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## Credit Policy of Commercial Banks in EU and the Asset Quality of Non-Financial Corporate Loan Portfolio in 2009-2021

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Aneta Kosztowniak<sup>1</sup>

**Abstract:**

**Purpose:** The study aims to identify changes in the credit activity of banks in EU, including the loan portfolio of non-financial corporation's (NFCs) and main determinants of non-performing loans (NPLs) in Poland in the period Q1.2009 - Q4.2021.

**Design/Methodology/Approach:** The study presents the differences in the NPL rates and debt servicing costs in the Visegrad Group countries, as well as Germany and France. The author presents the results of an overview of NPL research on EU countries. In modelling the NPLs granted to NFCs in Poland the variables used are, macroeconomic (market), financial variables of corporations, and banking conditions.

**Findings:** The analysis of NPL changes shows that there was a long-term downward trend confirming the improvement in the quality of the portfolio of loans of NFCs. However, the last quarters (during the COVID pandemic) have brought an increase in the NPLs. Results of the impulse function confirmed, that the NPLs showed declining trends in response to impulses from, NPL's own changes, GDP, CPI, WIBOR, ROAC, GFCF, TOFSP and the increasing trends in response to changes, CROAC, GTPR, AIRCL, CAR and CR of CR. Results of variance decomposition indicate that the main pillar of the explanation of NPL changes were, GDP, GFCF as well as CPI and WIBOR.

**Practical Implications:** The results of the research will enable the management of the loan portfolio of NFCs and credit risk management.

**Originality/Value:** The article contains a literature review and current research results concerning the analyzed issue Results of the NPLs research confirmed the pro-cyclical nature of lending activity in Poland in the verified years.

**Keywords:** Banks, credit policy, asset quality, loan portfolio, NPLs, NFCs, credit risk, UE, Poland.

**JEL classification:** E4, E5, G2.

**Papier type:** A research study.

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<sup>1</sup>SGH Warsaw School of Economics, College of Management and Finance, Department of Applied Economics, Warsaw, Poland, and the NBP. The views expressed in this study are the views of the author and do not necessarily reflect those of NBP.

ORCID ID: 0000-0001-6088-1899, [akoszt@sgh.waw.pl](mailto:akoszt@sgh.waw.pl);

## **1. Introduction**

The bank's credit policy is adjusted to its specificity and changing economic conditions, while maintaining the security of loan portfolio management. In terms of risk assessment in the banking sector, the Basel regulations are of great importance (Basel Committee on Banking Supervision, 2014). An important group of instruments used to mitigate credit risk are exposure concentration limits: internal (created by banks) and external (supervisory), which are defined in legal regulations (including numerous directives).

A significant problem related to the credit policy is the quality of the loan portfolio. The quality of the loan portfolio depends on the exposure to banking risks, especially credit risk. Among the credit risk factors, there are internal factors – endogenous inside business entities and external factors – endogenous in the environment of enterprises and independent of them. The bank's credit policy and credit portfolio management are adjusted to the internal and external factors independent from them. Among the many reasons for the quality of the portfolio, the following should be mentioned:

- overall increase in financial risk in the economy,
- sudden changes in the economy, resulting on the one hand in the need for quick adjustments of all business entities, and on the other hand – reducing the possibility of hedging against risk,
- increasing number of bankrupting enterprises, which results from the increase in the number of companies established in order to obtain high ad hoc profits, often on speculative transactions, increasing risk in foreign trade due to the increase in the number of heavily indebted countries and with a high inflation rate,
- growing competition on the banking services market, limiting the banks' ability to choose customers.

When analyzing credit risk, it is important to distinguish between individual risk, portfolio risk and risk of individual client (natural person) from the credit risk of institutional client (enterprise). Individual assessment of the creditworthiness of enterprises is determined on the basis of many financial indicators. In addition, banks for internal needs forecast changes in the quality of loans, for example to enterprises, using: credit exposures, the results of corporate financial statements and numerous macroeconomic indicators.

One of the final effects of the assessment of banks' lending policies is changes in the portfolio of non-performing loans (NPLs). As NPLs can cause monetary crises that may turn into financial crises affecting an entire economy, monitoring them is very important. If NPLs are not identified and recognized efficiently, both in terms of speed and scope, NPL resolution effectiveness is undermined, which in turn will have negative effects on banking sector and finally on GDP growth.

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There are still differences in NPL levels between EU countries, despite many common regulations followed by commercial banks. Therefore, the study presents the main differences in the lending policy and NPLs between the Visegrad group countries as well as Germany and France. Finally, the study aims to identify changes in the credit activity of banks in EU, including the loan portfolio of non-financial corporation's (NFCs) and main determinants of non-performing loans (NPLs) in Poland in the period Q1.2009 - Q4.2021.

## 2. Credit Policy and Non-Performing Loans

Due to the multithreaded scope of portfolio quality in banking activity, the scope of legal regulations, including monitoring, is also extensive. Among the regulations of the European Commission (EC) in the field of financial supervision and management, it is worth mentioning (EC, 2022):

- Financial conglomerates - Directive (2002/87/EC)
- Banking prudential requirements - Directive 2013/36/EU
- Banking prudential requirements - Regulation (EU) No 575/2013
- Bank recovery and resolution - Directive 2014/59/EU
- Deposit guarantee schemes - Directive 2014/49/EU
- Credit rating agencies - Regulation (EC) No 1060/2009
- Prudential supervision of investment firms - Directive (EU) 2019/2034
- Prudential supervision of investment firms - Regulation (EU) 2019/2033.

Supervision of the quality of loan portfolio (including NPLs), is one of the key areas of risk reduction in the European banking sector. European Council notes that the financial crisis and ensuing recessions, together with structural factors, accompanied by inadequate loan origination practices, have left the banks in some Member States with high ratios of NPLs.

The Commission and other EU authorities have long highlighted the urgency of taking the necessary measures to address the risks related to NPLs (ECS, 2019). In order to reduce the high NPL stocks, the EU agreed on a comprehensive set of measures outlined in the "Action Plan to Tackle NPLs in Europe" (European Council, 2017), which is currently being implemented. The ongoing decline of NPLs has been and continues to be one of the key areas for reducing risk in the European banking sector. Still, high NPL ratios remain an important challenge, for some (EC, 2019, June 12; EC, 2019, July 11).

Monitoring the quality of the corporate loan portfolio in the banking sector results from prudential regulations. As part of its package of proposals on NPLs put forward in March 2018, the Commission proposed a Regulation amending the CRR (Regulation EU 575/2013, European Parliament, 2013), introducing a 'statutory prudential backstop' in order to prevent the risk of under-provisioning of future

NPLs (Regulation EU, 2019/630, European Parliament, 2019). The regulation was adopted in April 2019 and it requires banks to have sufficient loan loss coverage (i.e. common minimum coverage levels) for newly originated loans if these become non-performing exposures (NPEs). In case a bank does not meet the applicable minimum coverage level, it has to deduct the shortfall from its own funds.

