

# Bank Performance Measures

## Navigating AI, Climate and Geopolitical Risks

**Paweł Niedziółka**

First published 2026

ISBN: 978-1-041-13602-6 (hbk)

ISBN: 978-1-041-13603-3 (pbk)

ISBN: 978-1-003-67062-9 (ebk)

### 4 Profitability, efficiency, and lending dynamics in an unstable environment

(CC-BY-NC-ND 4.0)

DOI: 10.4324/9781003670629-4

Financed by the Minister of Science and Higher Education under the “Regional Excellence Initiative” Programme.



Ministry of Science and Higher Education  
Republic of Poland



Regionalna  
Inicjatywa  
Doskonałości



**Routledge**  
Taylor & Francis Group  
LONDON AND NEW YORK

## 4 Profitability, efficiency, and lending dynamics in an unstable environment

### 4.1 Measures of profitability of banking activities

Among the primary profitability measures in banking, the most prominent are return on equity and return on assets. The former can be expressed as follows:

$$ROE = \frac{NR}{OF} \quad (4.1)$$

where,

ROE – return on equity.

NR – net profit for the given financial year.

OF – own funds.

Return on assets (ROA) can be stated as:

$$ROA = \frac{NR}{TA} \quad (4.2)$$

where,

TA – total assets.

Return on sales (ROS) can be defined as:

$$ROS = \frac{NR}{REV} \quad (4.3)$$

where,

REV – total revenue for the period.

If revenue is adjusted for releases of provisions and extraordinary gains, the ROS formula transforms into PM (Iwanicz-Drozdowska, 2012):

$$PM = \frac{NR}{OPREV} \quad (4.4)$$

where,

OPREV – operating revenue, that is total revenue less releases of provisions and extraordinary income.

Profitability ratios are interrelated and the application of DuPont analysis enables their decomposition, which allows the identification of factors determining the value and dynamics of each ratio. Further development of such analysis requires introducing the following terms (Iwanicz-Drozdowska, 2012):

$$AU = \frac{PM}{TA} \quad (4.5)$$

And

$$EM = \frac{TA}{OF} \quad (4.6)$$

where,

AU – asset utilisation ratio.

EM – equity multiplier (leverage ratio).

Defining AU and EM makes it possible to link ROE and ROA:

$$ROE = ROA \cdot EM = PM \cdot AU \cdot EM \quad (4.7)$$

Return on equity is compared against the cost of equity. If the cost of equity exceeds the bank's return, the issuance of new shares becomes less viable from the perspective of shareholders due to insufficient profitability, with retained net profit, if present, consequently remaining the sole source of new capital. A higher cost of equity than ROE thus constrains lending activity and reduces loss-absorption capacity. Unlike the cost of debt, the cost of equity cannot be directly observed (it is not subject to market pricing), making it necessary to therefore estimate its level using theoretical models. For example, the National Bank of Poland bases its calculations on a combination of factor models employing historical market data and implied models based on analysts' forecasts for bank profits and dividends (NBP, 2022).

Financial stability reports also analyse the profitability of regulatory capital in banks (NBP, 2024):

$$RORC = \frac{NR}{RC} \quad (4.8)$$

where,

RORC – return on regulatory capital.

RC – regulatory capital.

Profitability can also be measured by net interest margin (NIM), which is generally expressed as (Iwanicz-Drozdowska et al., 2023):

$$NIM = \frac{IR}{IBA} \quad (4.9)$$

where,

NIM – net interest margin.

IR – interest revenue.

IBA – interest-bearing assets.

NIM calculations sometimes use the average volume of interest-bearing assets rather than their total value at the end of the reporting period. It is worth noting that in the years following the subprime crisis, NIM eroded as a result of quantitative easing and the use of other unconventional monetary policy instruments. Continuing with a DuPont analysis, it is possible to decompose the return on invested capital (ROIC) (Chen, 2014):

$$ROIC = \frac{NR}{RWA} \cdot \frac{RWA}{OF} \quad (4.10)$$

where,

$\frac{NR}{RWA}$  – return on risk-weighted assets (RoRWA).

$\frac{RWA}{OF}$  – leverage ratio based on risk-weighted assets.

This decomposition allows for analysing the bank's condition from two perspectives:

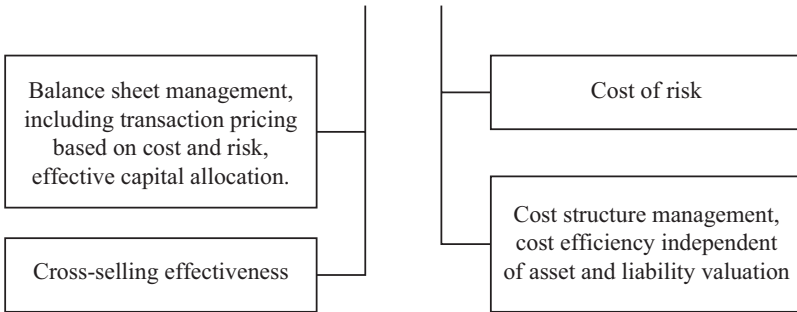
- volatility of operational efficiency (RoRWA),
- volatility of leverage.

Particular attention should be given to RoRWA due to its decomposition as proposed by Bain & Company (Figure 4.1), where the focus is not the ratio of net profit to RWA but the relationship between pre-tax operating profit and RWA.

Although RoRWA is not a precise risk metric, it is nonetheless a very useful tool for bank management and can be used not only for individual banks but also for entire banking sectors. This ratio has gained importance and popularity since the subprime crisis due to its managerial applications and its utility for optimising the following areas:

- balance sheet management, including the pricing of individual transactions or products with risk adjustment. Given market constraints (e.g. competition preventing an increase in the profitability of certain products), risk-adjusted profitability information enables optimisation of capital allocation,
- historical efficiency and cross-selling potential, as well as the level of income diversification,
- cost efficiency, in terms of operating costs (excluding the net position of provisions made and released) per unit of risk-weighted assets,
- cost of risk, reflecting the quality of credit risk management.

$$RoRWA = \frac{NII}{RWA} + \frac{FM}{RWA} + \frac{FC}{RWA} - \frac{OPEX}{RWA} - \frac{LLP}{RWA} \quad (4.11)$$



where:

NII – net interest income.

FM – income from financial operations.

FC – fee and commission income.

OPEX – operating expenses.

LLP – loan loss provisions.

*Figure 4.1* Decomposition of RoRWA

*Source:* Own elaboration based on Sinn et al. (2013)

A particularly important area within RoRWA is balance sheet management, the effect of which depends on net interest income (NII), representing the difference between interest income and expense. To estimate business profitability, banks use funds transfer pricing (FTP) to centralise interest rate risk measurement, ultimately enabling profitability to be measured independently of this risk (KPMG, 2020).

RORWA is used to analyse fluctuations in net income and bank's capital needs, and it may also be used to verify whether the bank's capital buffers are adequate in the context of stress testing. Another application of RORWA is to monitor regulatory buffers in the event of major shocks in the bank by calculating changes in this indicator (Botshekan et al., 2023).

Interest rate revenue may also be measured by the interest rate spread indicator (Iwanicz-Drozdowska et al., 2023):

$$IRSP = \frac{IRR}{IBA} - \frac{IRC}{IBL} \quad (4.12)$$

where,

IRSP – interest rate spread.

IRR – interest rate revenue.

IRC – interest rate costs.

IBL – interest-bearing liabilities.

The interest rate spread is thus the difference between the yield on assets and that on liabilities, and is used to assess the level and changes in competitiveness in two separate markets: lending and deposits (Chen, 2014).

#### **4.2 Effectiveness of a commercial bank**

The primary objective of research dedicated to banking efficiency is usually to determine whether the following are efficient:

- global banks (their activity in local markets) or local ones,
- large or small banks,
- domestically or foreign-owned banks,
- state-owned or private banks.

The following types of banking efficiency can be distinguished:

- cost efficiency – achieving this is synonymous with minimising costs to attain specific outcomes,
- income efficiency – understood as maximising outcomes (e.g. net profit or interest income) at a given (defined) cost level,
- technical efficiency – a concept related to the ratio of inputs to outputs in reference to the maximum or minimum available under specific technological conditions.

Research on banking efficiency primarily focuses on cost and technical efficiency (Skrzypek and Trojak, 2014).

Banking efficiency can be verified using the following groups of methods:

- parametric methods,
- non-parametric methods,
- ratio analysis methods.

