

APPLICATION OF THE CAPITAL BUFFER REQUIREMENT FOR OTHER SYSTEMICALLY IMPORTANT INSTITUTIONS IN LITHUANIA

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Abbreviations

BCBS	Basel Committee of Banking Supervision
GDP	gross domestic product
EBA	European Banking Authority
EU	European Union
CRR	Capital Requirements Regulation
CRD IV	Capital Requirements Directive IV
RoRWA	return on risk-weighted assets

Contents

SUMMARY	5
1. THE NEED FOR A SYSTEMICALLY IMPORTANT INSTITUTION CAPITAL BUFFER.....	6
2. IDENTIFYING SYSTEMICALLY IMPORTANT INSTITUTIONS.....	7
2.1. Methodology for identifying systemically important institutions.....	7
2.2. Systemically important institutions in Lithuania	9
3. DETERMINING THE SIZE OF THE CAPITAL BUFFER FOR SYSTEMICALLY IMPORTANT INSTITUTIONS	9
3.1. Methods for determining the size of the capital buffer for systemically important institutions	9
3.1.1. Expected impact method	10
3.1.2. Expected loss method	11
3.2. Determining the size of the capital buffer for systemically important institutions	11
REFERENCES.....	12

Summary

5

The main purpose of this paper is to introduce market participants and the public to the principles of the application of one of the measures of macroprudential policy, i.e. the capital buffer for other systemically important (hereinafter — systemically important) institutions, in Lithuania. The procedure of defining this buffer rate is regulated by the Rules for the Formation of Capital Buffers adopted by the Board of the Bank of Lithuania on 9 April 2015 (hereinafter — the Rules). According to the Rules, the capital buffer for other systemically important institutions should compose from 0 to 2 per cent of total risk-weighted assets of the bank. The list of systemically important institutions and the size of the relevant capital buffers was first published on 15 December 2015.

One of the intermediate objectives of the macroprudential policy^{1,2} is to limit the misaligned incentives of financial institutions that may have a systemic impact, with the aim of reducing the risk of moral hazard and excessive risk-taking by such institutions. As important financial institutions face difficulties, governments may be forced to reorganise or save them. This could reduce the incentive of banks to take risks within levels optimal from the point of view of the society. The bankruptcy of a systemically important bank could have negative effects on the financial system and the entire economy of the country. Therefore, it is necessary to set up additional measures to reduce the likelihood that losses incurred by a systemically important bank will exceed its capital buffer. The additional systemically important institution capital buffer is set by taking into account the importance of these institutions as well as the potential harm that would be experienced by the country's financial sector and the whole economy as a result of the bankruptcy of a particular institution. The additional capital buffer set enables these institutions to cover sizeable likely losses and will thus reduce the probability of bankruptcy for these institutions.

Seeking to increase the resilience of systemically important banks to negative shocks, the EU countries' macroprudential policy implementers identify systemically important financial institutions and set additional capital buffers for these institutions. At the EU level, the additional capital buffers for systemically important financial institutions are provided in the CRD IV. In determining the systemic importance of financial institutions in Lithuania, the following criteria are used: 1) size; 2) importance to the EU or Lithuanian economy; 3) significance of cross-border activities; 4) interconnectedness of the institution or financial group and the financial system. The determination of the systemic importance of financial institutions is detailed in the EBA Guidelines of 16 December 2014.³

The list of systemically important institutions and the size of the capital buffer set for systemically important institutions will be published by the Bank of Lithuania at the end of each year. In 2015, four systemically important institutions were identified in Lithuania. For *AB SEB bankas*, *Swedbank*, *AB*, and *AB DNB bankas* a 2 per cent systemically important institution capital buffer was set, while for *AB Šiauliy bankas* — a 0.5 per cent capital buffer. As of 2016, the capital buffer will be set and published by December of every year. It is projected that a one-year transition period to accumulate a respective capital buffer will be applied to systemically important institutions.⁴ For instance, institutions recognised as systemically important in 2015 will have to meet their additional capital buffer requirement starting from 31 December 2016.