In a narrow sense, the monitoring of NPLs concerns the diagnosis of the quality of the banking portfolio in terms of many financial indicators (IMF, 2003, May 14, p. 12). A bank loan is considered non-performing when more than 90 days pass without the borrower paying the agreed installments or interest. According European Central Bank (ECB) – the NPLs are also called “bad debt” (ECB, 2020a). The ECB requires asset and definition comparability to evaluate risk exposures across euro area central banks. The ECB specifies multiple criteria that can cause an NPL classification when it performs stress tests on participating banks.

The ECB has performed a comprehensive assessment and developed criteria to define loans as nonperforming if they are:

- 90 days past due, even if they are not defaulted or impaired
- Impaired with respect to the accounting specifics for U.S. GAAP and International Financial Reporting Standards (IFRS) banks
- In default according to the Capital Requirements Regulation (CRR).

The increase in the NPL ratio proves the deterioration of the lending policy. If a bank has too many bad loans on its balance sheet, its profitability will suffer because it will no longer earn enough money from its credit business. However, limiting lending on the part of banks means limiting the sources of financing investments among enterprises and, further, increases unemployment in the economy. Asset quality monitoring is a key area of supervision in banks, along side liquidity and profitability.

The asset quality analysis mainly involves calculation:

- NPLs to total loans,
- NPLs less provisions to capital,
- Sectoral distribution of loans to total loans.

NPLs may affect financial stability as they weigh on the viability and profitability of the affected institutions and have an impact, via reduced bank lending, on economic growth. More specifically, high stocks of NPLs can weigh on bank performance through two main channels:

- NPLs generate less income for a bank than performing loans and thus reduce its profitability, and may cause losses that reduce the bank’s capital. In the most

severe cases, these effects can put in question the viability of a bank, with potential implications for financial stability.

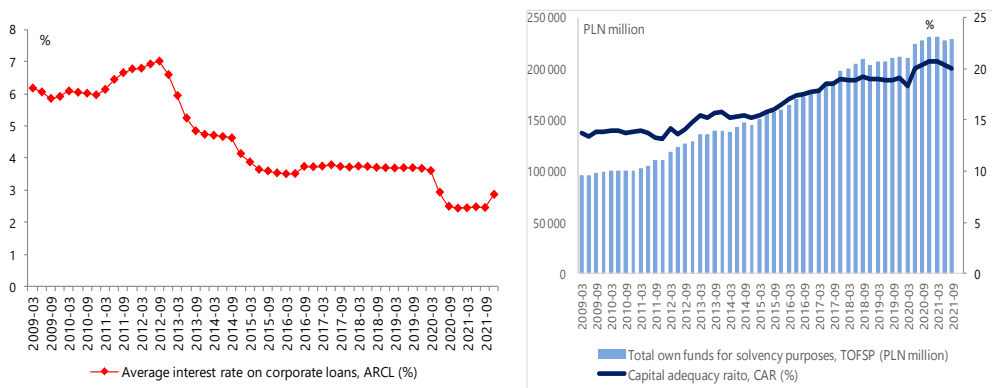
- NPLs tie up significant amounts of a bank's resources, both human and financial. This reduces the bank's capacity to lend, including too small and medium-sized enterprises, which rely on bank lending to a much greater extent than larger companies. In turn, this negative effect in terms of credit supply also reduces the capacity of businesses to invest, affecting economic growth and job creation, hence creating a tangible effect on the real economy (European Commission Services, ECS, 2020).

In case of Poland in the years 2009-2021, the credit policy of banks consisted of:

- on the one hand, the liberalization of interest rates on loans for private and institutional clients, including NFCs – mainly since 2012 – by lowering interest rates on loans,
- on the other hand, increasing the capital requirements of banks, including increasing the capital adequacy ratio and reserves for securing credit risk – which was also served by national recommendations (Polish Financial Supervision Authority, PFSA) and numerous EU directives.

In the period Q3.2012 - Q3.2021, the average interest rate on corporate loans fell from 7.0% to 2.4%. Only in Q4.2021 these rates were raised to 2.9% due to the increase in inflation (consumer price index, CPI) (Figure 1, left panel). In terms of capital requirements and securing capital adequacy, banks systematically raised them. Total own funds for solvency purposes (TOFSP) grew from PLN 95,692 million to PLN 228,037 million. These capitals made it possible to maintain the capital adequacy systematically growing, from 13.7% in Q1.2009 to 20.0% in Q3.2021 on average in banks in Poland (Figure 1, right panel).

**Figure 1.** Average interest rate on corporate loans (left panel), the total own funds for solvency purposes and the capital adequacy ratio (right panel) in Poland in the period of Q1.2009-Q4.2021 (% , PLN million)



Sources: Author's compilation based on NBP 2022.

In the case of Poland, it is worth paying attention to the numerous recommendations of the PFSA regarding the lending policy of banks, including the quality of assets (KNF, 2022):

- Recommendation M – concerning operational risk management in banks.
- Recommendation P – concerning the management of banks' liquidity risk.
- Recommendation R – concerning the principles of identifying balance sheet credit exposures that are impaired, determining: impairment losses on balance sheet credit exposures and provisions for off-balance sheet credit exposures.
- Recommendation R – concerning the principles of credit exposure classification, estimation and recognition of expected credit losses and credit risk management / Recommendation R comes into force on 1 January 2022.
- Recommendation S – concerning good practices in the management of mortgage-secured credit exposures.
- Recommendation S – concerning good practices in the management of mortgage-secured credit exposures.
- Recommendation T – concerning best practices in managing the risk of retail credit exposures.
- Recommendation U – concerning good practices in the field of bancassurance.
- Recommendation W – concerning model risk management in banks.
- Recommendation W – on model risk management in banks.
- Recommendation Z – concerning the principles of internal governance in banks.

The above-mentioned recommendations and supervision of banks in Poland in terms of their implementation by the PFSA significantly improve the quality of the lending policy, and thus the level of NPLs. Moreover, systematic lowering of interest rates on loans to corporations as well as an increase in capital requirements and securing capital adequacy on the part of banks – to legal regulations (directives, numerous recommendations) – guaranteed an appropriate credit policy and credit risk protection. Due to these actions, there were no bank failures in the commercial banking sector in Poland.

### **3. Review of Researches in the Field of NPLs**

Many researchers analyze changes in NPLs taking into account the impact of many macroeconomic and banking variables. In the group of macroeconomic factors commonly studied are, the real GDP growth, the value of GDP/GDP per capita, the exchange rate, the interest rates and the level of inflation. The results confirm that, real GDP growth usually translates into a higher level of income, improving the financial standing of borrowers and decreasing NPLs. When an economy is below normal conditions or in a recession, NPL levels may rise due to the ensuing rise in unemployment, and borrowers face severe debt repayment difficulties (Salas and Suarina, 2002; Ranjan and Dhal, 2003; Fofack, 2005; Jiménez and Saurina, 2005; Thalassinós *et al.*, 2015).