Parametric methods involve applying a stochastic procedure to construct the efficiency frontier, where a random variable is taken into account, allowing deviations from the efficiency curve to be split between inefficiency and statistical noise. The functional form describing the relationship between input and output must be specified a priori, with the efficiency frontier estimated econometrically using the least squares method and its derivatives or maximum likelihood estimation (likelihood approximation). Parametric methods include the stochastic frontier approach (SFA) and the distribution-free approach (DFA).

The SFA method belongs to the family of benchmarking methods and is a comprehensive approach that describes the efficiency of the entire enterprise, with the inefficiency of a particular entity determined by comparing its function value to that of a benchmark object. It also involves defining a theoretical efficient set. As the name suggests, SFA is a stochastic method and thus accounts for the existence of a random component. In this case, the functional form of the frontier is used to estimate the production or total cost function, with the comparison of inputs and outputs, and the determination of the functional relationship between them, accounting for both the random factor and inefficiency, for which separate distributions must be specified (Jarzębowski, 2014). SFA is based on the assumption of a dichotomous random component. According to the method's assumptions, all entities should be capable of operating at a specified efficiency level, defined as the frontier level, which is determined by benchmark, efficient representatives of the sector. One of the most significant advantages of SFA is that it accounts for random disturbances affecting efficiency measurement outcomes, while disadvantages include computational complexity and the need to specify production and cost functions (Skrzypek and Trojak, 2014; Wardzińska, 2012). The SFA method has been applied to determine the efficiency of banks by, among others, Barburski (2010), who ranked the analysed institutions for each study period. Production factors (financial, human and physical capital) include the number of employees, value of deposits, real estate, and other fixed assets, while production is identified with the value of loans granted.

The DFA method, often used to measure the (in)efficiency of financial or credit institutions, assumes that entities exhibit persistent inefficiency over time, which can be revealed by estimating a panel cost (or profit) function and averaging annual residuals for each institution over time, with a key advantage of DFA being its use of data from several years rather than a single year. On the other hand, a drawback is that key conditions and factors affecting efficiency may change over time due to shifts in management style, making it difficult to identify the sources of inefficiency (DeYoung, 1996). The DFA method utilises panel data and assumes that underlying inefficiency is persistent, while random errors tend to average out over time (Asmare and Begashaw, 2018).

Non-parametric methods are used to measure the effectiveness of transforming inputs into outputs. Efficiency estimation does not require knowledge of the efficiency function and involves determining the ratio of weighted sums of outputs to weighted sums of inputs, with the efficiency of specific entities determined relative to the entire group. Non-parametric methods include data envelopment analysis (DEA) and free disposal hull (FDH).

DEA, which is deterministic, allows for the study of the relationships between aggregated types of inputs and income. DEA is an econometric tool for evaluating technical efficiency and is especially useful when comparing the efficiency of organisations characterised by numerous types of inputs and outputs is challenging (Piwowska, 2010). Entities located on the DEA-defined efficiency

curve (the so-called best practice frontier) are considered efficient (efficiency score of 1.0); all others (deemed inefficient) are assigned values below 1.0. Efficient entities are those that fully utilise available resources and cannot increase the production of a given good (bank product) without reducing the volume of other goods (Stola, 2010). The validity of DEA results depends on several conditions, the most significant including: (a) homogeneity of the entities studied, (b) recognising growth in all outcomes as desirable and inputs as undesirable, (c) using the same input and output measures, and (d) assigning the same weights to respective categories of inputs and outputs (Kopiński and Porębski, 2015). A challenge in applying DEA in banking is defining inputs and outputs, which is addressed by two alternative concepts of a commercial banking essence: the financial intermediary concept and the financial services producer concept. Under the intermediary concept, inputs comprise financial capital (deposits and funds borrowed on the financial market) and physical capital, while outputs consist of loan and credit volumes and the value of the investment portfolio. In the financial services producer concept, inputs are generally non-interest expenses (including staff and other ongoing non-interest operating expenses, and depreciation of fixed assets), while outputs include the number of transactions, accounts managed, or volumes of specific products – factors more decisive for market share than the number of such products, that is the total value of deposits, account turnovers, and loans. The intermediary concept is thought to better reflect the efficiency of an entire bank, while the producer concept is better suited for comparing efficiency across similar bank units, with its application to an entire bank bearing an error of overestimating the scale effect (Stępień, 2015). Technical efficiency as defined by the intermediary and producer concepts yields different outcomes for identifying efficient and inefficient institutions, as well as varying ratings within a sample, which is confirmed by results obtained for the Polish banking sector. In this case, under the intermediary concept, inputs included fixed assets, employment and total liabilities (including deposits), while outputs were total receivables (including loans granted), securities, and commission income. Meanwhile, to determine efficiency under the producer concept, fixed assets and employment were treated as inputs, and receivables and liabilities as outputs, respectively (Chudy et al., 2012; Stępień, 2015).

Among ratio-based methods, the calculation of the cost-to-income ratio (CIR) is of primary importance for banks. CIR is the ratio of operating expenses to banks' income, with operating expenses including staff costs, depreciation of tangible assets and amortisation of intangibles, general administrative expenses (including property maintenance and marketing), and income comprising the sum of interest income and fee and commission income. It should be noted that CIR estimation does not take into account provision costs incurred in the event of impairment. CIR-based efficiency comparisons should be made among banks with the same business model, since, for example, retail banks typically exhibit CIR values between 30% and 50%, while investment banks are characterised by CIR levels of 60%–80% (Chen, 2014).

Banking efficiency can also be studied in relation to employment (Iwanicz-Drozdzowska et al., 2023; Dec, 2016):

$$EAE = \frac{TA}{TE} \quad (4.13)$$

where,

EAE – employment efficiency in relation to assets.

TA – total assets.

TE – total number of employees (FTE).

$$ERE = \frac{NI}{TE} \quad (4.14)$$

where,

ERE – employment efficiency in relation to net revenue.

NI – net income.

$$EBRE = \frac{BAR}{TE} \quad (4.15)$$

where,

EBRE – employment efficiency in relation to banking revenue.

BAR – banking activity result.

Another measure of employment efficiency is the compensation ratio (Chen, 2014):

$$COMR = \frac{PE}{NOI} \quad (4.16)$$

where,

COMR – compensation ratio.

PE – total payroll expense (including salaries and bonuses).

NOI – net operating income.

COMR is commonly used in the assessment of investment bank efficiency, where bonuses linked to completed transactions play a key role.

### 4.3 Risk-adjusted profitability

The return on assets or equity does not inform stakeholders of the risk undertaken to achieve this profitability. These dimensions of economic activity (profitability and risk) are linked by risk-adjusted performance measurement (RAPM) methodologies. Key benefits of managing risk-adjusted profitability include (KPMG, 2020):

- identifying the true sources of profitability, leading to better resource allocation,
- optimising market strategies in terms of product and service offerings and their pricing,

- selecting and focusing on specific products and services, and aligning sales channels accordingly,
- optimising incentive systems for managers and other staff,
- optimising capital usage and allocation.

Risk-adjusted profitability ratios include, among others (Marcinkowska, 2003):

- RORAA (return on risk-adjusted assets) – return on assets weighted by the risk they generate,
- RAROA (risk-adjusted return on assets) – risk-adjusted return on assets, with profit adjusted for risk,
- RORAC (return on risk-adjusted capital) – risk-adjusted return on capital, where capital at risk is used instead of equity,
- RAROC (risk-adjusted return on capital) – risk-adjusted return on capital. In this case, asset income is adjusted for risk (expected loss), while the denominator is the regulatory capital required to cover credit, market and operational risks.

A distinction should be made between the RORAC and RAROC calculation methodologies. In some cases, economic capital is used in the denominator, whereby RORAC is the ratio of the difference between income and expenses to economic capital and RAROC is the ratio of the difference between income and expenses net of expected loss to economic capital, which implies that RORAC is higher than RAROC (Iwanicz-Drozdowska, 2012).

#### **4.4 Diversification of bank income**

The degree of diversification of a bank's income sources, and thus its resilience to shifts in monetary policy, can be assessed using the following indicators:

$$\frac{\text{Net interest income or net non-interest income*}}{\text{Total assets or Operating income or Equity}} \frac{(\text{Numerator})}{(\text{Denominator})} \quad (4.17)$$

\*Apart from commission income related to lending, 'non-interest income' also includes commissions from capital market services, asset management, advisory, etc.

A relatively high share of commission income is associated with a high degree of income diversification, and while empirical findings in this area are not always consistent, the prevailing view is that diversification has a positive impact on bank stability and value (Olalere et al., 2021). Li et al. (2021) showed that diversification indeed enhances profitability, but it is associated with increased risk, whereas Schreiber (2024) demonstrated that the impact of diversification on profitability, capital and risk depends on bank size.

