
D	/	/		DDD	/	Obligations are in default	
				DD			
				D			