Exchange rate fluctuations may have a negative impact on the quality of assets, especially in countries with a large amount of foreign currency loans. The same applies to interest rate increases, particularly in the case of loans with flexible interest rate (Louzis *et al.*, 2012; Zaman and Meunier, 2017). However, on the one hand, higher inflation may ease debt compensation by affecting the real value of unpaid credit, while on the other hand it may also reduce the real income of unprotected borrowers. In countries where credit rates are flexible, higher inflation may lead to higher rates resulting from monetary policy actions to fight inflation (Nkusu, 2011).

Klein (2013) for NPLs in Central, Eastern and South-Eastern European countries (CESEE) in 1998-2011 confirmed that NPLs responded to macroeconomic conditions, i.e., unemployment, GDP growth and inflation, and that high NPLs in these countries have a negative effect on economic recovery. According to Mazreku *et al.* (2018) for 10 transition countries (Central and Eastern Europe, CEE) in 2006 and 2016, dynamic panel estimates show that GDP growth and inflation are both negatively and significantly correlated with the level of NPLs, while unemployment is positively related to NPLs. Export growth shows largely insignificant results, indicating that NPLs in the sample are mainly influenced by domestic conditions rather than external economic shocks.

Vogiazas and Nikolaidou (2011) investigate the determinants of nonperforming creditors in the Romanian banking sector during the Greek crises (2001-2010) and find that inflation and external GDP information influence the credit risks of the banking system in the country. According to Hada *et al.* (2020), the exchange rates (mainly EUR, USD and CHF), unemployment rate and inflation rate had a significant impact on NPLs in the Romanian banking system in the period 2009-2019.

Among the banking variables that define NPLs, research focuses on return on assets (ROA), bank efficiency, and bank capital. However, the specificity of each bank and its customers are very important for NPL changes. For example, Godlewski (2008) investigates the association between NPLs and return on assets (ROA) and states that the lower the rate of ROA, the higher the NPLs and vice versa. Boudriga *et al.* (2010) confirm from their study that there is a negative association between ROA and NPLs. They conclude that when the ROA decreases, then a bank starts to make investments in high-risk projects and as a result the level of NPLs rises.

Anastasiou *et al.* (2016) investigate the various determinants of NPLs in the euro banking system and conclude that ROA has a significant impact upon NPLs. An insufficient control of the loan portfolio (including short-term loans) increases risk and NPLs. Fiordelisi *et al.* (2011) examine the various factors that increase the risk level in the EU banks and conclude that a declining efficiency hikes the risk level of banks in future. Furthermore, efficiency and performance factors have

influence on NPLs in the Greek banking sector (Louzis *et al.*, 2012). Rachman *et al.* (2018) state that operating efficiency does not influence NPLs.

The effect of bank capital on NPLs works in the opposite direction. For one part, incentivised managers of low capitalized banks tend to get involved in high-risk investments and give loans that are issued without proper credit rating and monitoring (Keeton, 1999). For another part, banks with a high level of capital tend to give loans easily as they know that owing to these loans banks are not going to be bankrupt and fail; therefore, banks are highly engaged with these kinds of risky credit activities suggesting a positive association between capital and NPLs (Rajan, 1994).

Moreover, the capital adequacy ratio (CAR) shows the ability of an organization to face abnormal losses and to survive that situation. Makri *et al.* (2014) also state that there is a negative association between CAR and NPLs. Constant and Djiogap *et al.* (2012) claim that NPLs and CAR have a positive association with each other. Bank profitability and sustainability can only be provided through a proper flow of interest income generated through the lending function.

However, since banks are no longer able to generate enough interest income through classical safe credit and are required to maintain reserves in the form of provisions to cover for eventual loan losses, bank capital decreases together with their health, which is becoming fragile, increasing the trend of NPLs. Therefore, banks are required to take proactive action to deal with the phenomenon of a poor choice of borrowers by identifying and understanding the macroeconomic factors that contribute to the rise of classified credit in the banking system (Anjom and Karim, 2015).

According to Baudino and Yun (2017), the resolution of NPLs that have reached systemic levels is complex and costly. Bank NPL problems tend to emerge after credit booms or protracted periods of low growth in structurally weak financial systems. NPLs crowd out new lending, eroding both the profitability and solvency of banks. When high NPL levels affect a sufficiently large number of banks, the financial system stops functioning normally, and banks can no longer provide credit to the economy. A prompt recovery can be obstructed by impaired market functioning and coordination failures among banks. In such circumstances, authorities usually step in to lead the crisis response. To this end, they can deploy a variety of resolution instruments, although these typically require a large amount of resources and take time to deliver results.

Moreover, results of Baudino and Yun (2017), show that the resolution toolkit used by the authorities has remained broadly unchanged for several decades in Europe (Iwanicz-Drozdowska, 2015), and the United States. Success of resolution policies varies from case to case. Important role play structural banking sector conditions, the type of problem assets, the fiscal space for public sector intervention, and legal and



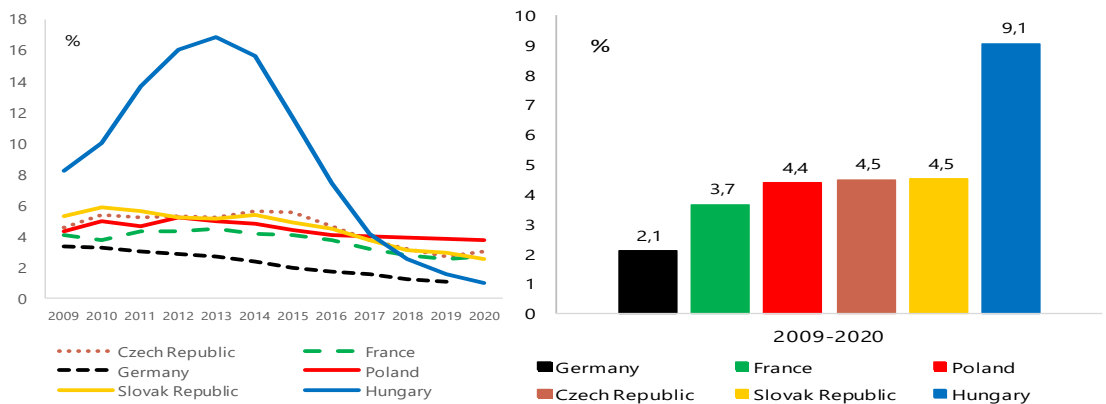
judicial frameworks for NPL resolution. These country-specific characteristics determine how far specific resolution options may be applicable and effective in one country but not in another (ECB, 2020b).