#### 4.5 Lending dynamics

To conclude this chapter, it is worth highlighting indicators of lending dynamics. The following types of dynamic indicators can be distinguished (Zimny, 2010):

- fixed-base (single-base) indicators – changes are presented as the value of a variable in consecutive periods relative to its value in a base period,
- chain-base indicators – changes are measured by comparing the value of the variable in consecutive periods to the value in the immediately preceding period.

Iwanicz-Drozdowska et al. (2023) distinguish:

- nominal dynamics:

$$ND = \frac{A_1}{A_0} \cdot 100\% \quad (4.18)$$

where,

ND – nominal dynamics.

A1 – value of a given variable at time t1.

A0 – value of the variable at time t0.

- real dynamics:

$$RD = \frac{ND}{1 + I} \quad (4.19)$$

where,

RD – real dynamics.

I – inflation rate.

Lending dynamics are most commonly examined on a quarterly (q/q) or annual (y/y) basis, with annual dynamics often analysed by comparing quarter-end data with the same quarter of the previous year. Figure 4.2 illustrates the annual dynamics of lending activity in European Union countries.

The data in Figure 4.2 reflects the dynamics of monetary financial institution exposures to non-financial corporations and households. The conversion of exposures from the national currencies of non-euro area countries into the euro means that in the case of appreciation of those currencies against the euro, the actual lending dynamics are higher than those shown in Figure 4.2. It should also be emphasised that Figure 4.2 presents nominal dynamics. Figure 4.3 shows the average and median annual lending dynamics in EU countries.

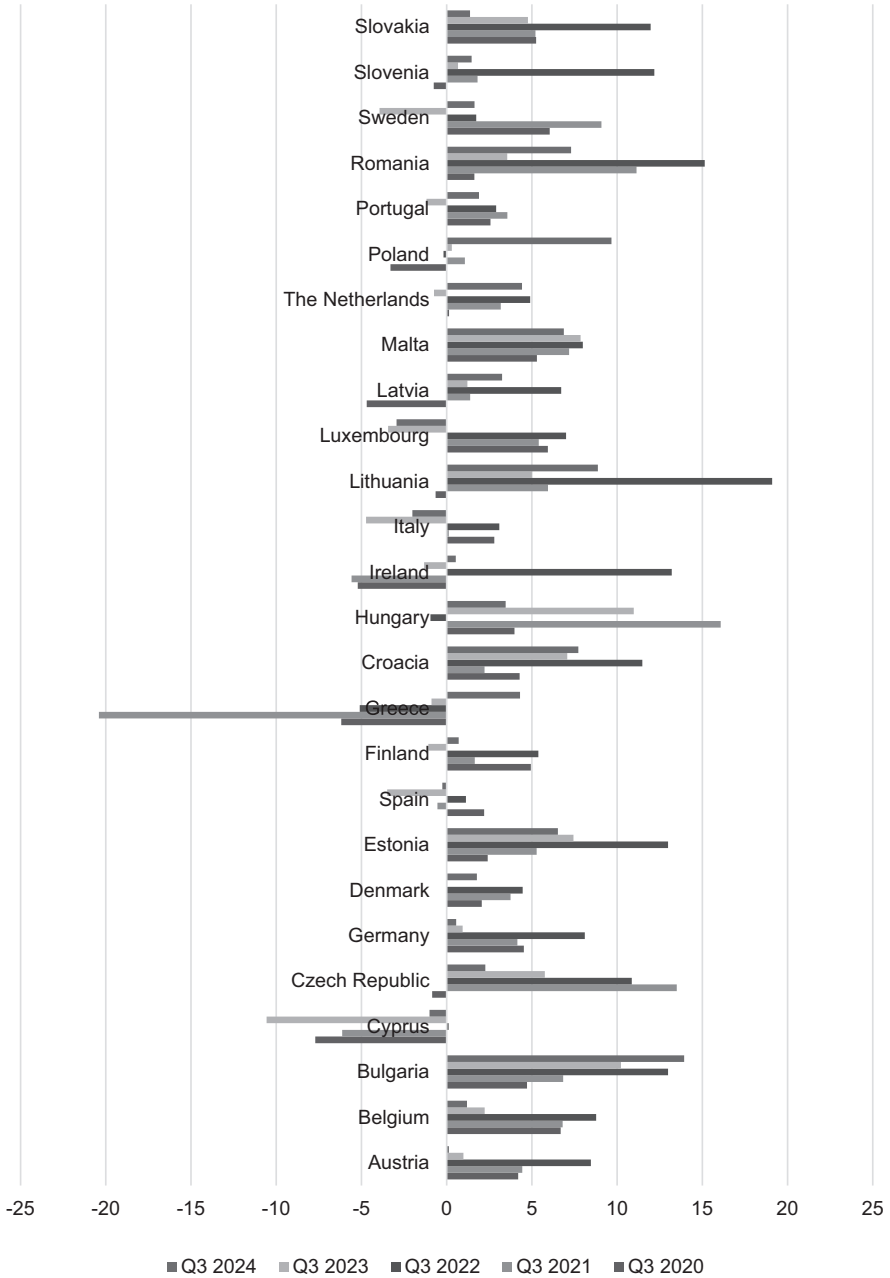


Figure 4.2 Nominal lending dynamics in European banking sectors between 2020 and 2024  
 Source: Own elaboration based on ECB data

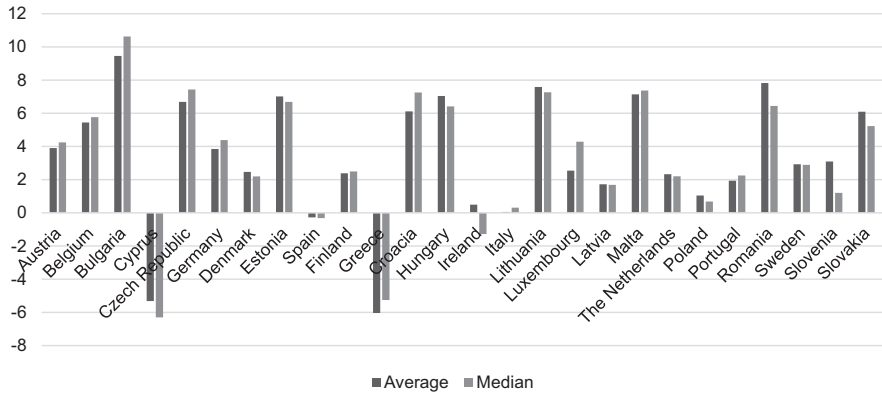


Figure 4.3 Average and median nominal lending dynamics in EU countries between 31.03.2000 and 30.09.2024

Source: Own elaboration based on ECB data

An analysis of the data presented in Figures 4.2 and 4.3 indicates that, with some exceptions, the highest lending dynamics are found in Central and Eastern European countries, which particularly applies to the years 2023–2024. Lending activity, on the other hand, was contracted in countries that have experienced crises over the past two decades (Cyprus and Greece).

Lending dynamics are a function of many factors, including:

- the stringency of capital regulations – tightening them reduces banks’ capacity to extend new loans, whereas increasing equity capital boosts lending. The flexibility of lending in response to capital increases and regulatory requirements has been studied, among others, by Malovaná et al., 2023
- the stringency of macroprudential regulations regarding permissible lending parameters, for example lowering the maximum permissible LTV or LTI ratio (Behncke, 2023),
- loan demand arising from the expectations of enterprises and households regarding future economic conditions (the level of optimism among managers and consumers) and the current monetary policy stance,
- ownership structure – research shows that state-controlled banks conduct less pro-cyclical lending policies compared to private and foreign banks, smoothing credit cycles during economic expansions and contractions, a phenomenon that intensifies in times of financial turbulence. Additionally, the impact of ownership structure on lending dynamics varies by type of financial crisis. If the source of the crisis is global, foreign banks do not behave significantly differently from domestic private banks; if local, foreign banks restrict lending far more than domestic private banks and state-controlled banks (Çolak and Şenol, 2021).

This monograph is primarily dedicated to indicators for assessing an individual commercial bank, with a question arising as to how this relates to an analysis of lending dynamics at the aggregate level. There are at least two contexts:

- a high lending dynamic in a given bank compared to the banking sector (excluding the bank under study) may point to a relaxation of credit assessment standards or aggressive pricing policy,
- high lending dynamics in a given banking sector may suggest evidence of a loosening of macroprudential or monetary policy, or both. Credit booms accompanied by relaxed creditworthiness standards have frequently led to financial crises, the consequences of which affect all banks in the sector (Gertler et al., 2020; Ivashina et al., 2024).