¹ As per amendments of the Law on the Bank of Lithuania introduced on 24 September 2014 (18-09-2014, No XII-1097), the Bank of Lithuania is obligated to ensure constant monitoring and evaluation of threats arising to the stability of the financial system of the country, apply necessary macroprudential policy measures, and identify systemically important institutions.

² Resolution No 03-31 of 12 March 2015 of the Board of the Bank of Lithuania "On the Approval of the Macroprudential Policy Strategy".

³ Guidelines on the Criteria to Determine the Conditions of the Application of Article 131(3) of Directive 2013/36/EU (CRD) in Relation to the Assessment of Other Systemically Important Institutions (O-SIIs).

⁴ The legislation does not provide for a period of time, following which institutions are required to meet the capital reserve requirement. Taking into account the fact that it may be difficult for the institutions to quickly attract additional capital as well as the practice related to the countercyclical capital buffer, the one-year transition period is applied.

1. The need for a systemically important institution capital buffer

Taking into account the lessons drawn from the recent global financial crisis, significant regulatory changes introduced in the financial sector after 2008 were aimed at preventing risks of systemic nature in the financial sector. Up until 2008, regulation of the financial sector was mainly based on supervision of individual financial institutions, while the analysis of disbalances of a systemic nature and application of various measures limiting systemic risks received less attention. After 2008, significant regulatory initiatives were taken up to develop an effective system for application of macroprudential measures. One of the main reforms was the reform of the capital requirements developed by the BCBS, which is being implemented on a global scale.⁵ The reform is aimed at setting stricter capital requirements (additional capital buffers) for systemically important banks on a global, regional and national scale. Many provisions of the Basel III were transferred to the CRR and CRD IV⁶, and they were ultimately integrated in the national legal systems of the EU Members States. The CRD IV implemented at the EU level provides for new capital buffers reducing systemic risks of financial institutions: the capital buffer for global systemically important institutions, the capital buffer for other systemically important (hereinafter – systemically important) institutions and the systemic risk buffer.

The key purpose of the capital buffer is to increase the resilience of financial institutions to potential losses. Capital primarily protects depositors and other creditors of a bank from various shocks, because losses of the bank are covered by own capital first (Berlin, 2011; Allen, Carletti & Marquez, 2011). The larger the bank's capital, the greater the shocks it can withstand. Various studies show that a stricter bank capital adequacy requirement is associated with the lower probability of bankruptcy of a bank and systemic crisis (Miles *et al.*, 2012; Sveriges Riskbank, 2011; Kragh-Sørensen, 2012). Moreover, larger capital of a bank means greater financial involvement of bank owners and more extensive potential losses in case of bankruptcy, which encourages adequate risk-taking by bank owners (Allen, Carletti & Marquez, 2011; Mehran & Thakor, 2011).

Misaligned incentives to take excessive risk is more typical of systemically important institutions than small ones. Seeking to avoid major negative effects on the economy, governments are often forced to rescue failing systemically important financial institutions as well as their owners and creditors using taxpayers' money. Owners and creditors of systemically important institutions can, respectively, take greater risks (accumulate inadequate capital buffer, use unstable sources of financing, etc.) to achieve the highest possible return in economic upturn and reduce losses incurred in times of economic downturn. In addition, the possibility of receiving help from the state significantly reduces the probability of bankruptcy of systemically important institutions; therefore, natural persons and legal entities become more inclined to hold their money in these institutions (Ötker-Robe *et al.*, 2011), which even further contributes to the growth of their importance. Ireland is among the most well-known examples, where significant intervention of the state was required for recapitalisation of systemically important banks. In 2009, seeking to avoid negative effects on the country's financial system and the economy, the Irish Government recapitalised the two largest Irish banks and guaranteed fulfilment of obligations to creditors of six major Irish banks over the period from 2008 to 2010. The Government of Ireland contributed a significant amount of funds to its financial system and substantially increased government debt.