#### 4. Differences in the NPLs between EU Countries

The bank non-performing loans to total gross loans according to the World Bank (2021) show significant differences in the banking sectors of EU countries (e.g., 27.0% Greece, 15.0% Cyprus, 5.8 % Bulgaria, 4.9% Portugal, 3.7% Poland, 2.93% Czech Republic, 2.71% France, 2.53% Slovak Republic, 1.1% Germany and 0.93% in Hungary in 2020).

The differences in the average NPL ratio (e.g., for the years 2009-2020) reached several percentage points between the banking sectors. The lowest level of NPL in the presented period was maintained by Germany (2.1%), France (3.7%), Poland, the Czech Republic and Slovakia (4.4% - 4.5%) compared to the highest level in Hungary (9.1%) (Figure 2).

**Figure 2.** Bank non-performing loans in selected countries in 2009-2020 (%)



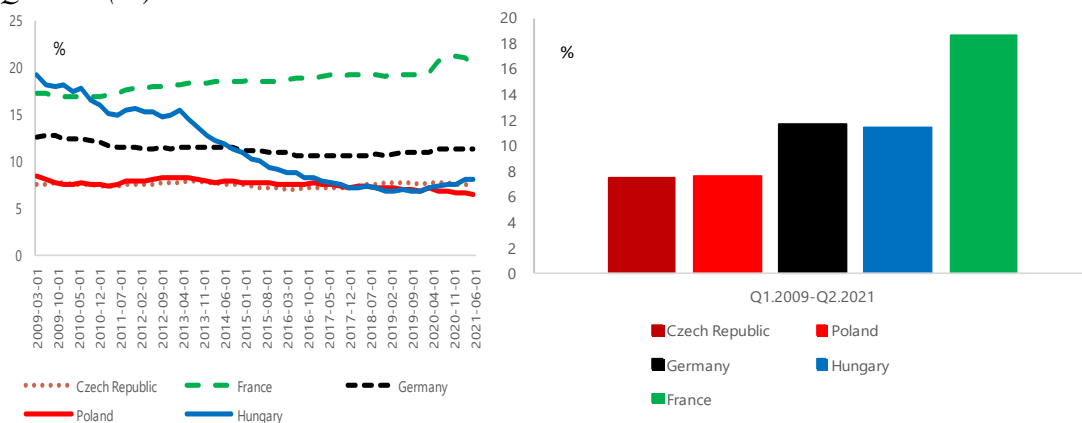
**Sources:** Author's compilation based on WDI (2022).

The varying quality of bank portfolios in the EU countries is also accompanied by significant differences in debt servicing costs. Lower and relatively stable debt servicing costs are usually accompanied by better portfolio quality and lower NPL values, such as in the Czech Republic, Poland or Germany (Figure 3).

In the case of Poland, a more detailed analysis of the changes in NPLs in 2009.Q1-2021.Q4 in relation to the structure of the NFCs' loan portfolio indicates that with the gross loan increase, the NPL decreased annually. The total value of corporate loans in the banking sector in Poland showed a general upward trend in the years Q1.2009 - Q1.2020 (from PLN 242.9 million to PLN 401.6 million). Only the period Q2.2020 - Q4.2020 brought a decrease in the total value of loans (PLN 383.5 million

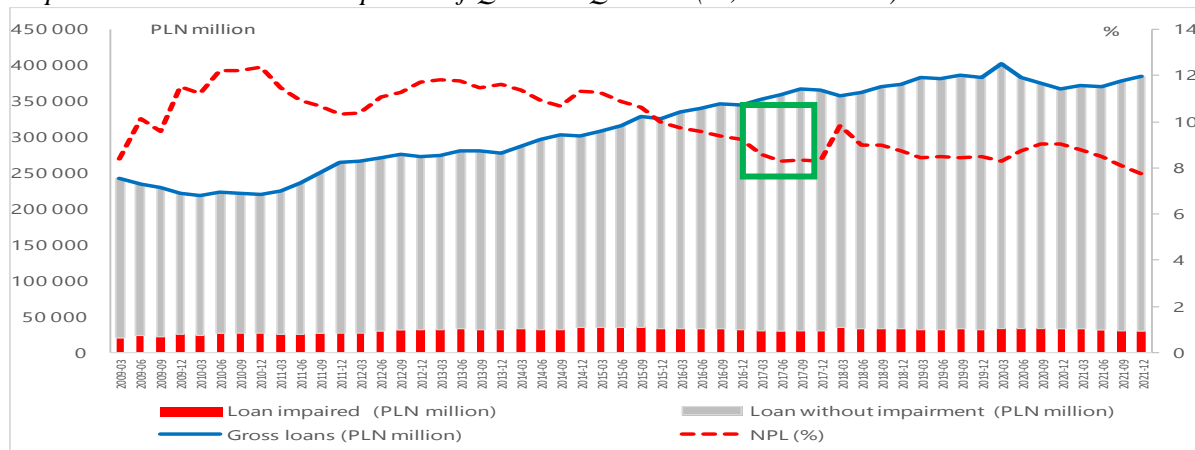
and PLN 366.9 million) and re-growth. The NPL ratio showed quarterly fluctuations, however generally it showed a downward trend in the period Q4.2010 - Q1.2020 (from 12.3% to 9.4%), and next quarter decreased in the Q4.2021 (7.7% (Figure 4).

**Figure 3.** Debt service ratio for the private NFCs in selected countries in Q1.2009 - Q2.2021 (%)



Sources: Author's compilation based on BIS (2022).

**Figure 4.** Changes of loans impaired and without impairment of non-financial corporations in Poland in the period of Q1.2009-Q4.2021 (% , PLN million)

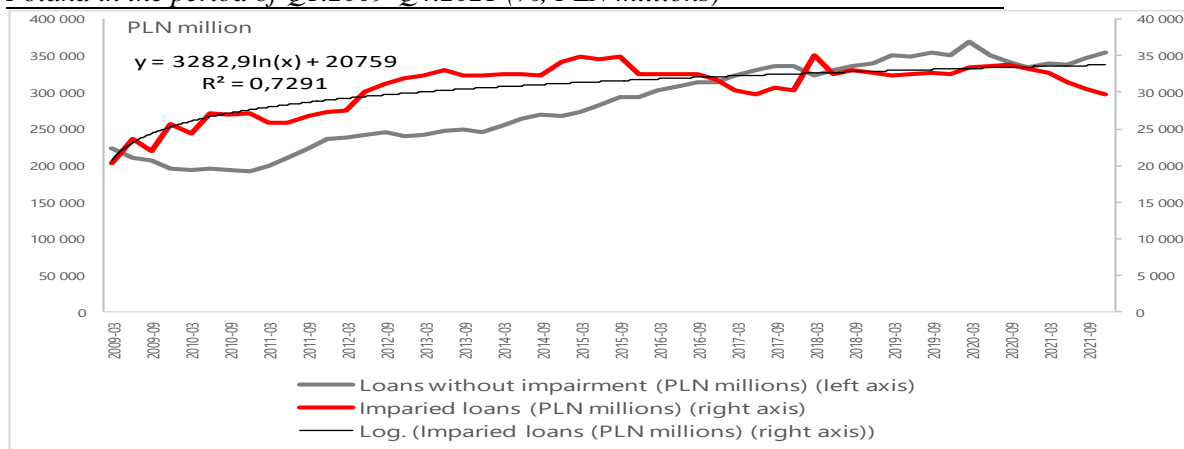


**Note:** The increase in NPL in the period Q4.2017-Q2.2018 – is the result of changes introduced in the classification of impaired receivables. The anomalies shown in the box in the chart are the result of changes (in the qualification of receivables to phase 3 / impaired) in the mandatory reporting of banks to the NBP (FINREP) and bank adjustments related to the obligation to include in the gross carrying amount also interest on receivables included in the phase 3. After about six months, a significant part of this interest was written off the balance sheet and charged to provisions.