#### **4.6 Profitability of European commercial banks in the third decade of the 21st century**

During the pandemic, many companies experienced a sudden decline in revenue and cash flows, threatening their debt servicing capacity and raising questions about the need for credit provisioning. The reduction in net interest revenue due to interest rate cuts weakened bank profitability, while the economic shock reduced demand for banking services, resulting in a decrease in non-interest income (Beck and Keil, 2022; Ozili and Arun, 2020; Alkhazali et al., 2024).

Focusing the analysis on banks supervised by the ECB, it should be noted that all supervised entities are by default classified as less systemically important institutions (LSIs). They are considered systemically important institutions (SIs) if they meet at least one criterion set out in the SSM Framework Regulation, that is size, importance to the economy of the home country or the entire EU, or cross-border activities. As at December 2023, 110 banks were classified as significant, with around 2,000 as less significant. LSIs are supervised by national authorities under ECB oversight, while SIs are supervised directly by the ECB (ECB, 2024b).

Figures 4.4–4.7 present selected profitability measures for euro area banks and a breakdown of their income.

Analysis of the data depicted in Figures 4.4 and 4.5 indicates that both return on equity and return on assets have increased in line with the rise in the ECB deposit rate, with systemically important banks exhibiting a higher return on equity than LSIs, which attests to better capital management in large credit institutions. No unequivocal conclusion can be drawn with regard to ROA, with the lack of SI supremacy in this area potentially stemming from relatively lower risk appetite, itself a consequence of stricter supervisory oversight, which correlates with the higher net interest margin (NIM) observed for less significant banks throughout the period under review. The operating income structure of both significant and less significant banks is fairly similar, confirming the homogeneity of European banking sectors. It is also noteworthy that in 2022, less significant banks recorded an above-average share of both interest

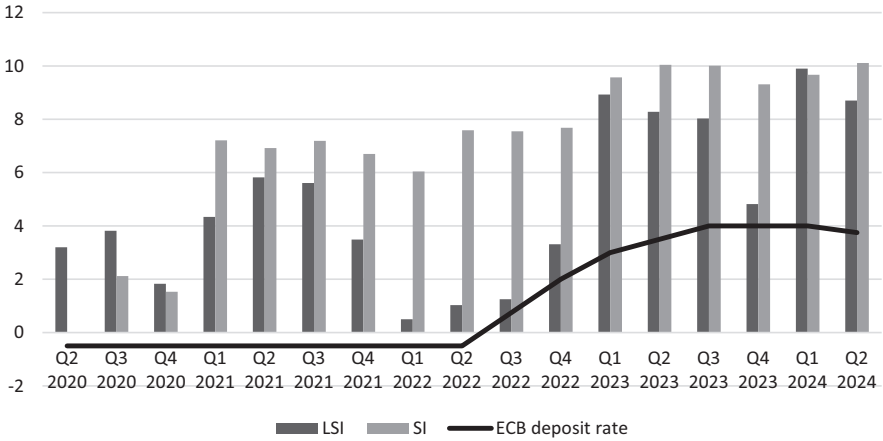


Figure 4.4 ROE of significant (SI) and less significant (LSI) euro area banks against the ECB deposit rate (in percentage points)

Source: Own elaboration based on ECB data

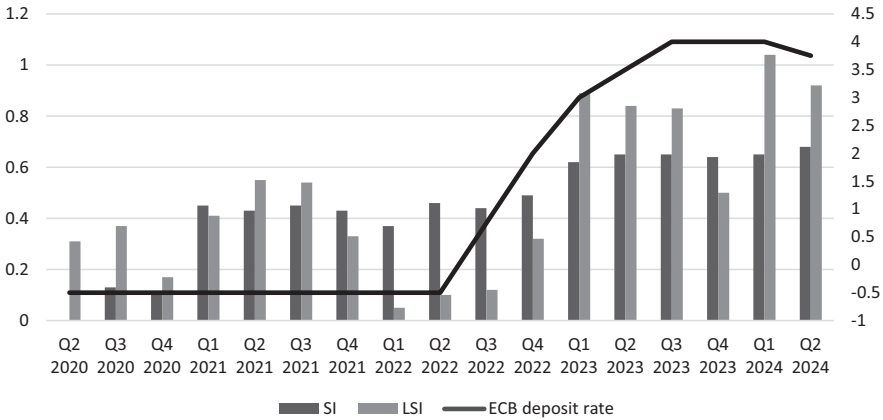


Figure 4.5 ROA of significant (SI) and less significant (LSI) euro area banks against the ECB deposit rate (in percentage points)

Source: Own elaboration based on ECB data

and commission income. The sum of these shares exceeds 100%, which is attributable to the trading losses reported by these less significant institutions in that period.

The aggregate return on equity (ROE) of euro area systemically important institutions declined from 5.3% at the end of 2019 to 1.3% in the fourth quarter of

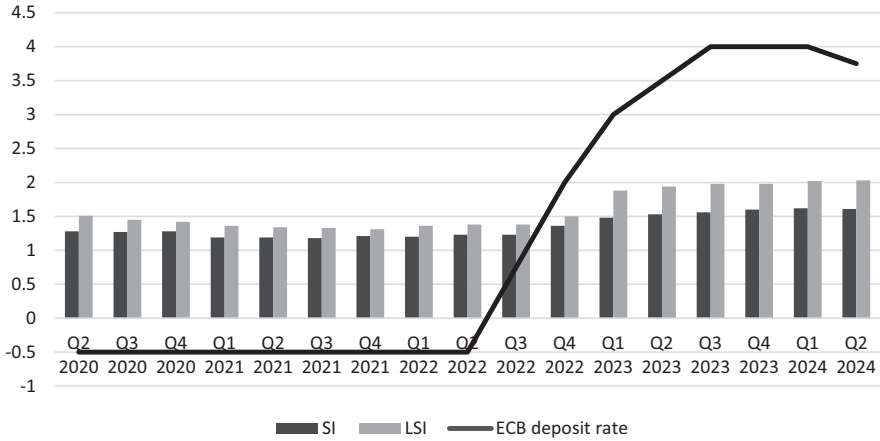


Figure 4.6 NIM of significant (SI) and less significant (LSI) euro area banks against the ECB deposit rate (in percentage points)

Source: Own elaboration based on ECB data

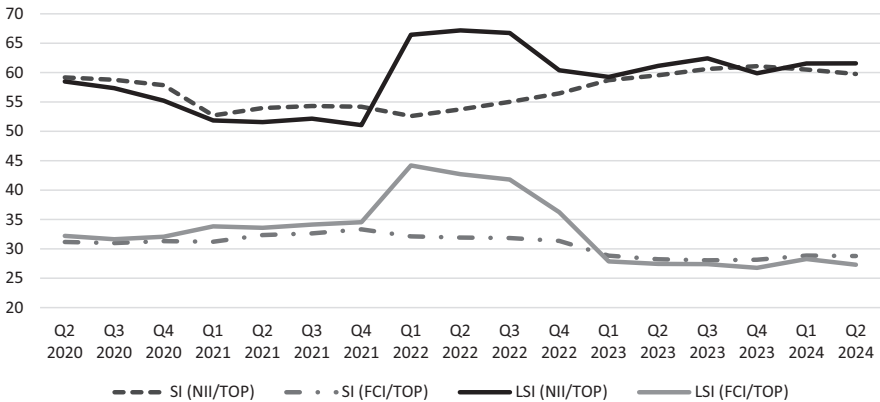


Figure 4.7 Decomposition of operating income of significant (SI) and less significant (LSI) euro area banks (in percentage points)

Source: Own elaboration based on ECB data

2020. While the first half of 2020 was marked by substantial loan loss provisioning to cover the pandemic’s effects, the second half saw a marked decrease in income, primarily due to weaker demand for corporate loans. The decline in ROE was more pronounced in countries more affected by previous crises; in Cyprus, Greece, Ireland, Italy, Portugal, and Spain, ROE was negative (ECB, 2021). Following the

outbreak of war in Ukraine, energy prices surged, fuelling cost-driven inflation. Central banks raised interest rates, which drove up rates in the interbank market, improving bank profitability via higher net interest income and net interest margin, especially in countries with a large share of variable-rate loans. Banks were relatively slow to increase deposit rates for households, which was the main driver of higher ROE, in contrast to 2021, when the return on capital was boosted by the release of loan loss provisions. Changes in loan loss provisioning in 2022 were rather mixed, with a slight majority of banks recording an increase in rolling cost of risk between the end of 2021 and mid-2022, and banks most exposed to energy-intensive sectors tending to increase their provisions. Likewise, some banks considerably increased reserves for exposures to Russia and Ukraine in the first half of 2022, although in aggregate terms, the war in Ukraine did not lead to a substantial increase in provisions significant enough to affect ROE (ECB, 2023a, 2023b).