Systemically important financial institutions facing operational difficulties can have negative impact on other financial institutions or markets due to their interconnectedness (Allen & Gale, 2000). As one bank encounters financial difficulties rendering it unable to fulfill its obligations to another bank, the latter financial institution may face liquidity problems and fail to fulfill its obligations to another third party. Therefore, problems encountered by one financial institution can spread over the whole financial and interbank system, affecting a significant number of its participants. Two types of financial contagion can be identified: information and counterparty contagion (Bedard, 2012). Information contagion can refer to the spread of negative information: financial difficulties of one bank can reveal information on an increased bankruptcy risk of another bank, where such banks are characterised by similar sources of risk. Counterparty contagion results from an increased credit risk of other institutions connected by financial links. If one institution has obligations to other financial institutions, the insolvency of such an institution can cause financial difficulties for other institutions as well. The bankruptcy of Lehman Brothers in 2008 is one of the leading examples where bankruptcy of a systemic bank had significant adverse effects on the global financial system. The latter event resulted in a wave of caution and lack of trust in financial institutions, substantially reducing the scale of lending in global economies.

Even though stricter capital requirements are associated with a higher lending price and reduced lending scale, the costs are noticeably lower than the likely economic benefit of reducing the risk of bankruptcy of systemically important institutions. In literature, banking crisis losses are often seen as cumulative loss of GDP,

⁵ BCBS (2011). Basel III: A Global Regulatory Framework for More Resilient Banks and Banking System. Basel Committee on Banking Supervision (<http://www.bis.org/publ/bcbs189.pdf>).

⁶ Capital Requirements Directive (2013/36/EU) and Regulation (EU No. 575/2013)

compared to long-term economic development trends observed before the crisis. For example, a BCBS study (2010) presenting an overview of various studies of the impact of crises states that cumulative (and discounted) loss of bank crises reaches an average of 63 per cent of GDP that was before the crisis. Costs of additionally required capital, on the other hand, are mainly associated with negative impact on the supply of lending, i.e. higher interest rates on loans and potential lending restrictions. A stricter capital adequacy requirement forces banks to increase the amount of capital or reduce the amount of risky assets. As the amount of capital increases, the rate of return on assets decreases (unless other conditions change); therefore, to maintain rates of return required by shareholders, banks can increase the lending price. In the second case, by opting for the strategy of reduction of the amount of risky assets, banks can restrict lending, especially to higher-risk debtors. Findings of the published empirical studies show that public expenditure related to the tightening of capital adequacy requirements is relatively low. For example, Miles *et al.* (2012) state that, in the case of the United Kingdom, doubling the capital requirement from 5 to 10 per cent would increase the weighted average price of financing by banks by only 0.1–0.4 p.p. Similar results were presented by Admati *et al.* (2011). Empirical studies (e.g. BCBS, 2010, Miles *et al.*, 2012, Sveriges Riksbank, 2011, Kragh-Sørensen, 2012) have found that an increase of capital adequacy requirement by 1 p.p. would have mild restrictive effects on the supply of lending and reduce the annual GDP growth by about 0.06–0.25 per cent.

2. Identifying systemically important institutions

2.1. Methodology for identifying systemically important institutions

The methodology for the identification of systemically important institutions at the European level is defined in the CRD IV and EBA Guidelines. The CRD IV and the EBA Guidelines are the main legal documents to be used by the EU Member States to identify systemically important institutions and additional capital buffers for other systemically important institutions. As of 2016, all of the EU countries are required to identify systemically important institutions and set capital buffers for systemically important institutions. In Lithuania, the procedure of setting the buffer rate is regulated by the Rules adopted by the Board of the Bank of Lithuania on 9 April 2015. The capital buffer of other systemically important institutions should compose from 0 to 2 per cent of the total amount of risk-weighted assets of a bank.

The CRD IV and the EBA Guidelines identify four main criteria used for full assessment of the systemic importance of financial institutions:

1. The size of a financial institution or financial group.
2. Interconnectedness of a financial institution or financial group and the financial system.
3. Importance of a financial institution for the economy of the EU or Lithuania, taking into account the substitutability of the services offered and/or infrastructure of the financial institution.
4. Complexity of a financial institution, including increased complexity due to cross-border activities.