Source: The author's compilation based on NBP (2022).

Despite the fact that the value of loans generally increased, the dynamics of growth of loans without impairment was weaker in the period 2009-2021. The indicated increase in the NPL ratio in the period Q2-Q4.2020 (8.7%-9.0%) was results from quickly decreased in loans without impairment (from PLN 350.0 million to PLN 333.8 million) than impaired loans (PLN 33.5 million to PLN 33.2 million) (Figure 5).

**Figure 5.** Changes of the impaired loans and loans without impairment of NFCs in Poland in the period of Q1.2009-Q4.2021 (% , PLN millions)



Sources: Author's compilation based on NBP (2022).

The indicated changes in the loan portfolio (Q2-Q4.2020) and increases in NPL rates were mainly caused by the reduction of economic activity and, consequently, lower income. While in Q4.2019 the value of gross revenues from the total activity of corporations in Poland amounted to PLN 3 235 515.6 million, it decreased to PLN 786 700.6 million in the Q1.2020. The following quarters saw a slow increase in this revenues (Central Statistical Office, CSO, 2022). With the outbreak of the Covid-19 pandemic, additional regulatory requirements were imposed on banks to maintain security in the banking sector (BIS, 2020).

## 5. Research Methodology

The importance of diagnosing changes in NPLs of NFCs in Poland results, apart from the legal obligations of banks, also from the role of this segment of loans. The share of corporate loans in the structure of the gross loan portfolio was 57%. This means that any changes in this portfolio had a significant impact on the entire loan portfolio (NBP, 2022).

The NPL rate is calculated as the ratio of the non-performing loans (impaired loans) and advances of non-financial corporation to the gross value of total loans and advances of these corporations (NBP, 2020).

$$NPL\ ratio = \frac{Non-performing\ loans}{Total\ loans} \quad (1)$$

In this study author made an attempt to assess the quality of the portfolio of loans granted to non-financial corporations, therefore, respectively, impaired loans and total loans granted to these corporations (included in the so-called phase III, portfolio B) were taken into account.

In modelling the quality of the portfolio of NPLs granted to NFCs, mainly the following variables are taken into account: market and financial variables of corporations – determine the possibility of servicing loans, and variables of banking conditions – serving as capital hedging against an increase in banking risk. In order to analyse the relationship between changes in NPL ratio and chosen variables a final formula for the NPL function was developed:

$$NPL_t = \alpha_0 + \alpha_1 GDP_t + \alpha_2 CPI_t + \alpha_3 WIBOR_t + \alpha_4 ROAC_t + \alpha_5 CROAC_t + \alpha_6 GFCF_t + \alpha_7 GTPR_t + \alpha_8 AIRCL_t + \alpha_9 CAR_t + \alpha_{10} TOFSP_t + \alpha_{11} CROfCR_t + \xi_i \quad (2)$$

The explained variable:  $NPL_t$  – The non-performed loan ratio

Explanatory variables: (Table 1) and  $\xi_i$  – random component,  $t$  – period

**Table 1.** Description of model and data source

Variable	Description	Source	Expected impact
Macroeconomic variables			
$GDP_t$	Gross domestic product	OECD	“ – “
$CPI_t$	Consumer price index	CSO	“ – “
$WIBOR_t$	Warsaw Interbank Offered Rate	OECD	“+”
Variables of the financial standing of corporations			
$ROAC_t$	Revenues from the overall activity of corporations	CSO	““ – “”
$CROAC_t$	Costs of obtaining revenues from the overall activity of corporations	CSO	“+”
$GFCF_t$	Gross fixed capital formation	CSO	“ – “
$GTPR_t$	Gross turnover profitability ratio	NBP	“
Banking variables			
$AIRCL_t$	Average interest rate on corporate loans	NBP	“+”
$CAR_t$	Capital adequacy ratio	NBP	
$TOFSP_t$	Total own funds for solvency purposes	NBP	in line with changes in the
$CROfCR_t$	Capital requirements of credit risk	NBP	NPL ratio

**Sources:** The author’s compilation based on NBP (2022), CSO (2022) and OECD Internet databases (2022).

The methodology of changes in the quality of the loan portfolio corresponds to the methodologies used by central banks, e.g., by NBP and IMF (2003), Matthewes, Guo, and Zhang (2007), Maggi and Guida (2010). The study period includes 52 quarters data for the period Q1.2009 - Q4.2021, used the first differences.

In this study, methods are used known from literature on international economics and international finance and econometric methods like the VECM model (Vector Error Correction Method) including the impulse response functions and forecast error variance decomposition analysis. The data verification procedure and the selection of the analysis method included, ADF test, KPSS stationary test, VAR inverse root, the Engle-Granger and Johanson test and lag order (AIC, BIC, HQC criteria). In order to verify correctness of the VECM model results, two tests were carried out verifying the Autocorrelation Ljung-Box Q' test, and ARCH test. Co-integration was verified by means of the Engle-Granger and Johansen tests which confirmed the occurrence of co-integration and thus justified the use of the VECM model for the lag order 2 and co-integration of order 1 (Annex, Table 1, Figure 1).

In accordance with the Granger representation theorem, if variables  $y_t$  and  $x_t$  are integrated to the order of  $I(1)$  and are co-integrated, the relationship between them can be represented as a vector error correction model (VECM) (Piłatowska, 2003).

The general form of the VECM can be written as:

$$\begin{aligned} \Delta Y_t &= \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \dots + \Gamma_{k-1} \Delta Y_{t-k+1} + \pi Y_{t-k} + \varepsilon_t = \\ &= \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \pi Y_{t-k} + \varepsilon_t, \end{aligned} \quad (3)$$

where:

$$\Gamma_i = \sum_{j=1}^i A_j - I, \quad i = 1, 2, \dots, k-1, \quad \Gamma_k = \pi = -\pi(1) = -\left(I - \sum_{i=1}^k A_i\right)$$

and  $I$  is a unit matrix.