As of the end of Q2 2024, while European banks' profitability remained at historically high levels, most banks were already experiencing a decline in interest income, attributed to the onset of the interest rate-cutting cycle, with relatively high ROE values largely attributable to improved operational efficiency, particularly lower administrative and depreciation/amortisation costs. By mid-2024, both net interest income and net interest margin reached historical peaks. The main driver (interest income) of rising bank profitability began to lose momentum, reflecting the aforementioned decline in interest rates, negatively impacting ROE. The ROE projection to 2026, however, points to stabilisation of the return on capital due to expectations that the reduction in interest income will be offset by lower operating costs. The ECB has also noted the dispersion of bank profitability, manifested by the above-average profitability of the largest euro area commercial banks, which subsides as bank profitability declines (ECB, 2024a).

An analysis of the profitability of non-euro area banking sectors may also prove instructive, with the Polish banking sector being a representative example in this context. As an EU member state directly bordering both Ukraine and Russia, Poland's economy remains highly dependent on fossil fuel prices and availability, as well as climate policy. Figure 4.8 presents the evolution of selected profitability measures for the Polish banking sector.

Relatively low return on equity was already a feature of the Polish banking sector prior to the COVID-19 pandemic, a process that intensified during the pandemic due to low interest rates affecting interest income and provisions for legal risk related to foreign-currency mortgage loans (NBP, 2021), with a decline in return on equity below its cost observed at the same time. Although bank sector profitability in Poland had been falling for some time, it previously remained above or close to the cost of equity (NBP, 2022). As the economy emerged from the pandemic and, subsequently, following the outbreak of the war in Ukraine, inflation and interest rates both rose, accompanied by improved bank profitability. The main driver of this improvement was an increase in interest revenue, whose share in total banking income steadily increased, reaching 80% for commercial banks. From the post-pandemic period to the end of 2023, return on

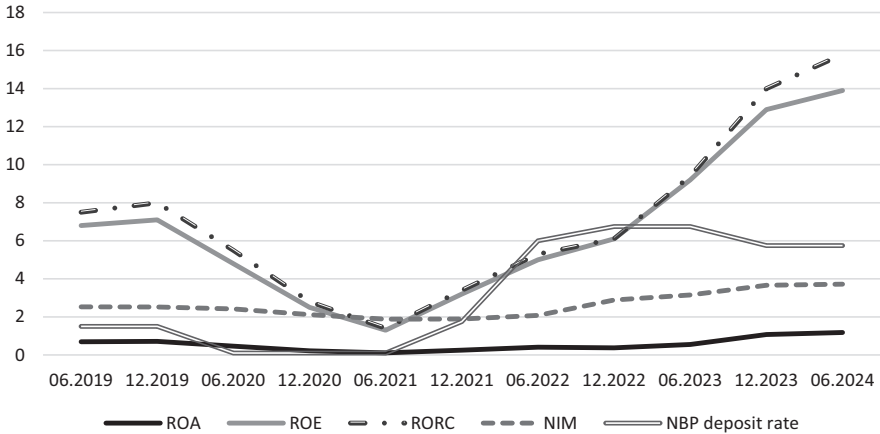


Figure 4.8 Profitability of the Polish banking sector against the National Bank of Poland's reference rate

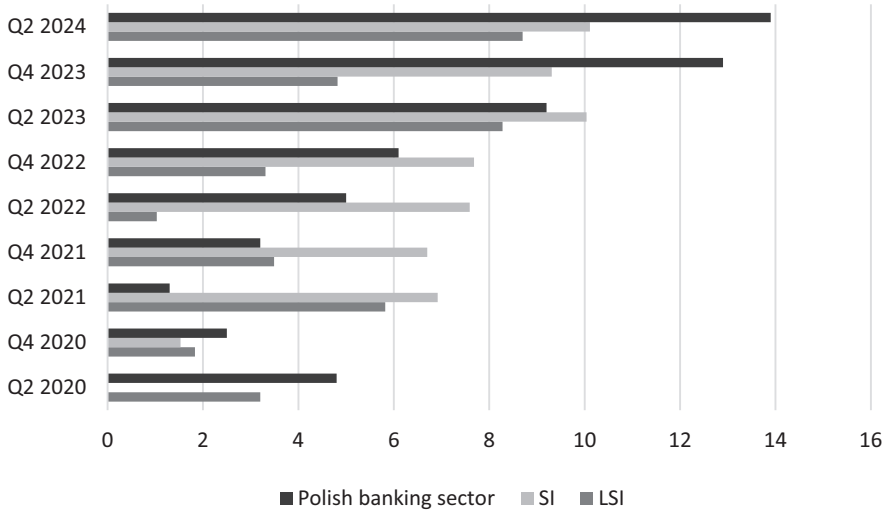
Source: Own elaboration based on NBP data

equity in Polish banks was lower than that of less significant euro area banks (NBP, 2024). The outbreak of the war in Ukraine did not result in higher credit provisions related to sanctions or banks' direct client exposures to the Russian market, but rather the rise in inflation had a more significant, though opposite, effect on bank profitability. On the one hand, higher interest rates reduced creditworthiness, while on the other, they boosted net interest revenue. In 2024, the Polish banking sector recorded an average net interest margin (NIM) compared with other EU countries, and a higher return on equity (see Figure 4.9), although return on equity remained low compared with peer countries in Central and Eastern Europe, due to relatively high effective taxation of banks in Poland and systematic charges against banks' results for legal risk related to foreign-currency mortgage portfolios (NBP, 2024).

#### 4.7 Profitability of banks in empirical research findings

In most studies, the impact of specific variables on various profitability measures (most frequently ROE, ROA and NIM) is subject to verification, with studies focusing exclusively on a single measure of profitability relatively rare. Interestingly, conclusions regarding the influence of individual variables on different profitability measures can sometimes be contradictory. The determinants of commercial bank profitability can be assigned to three groups:

- external variables, identified primarily with indicators describing the macroeconomic environment of the bank,



*Figure 4.9* ROE of the Polish banking sector versus the profitability of euro area banks (SIs and LSIs)

*Source:* Own elaboration based on ECB and NBP data

- variables related to the specific characteristics of a given bank (internal, specific factors),
- structural variables illustrating the characteristics of the banking sector or the financial system in which the bank operates.

A summary of selected research findings on the impact of external factors on various bank profitability measures is presented in Table 4.1 while Table 4.2 outlines results of studies dedicated to internal determinants.

Bank performance is also influenced by cultural factors. For instance, Jackowicz et al. (2024) demonstrate that banks operating in countries with high levels of trust offer comparatively lower loan interest rates, while at the same time, they tend to have relatively lower personnel costs compared to banks operating in countries with lower trust scores.

Structural factors affecting bank profitability can be divided into two groups. The first is banking sector concentration, most often measured by the Herfindahl–Hirschman or Lerner indices, while the second is the scale of the banking sector and its structure in relation to the size of the economy. Most studies indicate a positive impact of banking sector concentration on bank profitability (Kok et al., 2015; Silalahi et al., 2015; Ozili and Arun, 2022; Shahin et al., 2022), which is also enhanced by factors describing the scale, dynamics and structure of the banking sector in relation to the real economy, such as bank loans/GDP (Kok et al., 2015) or deposits/GDP (Brahmaiah and Ranajee, 2018).