The CRD IV provides that systemically important institutions have to be identified based on at least one of the above criteria. The EBA Guidelines detail provisions of the CRD IV and recommend taking into account all four criteria. The aim is to fully assess the importance of a relevant financial institution.⁷

The size of an institution is one of the most important criteria, when determining its systemic importance. The larger the institution in absolute terms is, the greater the impact of its bankruptcy on the country's financial stability and economy would be. The EBA Guidelines propose to measure the size of the institutions in view of the share of their assets in the whole financial system. It is worth noting that other estimates of systemic importance can also be used to measure the size of financial institutions. For example, in Denmark, one of the criteria used to identify systemically important institutions is the ratio between the total assets of an institution and the country's GDP.⁸

The second criterion measures the interconnectedness of an institution or a group and the financial system. The closer the interconnectedness of a financial institution, the stronger the domino effect and the impact of financial contagion on the whole financial system can be. In closely interconnected financial systems, financial difficulties encountered in one part of the system can spread to other parts and allow for a decrease of financial services, e.g., supply of lending. The EBA Guidelines propose to assess this criterion using such indicators as intra-financial system

⁷ The EBA Guidelines also provide optional indicators; however, these were not taken into account in the analysis. There was no need to use optional indicators, since participants of the Lithuanian financial system are rather similar in terms of financial services offered, and their importance on the whole system is fully defined by the main indicators.

⁸ Committee on Systemically Important Financial Institutions in Denmark (2013). "Systemically Important Financial Institutions in Denmark: Identification, Requirements and Crisis Management". Report for Public Consultation, 14 March 2013.

liabilities, inter-financial system assets and debt securities outstanding (see Table 1).

The third criterion is used to assess the importance of a financial institution on the economy of the EU or Lithuania, taking into account the substitutability of services offered by the institution and/or financial system infrastructure. If services rendered by the financial institution are unique or it is difficult for other institutions to take over the rendering of these services, the institution can be deemed systemically important to the country's economy and financial system infrastructure. For example, if a financial institution covers an extensive part of the country's payment market, a situation, where such an institution encounters problems (rendering it unable to render the service) could expose the country's economy to significant difficulties due to payment-related problems, even if the volume of assets of the institution is rather small. Therefore, this criterion is used to measure the financial market share covered by the institution and the possibility for other institutions to cover the relevant market share. The EBA proposes to assess the importance of financial institutions for the payment, loan, deposit and securities markets. To define this criterion, in its Guidelines, the EBA recommends taking into account the value of domestic payment transactions, private sector deposits from depositors in the EU, private sector loans to recipients in the EU (see Table 1).

The fourth criterion covers the importance of cross-border activity and the complexity of institutions. The issue of financial contagion has more relevance to institutions with a great number of cross-jurisdictional liabilities and claims. Over the past decades, an increasing number of financial institutions have gone global. At the same time, their connections with financial institutions operating in other jurisdictions have grown stronger. For example, during the crisis of 2008, many financial institutions worldwide had direct connections with the U.S. subprime mortgage market (by holding securities linked to the U.S. housing market), and the problems that occurred in the market spread to financial systems and the economies of other countries. The EBA proposes to assess this criterion using the value of over-the-counter derivatives, cross-jurisdictional liabilities and cross-jurisdictional claims (see Table 1).

Table 1. Mandatory indicators for the scoring provided in the EBA Guidelines

Criterion	Criteria weight, per cent	Indicators	Weight, per cent
Size	25	Total assets	25.00
		Value of domestic payment transactions	8.33
Importance (including substitutability of services offered by the financial institution/financial system infrastructure)	25	Private sector deposits from depositors in the EU	8.33
		Private sector loans to recipients in the EU	8.33
		Value of over-the-counter derivatives (notional)	8.33
Complexity and cross-border activity	25	Cross-jurisdictional liabilities	8.33
		Cross-jurisdictional claims	8.33
Interconnectedness	25	Intra-financial system liabilities	8.33
		Intra-financial system assets	8.33
		Debt securities outstanding	8.33

Source: EBA Guidelines.