## 6. Empirical Results

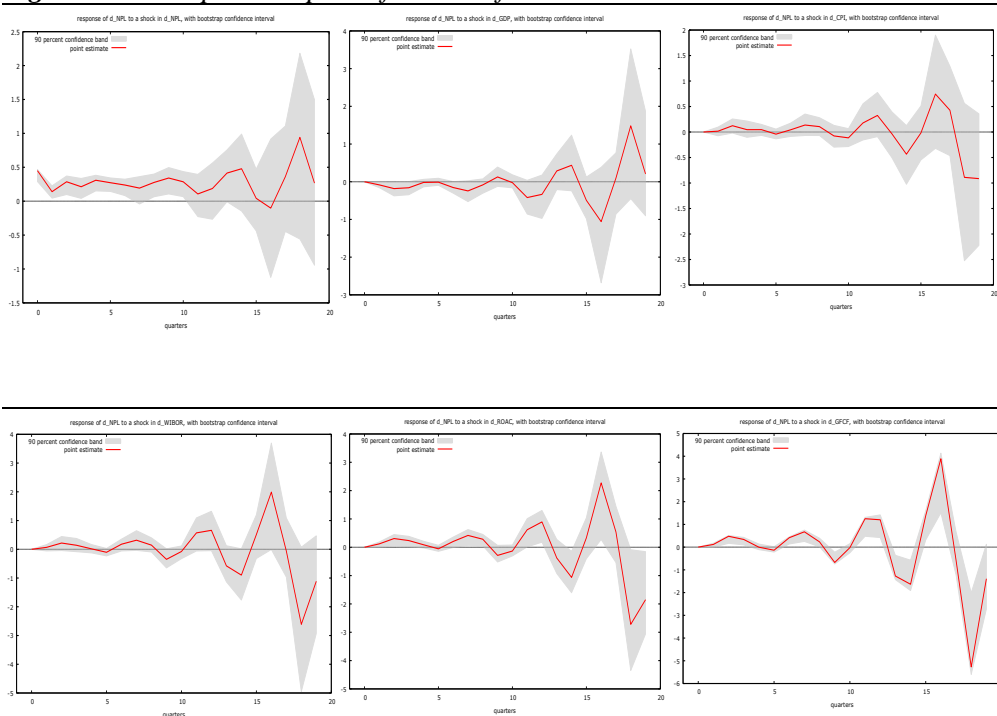
Analysis of the NPL response to impulses from the explanatory variables confirmed that the strength of the influence of these impulses increased over time. The impact of explanatory variables increased especially from the 4th-8th quarter, showing changes (positive/ negative) in the following quarters. The NPL showed the following reactions (responses) in the end 20th quarter:

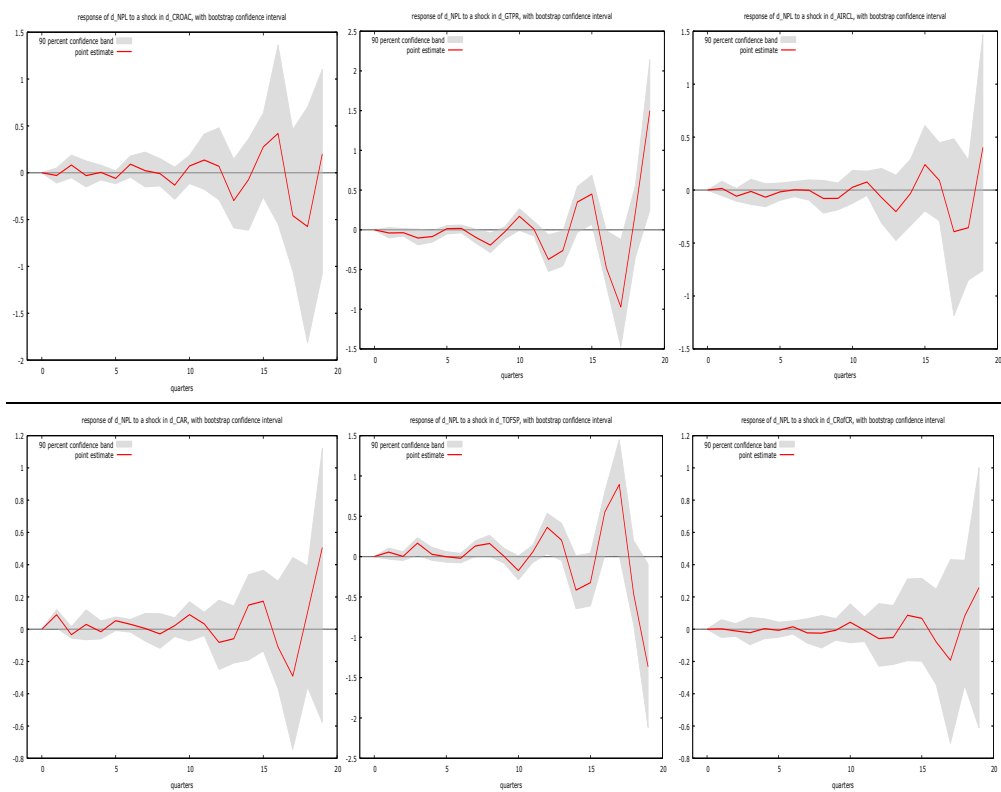
- The NPLs showed declining trends in response to impulses from: NPL's own changes, GDP, CPI, WIBOR, ROAC, GFCF, TOFSP.

- The NPLs showed increasing trends in response to changes: CROAC, GTPR, AIRCL, CAR and CRofCR (Figure 6).

The analysis of the decomposition of explanatory variables shows, in turn, that the NPL rate was significant in explaining the changes in the first period, by own changes (100.0%), in the 2nd period own NPL (65.5%), GDP (27.9%), CAR (2.8%), CROAC (1.4%) and TOFSP (1.3%) In the 8th period decreased rate of explanation own NPL (1.5%), increased GDP (94.33) and TOFSP (2.8%). Finally, in the 20th period this rate of explanation was stronger on the side of GDP (95.0%), own NPL (1.5%), GFCF (0,7%), CPI (0.1%) and also WIBOR (0.1%). This means that the main pillar of the explanation of NPL changes were changes in GDP (i.e., changes in the business cycle) and investment expenditure (GFCF) as well as CPI and WIBOR (Figure 7).