Table 4.1 External determinants of bank profitability

<i>Research</i>	<i>Sample</i>	<i>Profitability measure</i>	<i>Independent variables: (+) – positive impact(–) – negative impact</i>
Bonaccorsi di Patti and Palazzo (2020)	Banks from EU countries	ROA	GDP growth rate (+) – the impact of GDP growth is significant only for banks with a high and medium share of loans in total assets and insignificant for banks with a high share of securities in the total assets. Increase in yield curve slope (+)
Karkowska et al. (2025)	196 European banks from 31 countries	ROA, ROE, Net interest revenue/Assets, Commission income/Assets	Inflation increases bank profitability, but at the same time leads to deterioration in operating efficiency indicators.
Mondol and Wadud (2022)	Commercial banks in Bangladesh (2009–2018)	ROA NIM	GDP growth rate (–) GDP growth rate (–), inflation (+) Inflation (+)
Saif-Alyousfi (2020)	2,446 banks from 47 Asian countries (1995–2017)	ROA ROE NIM	GDP per capita (+), inflation (+), interest rates (+), level of economic development (+) GDP per capita (+), inflation (+), interest rates (+), level of economic development (+) GDP per capita (+), inflation (+), interest rates (+), level of economic development (+)
Caliskan and Kirer-Silva-Lecuna (2020)	Turkish banks (1980–2017)	ROA ROE	Inflation (+), interest rates (–), FX (+) Inflation (+), interest rates (–), FX (+)
Genay and Podjasek (2014)	US banks (2011–2013)	NIM ROA	Interest rates (+), employment level in the economy (+), GDP growth rate (+), real estate prices (+) Employment level in the economy (+), GDP growth rate (+), real estate prices (+)
Kok et al. (2015)	98 banks from 19 EU countries (1994–2014)	ROA	Inflation (+, not significant), loans/GDP (+), GDP growth rate (+)
López-Penabad et al. (2022)	2,596 banks from 29 European countries (2011–2019)	NIM	Interest rates (+). A decline in the short-term interest rate reduces the net interest margin in a negative interest rate environment.

(Continued)

Table 4.1 (Continued)

<i>Research</i>	<i>Sample</i>	<i>Profitability measure</i>	<i>Independent variables: (+) – positive impact(–) – negative impact</i>
Ghurtskaia (2018)	Georgian banks (2013–2017)	ROA	GDP growth rate (–, weak), unemployment (–, weak), inflation (–, weak), FDI (+, weak), FX (–, weak)
Ozili and Arun (2022)	Banking sectors of 22 countries (1998–2017)	NIM	EPU – Economic Policy Uncertainty Index (+), GDP growth rate (+)
		ROE	EPU (–), GDP growth rate (+)
		ROA	EPU (–), GDP growth rate (+)
Athari (2021)	Ukrainian banks (2005–2015)	ROE	Political stability (+), global economic instability (–)
		ROA	Domestic political stability (+), global economic instability (–)
Yüksel et al. (2018)	13 banking sectors in post-Soviet countries (1996–2016)	ROE	GDP growth rate (+), loans/GDP (–)
Brahmaiah and Ranajee (2018)	89 Indian banks (2005–2015)	ROA	Deposits/GDP (+), GDP growth rate (–)
		ROE	Deposits/GDP (+), inflation (+)
Khan (2022)	59 banks from Gulf countries (2011–2017)	ROA	GDP growth rate (+), inflation (+)
		ROE	GDP growth rate (+), inflation (+)
Rossi et al. (2018)	Banks from nine euro area countries (2006–2013)	ROA	Pre-subprime crisis: GDP growth rate (–). Post-subprime crisis: GDP growth rate (+)
		ROE	Post-subprime crisis: GDP growth rate (+)
Neves et al. (2020)	66 banks from Iberian Peninsula countries (2011–2016)	ROA	GDP growth rate (+)
		ROE	GDP growth rate (+)
Trujillo-Ponce (2013)	Spanish banks (1999–2009)	ROA	GDP (+),inflation (+),interest rates (–)
		ROE	GDP (+)
Satria et al. (2018)	Ten largest banks from ASEAN countries (1999–2020)	ROA	GDP (+),investment/banking sector assets (+)
Pradhan (2016)	22 Nepalese banks (2005–2011)	ROA	GDP (+),inflation (–)
		ROE	GDP (+),inflation (–)

*Source:* Own elaboration based on Karkowska et al., 2025.

Table 4.2 Internal determinants of bank profitability

<i>Research</i>	<i>Sample</i>	<i>Profitability measure</i>	<i>Independent variables: (+) – positive impact(–) – negative impact</i>
Mondol and Wadud (2022)	Commercial banks in Bangladesh (2009–2018)	ROA ROE NIM	Bank size (–), capital adequacy (+), liquidity (–), operating efficiency (+)
Saif-Alyousfi (2020)	2,446 banks from 47 Asian countries (1995–2017)	ROA ROE NIM	Share of non-traditional income (+), capital adequacy (+), market risk (+), demand deposits (+), credit growth (+), NPL (–)
Caliskan and Kirer-Silva-Lecuna (2020)	Turkish banks (1980–2017)	ROA ROE	Bank size (+), operating efficiency (+), liquidity (+), deposit conversion ratio (+)
Kok et al. (2015)	98 banks from 19 EU countries (1994–2014)	ROA	Bank size (–), capital adequacy (+), operating efficiency (+), share of retail activities (+), credit growth (+), NPL (–), non-interest income/revenue (–)
Ozili and Arun (2022)	Banking sectors of 22 countries (1998–2017)	NIM ROE ROA	Fixed costs/assets (–), capital adequacy (+), NPL (–)
Yüksel et al. (2018)	13 banking sectors in post-Soviet countries (1996–2016)	ROE	Non-interest income/interest income (+)
Brahmaiah and Ranajee (2018)	89 Indian banks (2005–2015)	ROA ROE	Capital quality and structure (+), operating efficiency (+)
Khan (2022)	59 banks from Gulf countries (2011–2017)	ROA  ROE	Bank size (+), operating profit/assets (+), capital adequacy (+), liabilities/assets (+), operating expenses/assets (+), net profit/assets (+) Bank size (+), capital adequacy (–), operating profit/assets (+), liabilities/assets (–), operating expenses/assets (–), net profit/assets (–)

(Continued)

Table 4.2 (Continued)

<i>Research</i>	<i>Sample</i>	<i>Profitability measure</i>	<i>Independent variables: (+) – positive impact(–) – negative impact</i>
Rossi et al. (2018)	Banks from nine euro area countries (2006–2013)	ROA ROE NIM	Pre-subprime crisis: equity/assets (+), costs/income (–); post-crisis: equity/assets (+), costs/income (–) Pre-subprime crisis: credit growth (+), costs/income (–). Post-crisis: costs/income (–) Pre-subprime crisis: loans/assets (+), equity/assets (+), bank size (–). Post-crisis: equity/assets (+), costs/income (–), loans/assets (+), bank size (–)
Neves et al. (2020)	66 banks from the Iberian Peninsula (2011–2016)	ROA ROE	Costs/income (–), interest income/total income (+), deposit growth (+), total loans/assets (–)
Trujillo-Ponce (2013)	Spanish banks (1999–2009)	ROA ROE	NPL/gross loans (+), loan loss provisions/net loans (+), capital/assets (+), costs/income (–)
Satria et al. (2018)	10 largest banks from ASEAN countries	ROA	Capital/assets (+)
Pradhan (2016)	22 Nepalese banks (2005–2011)	ROA ROE	Loans/deposits (+), liquidity (–), market share (+), NPL (–)
Zeitun (2012)	Islamic and conventional banks from Gulf countries (2002–2009)	ROE	Conventional banks: capital (+), costs/income (–); Islamic banks: costs/income (–), bank size (+)
Yuan et al. (2022)	20 banks from India and 20 from Bangladesh (2010–2021)	ROA	Bank size (+), debt/assets (+), deposits/assets (–), loans/deposits (–)
Hasanov et al. (2018)	Azerbaijani banks (2012–2017)	ROA	Bank size (+), capital (+), loans (+), liquidity risk (–)
Mehzabin et al. (2023)	492 banks from 28 Asian countries (2004–2018)	NIM	Loans/assets (+), costs/income (–)
Çollaku and Aliu (2021)	Kosovan banks (2010–2019) (2010–2019)	ROA	NPL (–)
Karkowska and Niedziółka (2019)	European banks (2000–2016)	ROA	Loans/Assets (+), loans/deposits (+), loans/(deposits + capital) (–)

(Continued)

Table 4.2 (Continued)

<i>Research</i>	<i>Sample</i>	<i>Profitability measure</i>	<i>Independent variables: (+) – positive impact(–) – negative impact</i>
Shahin et al. (2022)	22 Egyptian banks (2011–2020)	ROA NIM	Capital adequacy (+), costs/income (–), bank size (+) Capital adequacy (+), costs/income (–), bank size (+), ln of cash balances (–)
Bongini et al. (2019)	109 banking holdings (2006–2016)	Return on lending activity	NPL (–)
Derbali (2024)	Tunisian banks (1999–2020)	NIM ROA	Credit risk (–), capital (+), bank size (+), deposits (–)
Almaskati (2022)	Listed banks with a minimum market capitalisation of USD 500 million (2000–2019)	ROA  NIM	NPL (+), Z-score (+), bank size (+), capital/assets (+), credit growth (+), loans/assets (+), non-interest income/assets (+), operating expenses/assets (+), RWA/assets (+), (cash + liquid securities)/assets (+) NPL (+), Z-score (+), bank size (+), capital/assets (+), credit growth (+), loans/assets (+), non-interest income/assets (+), operating expenses/assets (+), RWA/assets (+)

Source: Own elaboration based on Karkowska et al., 2025.