The EBA Guidelines recommend assessing the systemic importance of financial institutions by calculating a score for each institution, reflecting all four criteria presented above. The score is calculated as an arithmetic average of the scores for the four criteria, while the score for each relevant criterion is determined as a simple average of scores of the indicators provided in the EBA Guidelines (see Table 1). Each criterion is equally important, when calculating the overall score of systemic importance of financial institutions, and is given a weight of 25 per cent. Indicators listed in Table 1 are mandatory under the EBA Guidelines and specify the weight of each indicator in the overall systemic importance score.

The EBA Guidelines propose to express the overall systemic importance score of financial institutions in terms of basis points, where the maximum value of the score is 10,000 basis points. To calculate the value of this score, market shares of the relevant indicators (see Table 1) are used; such market shares are calculated by dividing the value of the indicator of each relevant institution by the value of such an indicator calculated for the whole financial system of Lithuania.⁹ The resulting percentages are then multiplied by 10,000 to express the indicator scores in terms of

⁹ Sums of all indicator values for the analysed Lithuanian institutions.

basis points. Then, indicators are measured in terms of their weight specified in Table 1. If there was one bank operating in the country, it would have the maximum systemic importance score, i.e. 10,000 basis points.

Financial institutions with an overall score of 350 or more basis points should be deemed systemically important institutions under the EBA Guidelines. According to the EBA Guidelines, 350 basis points should be applied as a threshold; however, the Guidelines allow increasing or reducing the threshold (within the range of 275–425 basis points).

Given the peculiarities of the banking sector, Lithuania has opted for the threshold of 350 basis points. It should be noted that, based on the assessment results of 2015, the number of systemically important institutions in Lithuania would remain unchanged if any threshold falling within the permitted range of 275–425 provided for in the Guidelines was used.

2.2. Systemically important institutions in Lithuania

In Lithuania, systemically important institutions are identified based on the financial system analysis and the EBA Guidelines. During the analysis performed, details of all credit institutions operating in Lithuania are employed.¹⁰ Calculations are made using the data of financial statements harmonised at the EU level as well as data obtained from the TARGET2 system.¹¹ In the identification of systemically important institutions in Lithuania in 2015, consolidated data of the banks for the second quarter of 2015 were used.

In 2015, four systemically important banks were identified in Lithuania: AB SEB bankas, AB DNB bankas, Swedbank, AB, and AB Šiaulių bankas. Scores calculated for these institutions exceed the threshold of 350 basis points; when the aforementioned threshold is exceeded, an institution is designated as systemically important (see Table 2). If *Danske Bank A/S* Lithuanian branch and *Nordea Bank AB* Lithuanian branch operated not as branches of foreign banks, but as banks established in Lithuania, it is likely that these institutions would also be designated as systemically important.

3. Determining the size of the capital buffer for systemically important institutions

3.1. Methods for determining the size of the capital buffer for systemically important institutions

When determining the capital buffer for systemically important institutions, the systemic importance of the institutions and likely bankruptcy costs to be incurred by the financial system and whole economy are taken into account. To assess both of the above aspects, the capital buffer for individual institutions is assessed using the two following methods. In the first instance, the size of the capital buffer of systemically important institutions is determined using the expected impact method (Skorepa & Seidler, 2014). In view of the probability of bank failure, the systemic importance of banks and the potential harm of bankruptcy to the economy, the aim is to set capital buffer rates ensuring that the potential harm of the bankruptcy of a systemically important bank would be the same as the potential harm of the bankruptcy of a bank that is not systemically important. The second method, i.e. the expected loss method, is used to determine capital buffer rates for systemically important financial institutions, taking into account the likely loss of the institution, i.e. the higher the importance of the institution, the greater the amount of capital it should own to cover its potential losses. **A combination of these two methods is used to determine capital buffer rates for systemically important institutions in Lithuania.**

¹⁰ The analysis covered commercial banks (*AB SEB bankas, Swedbank, AB, AB DNB bankas, AB Šiaulių bankas, AB Citadele bankas, UAB Medicinos bankas, AB bankas FINASTA*), Lithuanian branches of foreign banks (*Nordea Bank AB* Lithuanian Branch, *Danske Bank A/S* Lithuanian Branch, *Pohjola Bank plc* Lithuanian Branch, *BIGBANK AS* Branch), members of the Lithuanian Central Credit Union (LCCU), credit unions outside the LCCU and other small banks or branches thereof.