**Figure 6.** *The impulse response functions for NPLs*

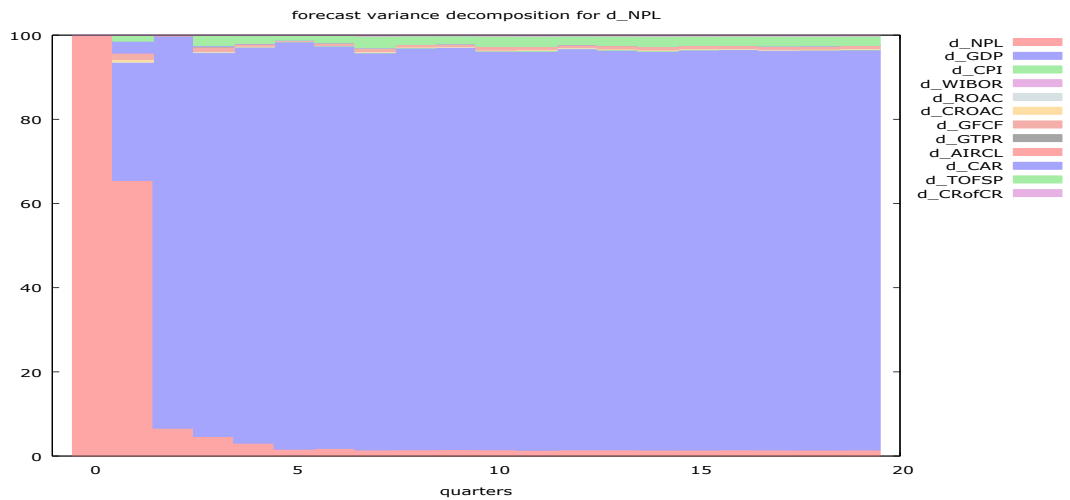




**Note:** Forecast horizon 20q, include bootstrap confidence interval  $1-\alpha=0.90$  (shaded area).

**Sources:** Author's compilation calculations.

**Figure 7.** Variance decomposition for the NPL variables



**Sources:** Author's calculations.

## **7. Conclusions**

The EU countries conduct a credit policy adapted to their macroeconomic and financial conditions of commercial banks. Although the main regulations of credit policies in the EU countries are common, the effects of, for example, the NPL level or debt servicing costs differ.

In case of Poland in the analyzed period, banks pursued a liberal policy of interest rates on loans while maintaining adequate capital requirements. The analysis of NPL changes shows that there was a long-term downward trend confirming the improvement in the quality of the portfolio of loans of non-financial companies in the period Q1.2009-Q4.2021. However, the last analysis quarters (during the COVID pandemic), brought an increase in the NPL ratio, respectively, Q2.2020 (8.7%) and Q4.2020 (9.0%). Whereas, in the entire period Q1.2009-Q4.2021, the structure of the loan portfolio in the Polish banking sector showed stable levels.

The results of the response function indicate negative NPL responses (in the end 20th quarter) to impulses (earlier) own NPL fluctuations, GDP, CPI, WIBOR, ROAC, GFCF and TOFSP. The NPLs showed increasing trends in response to changes: CROAC, GTPR, AIRCL, CAR and CRofCR. The results of variance decomposition indicate that the main pillar of the explanation of NPL changes were: GDP (i.e., changes in the business cycle) and investment expenditure (GFCF) as well as CPI and WIBOR. Also, the results of the NPLs research confirmed the procyclical nature of lending activity in Poland in the verified years.

Resuming, in the period 2009-2021 there was a long-term trend of improving the quality of the loan portfolio of NFCs, which was mainly explained by market (macroeconomic factors). Taking into account the implementation of prudential standards by banks in Poland, resulting from EU directives and numerous recommendations of the Polish Financial Supervision Authority, it should be stated that banks conducted a proper credit policy (they took care of the quality of assets). Moreover, the relatively liberal monetary policy of the NBP (in terms of the basic interest rates) in the last decade and the maintained GDP growth rate also contributed to lowering the NPLs.

The main problems of banking in Poland (which are mostly common problems of EU countries) are, adaptation to new customer expectations, the need for new financing, macroeconomic situation, possible rebound in banking sector profits?, consequences of the Court of Justice of the European Union (CJEU) judgment on loans in Swiss francs and cybersecurity and efficiency of systems.

## **References:**

Anjom, W., Karim, A.M. 2016. Relationship Between Non-Performing Loans and Macroeconomic Factors (With Specific Factors): A Case Study on Loan Portfolios-



- SAARC Countries Prospective. *Asia Pacific Journals of Finance and Risk Management*, 15(3), 84-103.
- Basel Committee on Banking Supervision. 2014. *Basel III: the net stable funding ratio*.
- Baudino, P., Yun, H. 2017. FSI Insights on policy implementation No 3 Resolution of non-performing loans – policy options. Financial Stability Institute, BIS, October, 1-39.
- BIS. 2020. Governors and Heads of Supervision announce deferral of Basel III implementation to increase operational capacity of banks and supervisors to respond to Covid-19. <https://www.bis.org/press/p200327.htm>.
- BIS. 2022. Debt service ratios for the private non-financial sector. <https://www.bis.org/statistics/dsr.htm?m=6>.
- Boudriga, A., Taktak, N.B., Jellouli, S. 2010. Bank Specific, Business and Institutional Environment Determinants of Banks Nonperforming Loans: Evidence from MENA Countries. *Economic Research Forum, Working Paper*, 1-28.
- CSO. 2022. Macroeconomics indicators. <https://stat.gov.pl/wskazniki-makroekonomiczne/>.
- Anastasiou, D., Louri, H., Tsionas, M. 2016. Determinants of Non-Performing Loans: Evidence from Euro-Area Countries. *Finance Research Letters*, 18, 116-119. doi:10.1016/j.frl.2016.04.008.
- Djiogap, F.C., Ngomsi, A. 2012. Determinants of bank long-term lending behavior in the central African economic and monetary community (CEMAC). *Review of Economics and Finance*, 2, 107-114.
- ECB. 2020a. What are non-performing loans (NPLs)? <https://www.ecb.europa.eu/explainers/tell-me/html/npl.en.html>.
- ECB. 2020b. Consolidated Banking Data. Calculations by Commission services (DG FISMA). [https://www.ecb.europa.eu/stats/supervisory\\_prudential\\_statistics/consolidated\\_banking\\_data/html/index.en.html](https://www.ecb.europa.eu/stats/supervisory_prudential_statistics/consolidated_banking_data/html/index.en.html).
- EC. 2019. Council conclusions on Action plan to tackle non-performing loans in Europe. <https://www.consilium.europa.eu/en/press/press-releases/2017/07/11/conclusions-non-performing-loans/>.
- EC. 2019. Fourth Progress Report on the reduction of non-performing loans and further risk reduction in the Banking Union, Brussels. COM(2019)278 final.
- EC. 2022. EU banking and financial services law. <https://ec.europa.eu/info/law/law-topic/eu-banking-and-financial-services-law>.
- ECS. 2019. Monitoring Report on Risk Reduction Indicators. European Working Group meeting. [https://www.consilium.europa.eu/media/37029/joint-risk-reduction-monitoring-report-to-eg\\_november-2018.pdf](https://www.consilium.europa.eu/media/37029/joint-risk-reduction-monitoring-report-to-eg_november-2018.pdf).
- ECS. 2019. Monitoring Report on Risk Reduction Indicators. European Working Group meeting. [https://www.consilium.europa.eu/media/37029/joint-risk-reduction-monitoring-report-to-eg\\_november-2018.pdf](https://www.consilium.europa.eu/media/37029/joint-risk-reduction-monitoring-report-to-eg_november-2018.pdf).
- ECS. 2020. Report of the FSC Subgroup on Non-Performing Loans. European Working Group meeting. <http://data.consilium.europa.eu/doc/document/ST-9854-2017-INIT/en/pdf>.
- European Council. 2017. Council conclusions on Action plan to tackle non-performing loans in Europe. <https://www.consilium.europa.eu/en/press/press-releases/2017/07/11/conclusions-non-performing-loans>.
- Fiordelisi, F., Marques-Ibanez, D., Molyneux, P. 2011. Efficiency and risk in European banking. *Journal of Banking and Finance*, 35(5), 1315-1326.
- Fofack, H. 2005. Non-performing Loans in Sub-Saharan Africa: Causal Analysis and Macroeconomic Implications. *World Bank Policy Research Working Paper No. 3769*.