**References**

- Alkhezali, O., Helmi, M. H., Mirzaei, A., & Saad, M. (2024). The impact of capital on bank profitability during the COVID-19 pandemic. *Global Finance Journal*, 62. <https://doi.org/10.1016/j.gfj.2024.100994>
- Almaskati, N. (2022). The determinants of bank profitability and risk: A random forest approach. *Cogent Economics & Finance*, 10(1). <https://doi.org/10.1080/23322039.2021.2021479>
- Asmare, E., & Begashaw, A. (2018). Review on parametric and nonparametric methods of efficiency analysis. *Open Access Biostatistics & Bioinformatics*, 2(2). <https://doi.org/10.31031/AAOA.2018.02.000534>
- Athari, S. A. (2021). Domestic political risk, global economic policy uncertainty, and banks' profitability: Evidence from Ukrainian banks. *Post-Communist Economies*, 33(4), 458–483.
- Barburski, J. (2010). Ekonometryczny pomiar efektywności ekonomicznej instytucji finansowych. Stochastyczny model graniczny kosztów. *Bank i Kredyt*, 41(1), 31–56.
- Beck, T., & Keil, J. (2022). Have banks caught corona? Effects of COVID on lending in the U.S. *Journal of Corporate Finance*, 72. <https://doi.org/10.1016/j.jcorpfin.2022.102160>
- Behncke, S. (2023). Effects of macroprudential policies on bank lending and credit risks. *Journal of Financial Services Research*, 63, 175–199. <https://doi.org/10.1007/s10693-022-00378-z>
- Bonaccorsi di Patti, E., & Palazzo, F. (2020). Bank profitability and macroeconomic conditions: Are business models different? *Economic Notes*, 49(2). <https://doi.org/10.1111/ecn.12155>
- Bongini, P., Cucinelli, D., Di Battista, M. L., & Nieri, L. (2019). Profitability shocks and recovery in time of crisis evidence from European banks. *Finance Research Letters*, 30, 233–239. <https://doi.org/10.1016/j.frl.2018.10.003>
- Botshekan, M. H., Abdollahi Poor, M. S., Takaloo, A., & Naeimabadi, M. (2023). The impact of banking health indicators on Return on Risk-Weighted Assets (RORWA) index in commercial banks: Evidence from Iran. *Journal of Money and Economy*, 17, 437–456. <https://doi.org/10.29252/jme.17.4.437>
- Brahmaiah, B., & Ranajee. (2018). Factors influencing profitability of banks in India. *Theoretical Economics Letters*, 8, 3046–3061. <https://doi.org/10.4236/tel.2018.814189>
- Caliskan, M. M. T., & Kirer-Silva-Lecuna, H. (2020). The determinants of banking sector profitability in Turkey. *Business and Economics Research Journal*, 11, 161–167. <https://doi.org/10.20409/berj.2020.242>
- Chen, S. (2014). *Integrated Bank Analysis and Valuation: A Practical Guide to the ROIC Methodology*. London: Palgrave Macmillan.
- Chudy, K., Sobolewski, M., & Stępień, K. (2012). *Analiza efektywności banków w Polsce w latach 1996–2007*. Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej.
- Çolak, M. S., & Şenol, A. (2021). Bank ownership and lending dynamics: Evidence from Turkish banking sector. *International Review of Economics & Finance*, 72, 583–605. <https://doi.org/10.1016/j.iref.2020.11.014>
- Çollaku, B., & Aliu, M. (2021). Impact of non-performing loans on bank's profitability: Empirical evidence from commercial banks in Kosovo. *Journal of Accounting, Finance and Auditing Studies*, 7(3), 226–242. <https://doi.org/10.32602/jafas.2021.027>
- Dec, P. (2016). *Ocena kondycji i metody predykcji bankructwa banku*. Warszawa: Oficyna Wydawnicza SGH.
- Derbali, A. M. S. (2024). The factors determining the profitability of Tunisian banks. In A. M. S. Derbali (Ed.), *Smart Strategies and Societal Solutions for Sustainable International Business*. Hershey: IGI Global. <https://doi.org/10.4018/979-8-3693-0532-4.ch009>
- DeYoung, R. (1996). A diagnostic test for the distribution-free efficiency estimator: An example using U.S. commercial bank data. *WP 96-2*. The Office of the Comptroller of the Currency (OCC).

- ECB – European Central Bank. (2021). *Financial Stability Review*, May. <https://www.ecb.europa.eu/press/financial-stability-publications/fsr/html/ecb.fsr202105~757f727fe4.pl.html#toc25>
- ECB – European Central Bank. (2023a). *Financial Stability Review*, May. <https://www.ecb.europa.eu/press/financial-stability-publications/fsr/html/ecb.fsr202305~65f8cb74d7.pl.html>
- ECB – European Central Bank. (2023b). *Financial Stability Review*, November. <https://www.ecb.europa.eu/press/financial-stability-publications/fsr/html/ecb.fsr202311~bfe9d7c565.en.html>
- ECB – European Central Bank. (2024a). *Financial Stability Review*, November. <https://www.ecb.europa.eu/press/financial-stability-publications/fsr/html/ecb.fsr202411~dd60fc02c3.pl.html>
- ECB – European Central Bank. (2024b). *What Are Less Significant Institutions?*, August. <https://www.bankingsupervision.europa.eu/about/banking-supervision-explained/html/lsi.en.html>
- Genay, H., & Podjasek, R. (2014). What is the impact of a low interest rate environment on bank profitability? *Chicago Fed Letter*, 324. <https://www.chicagofed.org/publications/chicago-fed-letter/2014/july-324>
- Gertler, M., Kiyotaki, N., & Prestipino, N. (2020). Credit booms, financial crises and macroprudential policy. *NBER, Working Paper*, 27481. <https://doi.org/10.3386/w27481>
- Ghurtskaia, K. (2018). Macroeconomic determinants of bank profitability: Evidence from Georgia. *Ecoforum*, 7(3), 1–6. <https://core.ac.uk/download/pdf/236086904.pdf>
- Hasanov, F. J., Bayramli, N., & Al-Muschel, N. (2018). Bank-specific and macroeconomic determinants of bank profitability: Evidence from an oil-dependent economy. *International Journal Financial Studies*, 6(78), 2–21. <https://doi.org/10.3390/ijfs6030078>
- Ivashina, V., Kalemli-Özcan, S., Laeven, L., & Müller, K. (2024). Corporate debt, boom-bust cycles, and financial crises. *NBER, Working Paper*, 32225. <https://doi.org/10.3386/w32225>
- Iwanicz-Drozdowska, M. (2012). *Zarządzanie finansowe bankiem*. Warszawa: Polskie Wydawnictwo Ekonomiczne.
- Iwanicz-Drozdowska, M., Jaworski, W. L., Szelągowska, A., & Zawadzka, Z. (2023). *Bankowość w gospodarce cyfrowej*. Warszawa: Poltext.
- Jackowicz, K., Kozłowski, L., & Wnuczak, P. (2024). Do local differences in trust affect bank lending activities? *Finance Research Letters*, 61. <https://doi.org/10.1016/j.frl.2024.105004>
- Jarzębowski, S. (2014). Metody oceny efektywności przedsiębiorstw – porównanie wyników. *Roczniki Naukowe*, 16(6), 161–166, Stowarzyszenie Ekonomistów Rolnictwa i Agrobiznesu.
- Karkowska, R., Korzeb, Z., & Niedziółka, P. (2025). Inflation's dual impact on European banks' profitability. *Journal of Policy Modeling* (forthcoming). <https://doi.org/10.1016/j.jpolmod.2024.11.004>
- Karkowska, R., & Niedziółka, P. (2019). Rentowność banków komercyjnych a ich płynność w kontekście implementacji ilościowych norm płynności rekomendowanych przez Bazyłejski Komitet ds. Nadzoru Bankowego. *Bank i Kredyt*, 50(2), 149–172.
- Khan, S. (2022). Determinants of banks profitability: An evidence from GCC countries. *Journal of Central Banking Theory and Practice*, 11(3), 99–116. <https://doi.org/10.2478/jcbtp-2022-0025>
- Kok, C., Mór, C., & Pancaro, C. (2015). Bank profitability challenges in euro area banks: The role of cyclical and structural factors. *Financial Stability Review*. [https://www.ecb.europa.eu/pub/pdf/fsr/art/ecb.fsrart201505\\_02.en.pdf](https://www.ecb.europa.eu/pub/pdf/fsr/art/ecb.fsrart201505_02.en.pdf)
- Kopiński, A., & Porębski, D. (2015). Próba oceny efektywności banków komercyjnych za pomocą metody DEA. *Annales Universitatis Mariae Curie – Skłodowska Lublin*, 49(4), Sectio H. <https://doi.org/10.17951/h.2015.49.4.257>