¹¹ Indicator of the value of domestic payment transactions marks the share in the TARGET2-BANK OF LITHUANIA Payment System by market participants covering real-time payments within the Eurosystem. The indicator covers data of payments to other banks, both Lithuanian and the EU's. It also includes bank-to-bank payments and customers' payments made in euro, where the bank chooses to perform them in the TARGET2 system.

3.1.1. Expected impact method

When setting the capital buffer rate for systemically important institutions, the aim is to determine such a rate that would reduce likely bankruptcy costs¹² to the amount of the likely bankruptcy costs of a marginal systemically unimportant bank. Even though the probability of the bankruptcy of systemically important banks is lower than that of other banks, the bankruptcy costs of such banks incurred by the country's economy are higher compared to those of systemically unimportant institutions (see Section 1). The objective is to make sure that likely bankruptcy costs of a certain systemically important bank (expressed as a product of bankruptcy probability (P_i) and bankruptcy costs of such a bank for the economy (C_i)) are the same as a product of bankruptcy probability (P^R) and bankruptcy costs (C^R) of a certain systemically unimportant bank (see Equation 1). The method is used by some other countries to set capital buffer rates of their systemically important institutions (e.g. a case study of the Czech Republic by Skorepa & Seidler, 2014). Equation 1 can be used to express critical bankruptcy probability of a particular systemically important institution (see Equation 2), which would still satisfy Equation 1, i.e. the likely impact of the bankruptcy of such an institution would be equal to the likely impact of a systemically unimportant bank.

$$P_i * C_i = P^R * C^R. \quad (1)$$

$$P_i = \frac{P^R}{\left[\frac{C_i}{C^R}\right]} \quad (2)$$

When determining the potential bankruptcy costs of a bank for the economy, it is presumed that these costs are directly proportionate to the systemic importance score of an institution (expressed in terms of basis points) calculated using the EBA's methodology. Some other authors make this presumption as well (e.g., Basel, 2013; Skorepa & Seidler, 2014). A growing systemic importance score of a bank means that the bank is expanding its market share in one, several or all of the analysed market segments. Thus, it is presumed that bankruptcy costs of the institution to be incurred by the economy would be higher by the number, by which its score value (sib_i) is higher than that of another institution (see Equation 3). When setting the capital buffer for systemically important institutions, scores of individual institutions are compared to a hypothetical institution (sib^R) with the score of 350.

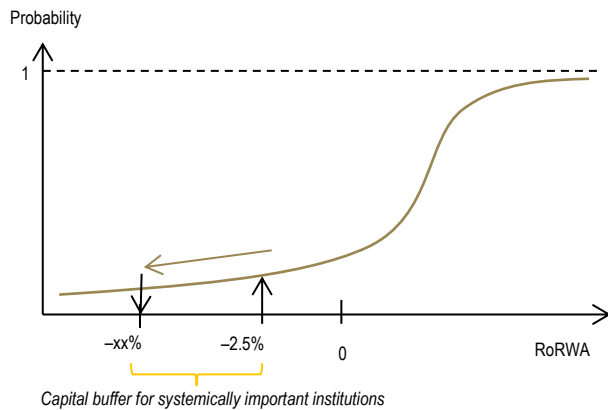
$$\frac{C_i}{C^R} = \frac{sib_i}{sib^R}. \quad (3)$$

Bankruptcy probability is calculated as a probability that the ratio of cumulative losses for four quarters and risk-weighted assets of a bank will exceed 2.5 per cent. All banks are required to meet the minimum capital requirement (8%) and additional requirement of the capital conservation buffer (2.5%). If a bank operated without any additional capital buffer and incurred losses exceeding 2.5 per cent of its total risk-weighted assets (i.e. its losses exceeded the capital conservation buffer), restructuring or bankruptcy proceedings could be initiated against such bank. If an institution had a certain capital buffer set for systemically important institutions, it would still be able to meet the minimum regulatory capital requirement even if it incurred higher losses.¹³ In view of the foregoing and based on the historical data of return on risk-weighted assets (RoRWA), it is possible to determine capital buffer rates for systemically important institutions. Where systemic importance score values of institutions are available, Equation 2 can be used to calculate critical bankruptcy probability of a certain systemically important institution so as to satisfy the conditions of Equation 1. This allows determining maximum losses with the calculated probability. The difference between the latter losses and losses of 2.5 per cent of the risk-weighted assets of a bank represents the missing capital buffer necessary to satisfy the conditions of Equation 1. In other words, according to the above-mentioned mathematical procedure, likely bankruptcy costs of a systemically important institution would be equal to likely bankruptcy costs of a marginal systemically unimportant institution. Where historical frequency distribution of return on risk-weighted assets of the banks is available, it is possible to assess and assign capital buffer rates to certain systemically important institutions (see Fig. 1).

¹² In the analysed literature, banking crisis losses are often seen as a cumulative loss of GDP, compared to long-term economic development trends observed before the crisis. For example, BCBS study (2010) presenting an overview of various studies of the impact of crises states that cumulative (and discounted) loss of bank crises reaches an average of 63 per cent of the highest GDP level that was before the crisis. However, it is true that estimates of crisis losses presented by various authors differ highly due to different assumptions regarding the duration of impact of the crisis and the extent of long-term impact of the crisis.

¹³ It should be noted that in the given case, additional and optionally accumulated capital buffer held by the institutions has not been taken into account, since it is not subject to the regulatory requirement and can always be reduced, e.g., by paying out dividends.

Fig. 1. Determining the size of the capital buffer for systemically important Institutions



Source: Bank of Lithuania.

Note: calculation of a certain capital buffer rate for systemically important institutions is based on the historical distribution of the total return on risk-weighted assets and systemic importance score values of individual banks. The higher the score of the institution, the greater its capital buffer should be. Since all institutions are required to accumulate a capital conservation buffer (2.5%), only losses exceeding 2.5 per cent were taken into account.

3.1.2. Expected loss method

The expected loss method is based on the assumption that financial institutions designated as systemically important should accumulate an additional capital buffer to cover potential likely losses, and such capital should be increased in proportion to the growing systemic importance of the institution. Since all financial institutions are required to accumulate a capital conservation buffer of 2.5 per cent, when applying this method, it is also important to analyse situations, where losses exceed 2.5 per cent of the capital (in the event of greater losses, the institution would violate the minimum capital requirement).

$$R_i = ExL * \left(\frac{sib_i - 350}{350} \right). \quad (4)$$

According to the data of the Lithuanian banks¹⁴, the average cumulative losses for four quarters exceeding 2.5 per cent of risk-weighted assets accounted for 5.1 per cent, while the probability that the cumulative losses for four quarters will exceed 2.5 per cent — 12 per cent. The product of the average losses and probability thereof is considered to be the expected losses that may be incurred by an institution (in the amount of 0.3% of risk-weighted assets). In this case, the capital buffer (R_i) for a systemically important institution is calculated using Equation 4: the higher systemic importance of the institution (i.e. the more its score (sib_i) exceeds the minimum threshold of 350 basis points), the higher expected losses (ExL) the institution should be able to cover. The ratio of the extent to which the systemic importance score of an individual institution exceeds the minimum threshold of 350 points and the said threshold shows the importance of the institution.