- KPMG. (2020). *Risk-Adjusted Profitability Management at Banks*. <https://assets.kpmg.com/content/dam/kpmg/in/pdf/2020/06/risk-adjusted-profitability-management-at-banks.pdf>
- Li, X., Feng, H., Zhao, S., & Carter, D. A. (2021). The effect of revenue diversification on bank profitability and risk during the COVID-19 pandemic. *Finance Research Letters*, 43. <https://doi.org/10.1016/j.frl.2021.101957>
- López-Penabad, M. C., Iglesias-Casal, A., & Silva Neto, J. F. (2022). Effects of a negative interest rate policy in bank profitability and risk taking: Evidence from European banks. *Research in International Business and Finance*, 60, 101597. <https://doi.org/10.1016/j.ribaf.2021.101597>
- Malovaná, S., Hodula, M., Bajzík, J., & Gric, Z. (2023). Bank capital, lending, and regulation: A meta-analysis. *Journal of Economic Surveys*, 38(3), 823–851. <https://doi.org/10.1111/joes.12560>
- Marcinkowska, M. (2003). *Wartość banku. Kreowanie wartości i pomiar wyników działalności banku*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
- Mehzabin, S., Shahriar, A., Hoque, M. N., Wanke, P., & Azad, M. A. K. (2023). The effect of capital structure, operating efficiency and non-interest income on bank profitability: New evidence from Asia. *Asian Journal of Economics and Banking*, 7(1), 25–44. <https://doi.org/10.1108/AJEB-03-2022-0036>
- Mondol, D. K., & Wadud, Md. A. (2022). Determinants of profitability of commercial banking in Bangladesh: A panel analysis. *International Journal of Statistical Sciences*, 22(1), 115–143. <https://csa.ru.ac.bd/stat-ijss/journals/v-22-iss-1-06/>
- NBP – Narodowy Bank Polski. (2021). *Raport o stabilności systemu finansowego*, Grudzień. <https://nbp.pl/wp-content/uploads/2022/09/rsf122021.pdf>
- NBP – Narodowy Bank Polski. (2022). *Raport o stabilności systemu finansowego*, Grudzień. <https://nbp.pl/wp-content/uploads/2022/12/rsf122022.pdf>
- NBP – Narodowy Bank Polski. (2024). *Raport o stabilności systemu finansowego*, Grudzień. <https://nbp.pl/wp-content/uploads/2024/12/Raport-o-stabilnosci-systemu-finansowego.-Grudzien-2024.pdf>
- Neves, M. E., Proença, C., & Dias, A. (2020). Bank profitability and efficiency in Portugal and Spain: A non-linearity approach. *Journal of Risk and Financial Management*, 13(11), 284. <https://doi.org/10.3390/jrfm13110284>
- Olalere, O., Islam, M. A., & Rahmi, M. N. (2021). The effect of revenue diversification on the firm value and stability of banks: A comparative study of Nigerian and Malaysian banks. *Banks and Bank Systems*, 16(3), 141–151. [https://doi.org/10.21511/bbs.16\(3\).2021.13](https://doi.org/10.21511/bbs.16(3).2021.13)
- Ozili, P. K., & Arun, T. (2020). Spillover of COVID-19: Impact on the global economy. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3562570>
- Ozili, P. K., & Arun, T. (2022). Does economic policy uncertainty affect bank profitability? *MPRA*. [https://mpra.ub.uni-muenchen.de/114403/1/MPRA\\_paper\\_114403.pdf](https://mpra.ub.uni-muenchen.de/114403/1/MPRA_paper_114403.pdf)
- Piowarska, H. (2010). Ocena efektywności technicznej krajowych elektrowni oraz elektrociepłowni zawodowych ciepłych z wykorzystaniem metody DEA. *Energetyka*, 4(2010). [https://www.cire.pl/pliki/2/oc\\_efekt\\_tech.pdf](https://www.cire.pl/pliki/2/oc_efekt_tech.pdf)
- Pradhan, R. S. (2016). Bank specific and macroeconomic determinants of bank profitability: A case of Nepal. <http://dx.doi.org/10.2139/ssrn.2793484>
- Rossi, S., Borroni, M., Lippi, A., & Piva, M. (2018). Determinants of bank profitability in the Euro area: What has changed during the recent financial crisis? *International Business Research*, 11(5), 18–27. <https://doi.org/10.5539/ibr.v11n5p18>
- Saif-Alyousfi, A. Y. H. (2020). Determinants of bank shareholder value: Evidence from GCC countries. *International Journal of Managerial Finance*, 16(2), 224–252. <https://doi.org/10.1108/IJMF-05-2019-0170>
- Satria, I., Supriyadi, E., Irfani, A., & Djamil, A. (2018). The most important factors affecting profitability of the top 10 commercial banks in Asean. *The International Journal of Social Sciences and Humanities Invention*, 5(5), 4742–4753. <https://doi.org/10.18535/ijsshi/v5i5.15>

- Schreiber, B. Z. (2024). The impact of revenue diversification on profitability, capital, and risk in US banks by size. *The North American Journal of Economics and Finance*, 69(A). <https://doi.org/10.1016/j.najef.2023.102000>
- Shahin, R., Khalil, M., & Sallam, H. (2022). The nexus between interest rate and bank profitability: Does bank prudential capital matter? *Banks and Bank Systems*, 17(2), 113–123. [https://doi.org/10.21511/bbs.17\(2\).2022.10](https://doi.org/10.21511/bbs.17(2).2022.10)
- Silalahi, T., Manurung, A., & Hidayat, Y. (2015). The Market structure of the bank, its performance and the macroprudential policy. *Buletin Ekonomi Moneter Dan Perbankan*, 18(1), 45–60. <https://doi.org/10.21098/bemp.v18i1.514>
- Sinn, W., D'Acunto, R., & Oldrin, A. (2013). *Striking the Right Balance between Risk and Return*. Bain & Company. [https://media.bain.com/Images/BAIN\\_REPORT\\_European\\_banking.pdf](https://media.bain.com/Images/BAIN_REPORT_European_banking.pdf)
- Skrzypek, J., & Trojak, R. (2014). Pomiar efektywności banków w Polsce z wykorzystaniem stochastycznej analizy granicznej. *Acta Universitatis Lodzianis. Folia Oeconomica*, 3(303). <https://ruj.uj.edu.pl/server/api/core/bitstreams/02dc5f1a-c81a-4af8-9f59-4bc1944308d8/content>
- Stępień, K. (2015). Kilka uwag i badania efektywności banków. Przypadek Polski. *Kwartalnik Kolegium Ekonomiczno-Społecznego Studia i Prace*, 3(2), 97–110. <https://econjournals.sgh.waw.pl/kwes/article/view/367/327>
- Stola, E. (2010). Efektywność techniczna banków komercyjnych a skala ich działalności. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, 144, 480–488.
- Trujillo-Ponce, A. (2013). What determines the profitability of banks? Evidence from Spain. *Accounting & Finance*, 53, 561–586. <https://doi.org/10.1111/j.1467-629X.2011.00466.x>
- Wardzińska, K. (2012). Stochastyczna analiza graniczna: przegląd zastosowań. *Ekonomia i Zarządzanie*, 4(4), 123–134.
- Yuan, D., Gazi, M. A. I., Harymawan, I., Dhar, B. K., & Hossain, A. I. (2022). Profitability determining factors of banking sector: Panel data analysis of commercial banks in South Asian countries. *Frontiers in Psychology*, 13, 1000412. <https://doi.org/10.3389/fpsyg.2022.1000412>
- Yüksel, S., Mukhtarov, S., Mammadov, E., & Özsarı, M. (2018). Determinants of profitability in the banking sector: An analysis of Post-Soviet countries. *Economies*, 6(41), 2–15. <https://doi.org/10.3390/economies6030041>
- Zeitun, R. (2012). Determinants of Islamic and conventional banks performance in GCC countries using panel data analysis. *Global Economy and Finance Journal*, 5(1), 53–72. <https://doi.org/10.12691/jfe-4-3-2>
- Zimny, A. (2010). *Statystyka opisowa*. Konin: Państwowa Wyższa Szkoła Zawodowa w Koninie.