3.2. Determining the size of the capital buffer for systemically important institutions

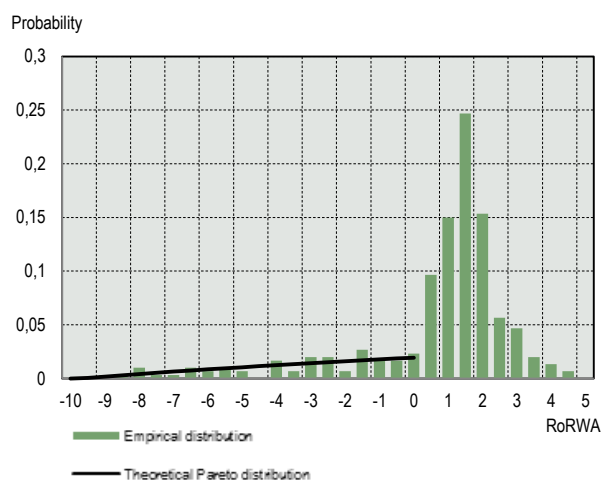
The expected impact and the expected loss methods (see subsection 3.1) were used to calculate capital buffers for systemically important institutions and these buffers were assigned to individual systemically important banks operating in Lithuania (see Table 2). Based on the data of the risk-weighted assets and profit of commercial banks operating in Lithuania (see Fig. 2), probability distribution function of return on risk-weighted assets (see Fig. 3) was drawn up. Consolidated data of financial statements of Lithuanian banks¹⁵ were used for the calculations. Moving sum of net profit generated by the banks over four quarters and quarterly risk-weighted assets were used to calculate historical indicator of return on risk-weighted assets. In other words, it is presumed that the bank needs

¹⁴ Data from Q4 of 2002 to Q2 of 2015 were analysed.

¹⁵ AB SEB bankas, Swedbank, AB, AB DNB bankas, AB Šiaulių bankas, UAB Medicinos bankas, and AB Citadele bankas.

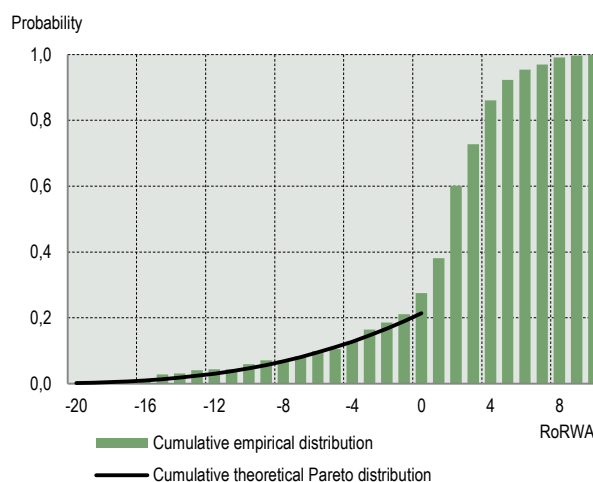
sufficient capital buffer to cover losses accumulated over four quarters. Given the limitations of data available in Lithuania¹⁶, it is presumed that losses incurred by the Lithuanian banks can be defined using the theoretical Pareto distribution.

Fig. 2. Empirical and theoretical RoRWA distributions of the Lithuanian banks



Sources: data of financial statements and calculations of the Bank of Lithuania.

Fig. 3. RoRWA (probability distribution functions) of the Lithuanian banks



Source: calculations of the Bank of Lithuania.

Due to relatively small data sample, the available historical distribution of return on risk-weighted assets of commercial banks was expressed in theoretical terms. Since calculations were performed with part of the sample that fell below -2.5 per cent (i.e. losses incurred exceeded 2.5% of risk-weighted assets), it was not necessary to make assumptions regarding another distribution form. To reduce calculation errors, theoretical Pareto distribution was used. Test calculations with other (symmetric and asymmetric) distributions revealed that errors of Pareto distribution were smallest.

In 2015, buffer rate of 2 per cent was set for three largest Lithuanian banks, based on the expected loss and the expected impact methods (see Table 2). Additional capital buffer rate of 0.5 per cent was set for the fourth systemically important.

Table 2. Capital buffer rates set for systemically important institutions and systemic importance scores of these institution

Name of financial institution	Capital buffer rate of systemically important institutions, percentage
AB SEB bankas	2.0
Swedbank, AB	2.0
AB DNB bankas	2.0
AB Šiaulių bankas	0.5

Source: calculations of the Bank of Lithuania.

¹⁶ Short time series, small number of banks, etc.

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