- Godlewski, C.J. 2008. Bank capital and credit risk taking in emerging market economies. *Journal of Banking Regulation*, 6(2), 128-145. doi: 10.1057/palgrave.jbr.2340187.
- Hada, T., Bărbuță-Mișu, N., Iuga, I.C., Wainberg, D. 2020. Macroeconomic Determinants of Nonperforming Loans of Romanian Banks. *Sustainability*, 12(18):7533, 1-19. DOI: 10.3390/su12187533.
- IMF. 2003. Financial Soundness Indicators – Background Paper. Prepared by the Staff of the Monetary and Financial Systems and Statistics Departments. Approved by C.S. Carson, S. Ingves. <https://www.imf.org/external/np/sta/fsi/eng/2003/051403bp.pdf>.
- Iwanicz-Drozdowska, M. 2015. Restrukturyzacja banków w Unii Europejskiej w czasie globalnego kryzysu (Restructuring of banks in the European Union during the global crisis). Oficyna Wydawnicza SGH, Warsaw.
- Iwanicz-Drozdowska, M. 2017. Zarządzanie ryzykiem bankowym (Bank risk management). Poltext, Warsaw.
- Jiménez, G., Saurina, J. 2005. Credit Cycles, Credit Risk, and Prudential Regulation. *Banco de España, International Journal of Central Banking*, 2(2), 1-34.
- Keeton, W.R. 1999. Does faster loan growth lead to higher loan losses. *Economic Review Federal Reserve Bank of Kansas City*, 57-75.
- Komisja Nadzoru Finansowego (KNF). 2022. Rekomendacje dla banków. [https://www.knf.gov.pl/dla\\_ryнку/regulacje\\_i\\_praktyka/rekomendacje\\_i\\_wytyczne/rekomendacje\\_dla\\_bankow](https://www.knf.gov.pl/dla_ryнку/regulacje_i_praktyka/rekomendacje_i_wytyczne/rekomendacje_dla_bankow).
- Louzis, D.P., Vouldis, A.T., Metaxas, V.L. 2012. Macroeconomic and Bank-Specific Determinants of Non-Performing Loans in Greece: A Comparative Study of Mortgage, Business and Consumer Loan Portfolios. *Journal of Banking and Finance*, 36(4), 1012-1027. doi: 10.1016/j.jbankfin.2011.10.012.
- Makri, V., Tsagkanos, A., Bellas, A. 2014. Determinants of Non-Performing Loans: The Case of Eurozone. *Panoeconomicus*, 61(2), 193-206.
- Mazreku, I., Morina, F., Misiri, V., Spiteri, J.V., Grima, S. 2018. Determinants of the Level of Non-Performing Loans in Commercial Banks of Transition Countries. *European Research Studies Journal*, 21(3), 3-13.
- NBP. 2022. Monetary and financial statistics. <https://www.nbp.pl/homen.aspx?f=/en/statystyka/monetary-and-financial-statistics.html>.
- Nkusu, M. 2011. Nonperforming loans and macro financial vulnerabilities in advanced economies. *IMF Working Papers*, 161.
- OECD Stat. 2022. <https://stats.oecd.org/>.
- Piłatowska, M. 2003. Modelowanie niestacjonarnych procesów ekonomicznych: Studium metodologiczne (Modelling of Non-Stationary Economic Processes: A Methodological Study). Uniwersytet M. Kopernika, Toruń.
- Rachman, R.A., Kadarusman, Y.B., Anggriono, K., Setiadi, R. 2018. Bank-Specific Factors Affecting Non-Performing Loans in Developing Countries: Case Study of Indonesia. *The Journal of Asian Finance, Economics and Business (JAFEB)*, 5(2), 35-42.
- Rajan, R. 1994. Why bank credit policies fluctuate. *The Quarterly Journal of Economics*, 2(109), 399-441.
- Ranjan, R., Dhal, S.Ch. 2003. Non-Performing Loans and Terms of Credit of Public Sector Banks in India: An Empirical Assessment. *Reserve Bank of India Occasional Papers*, 24(3), 1-41.
- Thalassinos, I.E., Stamatopoulos, D.T., Thalassinos, E.P. 2015. The European Sovereign Debt Crisis and the Role of Credit Swaps. In: *The WSPC Handbook of Futures Markets* (eds) W.T. Ziemba, A.G. Malliaris, in memory of Late Milton Miller (Nobel

1990), World Scientific Handbook in Financial Economic Series, Vol. 5, Chapter 20, 605-639. doi: 10.1142/9789814566926\_0020.

Salas, V., Saurina, J. 2002. Credit Risk in Two Institutional Regimes: Spanish Commercial and Savings Banks. *Journal of Financial Services Research*, No. 22, 203-224.

Vogiazas, S., Nikolaidou, E. 2011. Investigating the Determinants of Nonperforming Loans in the Romanian Banking System: An Empirical Study with Reference to the Greek Crisis. *Econ. Res. Int.*, 1-13.

WDI. 2002. World Development Indicators. <https://data.worldbank.org/indicator/FB.AST.NPER.ZS>.

Zaman, C., Meunier, B. 2017. A Decade of EU Membership: Evolution of Competitiveness in Romania. *European Research Studies Journal*, 20(2A), 224-236.

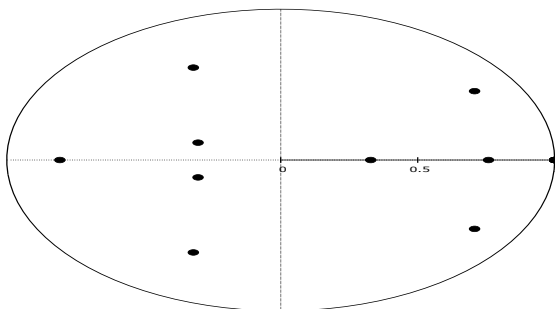
## Annex:

*Table 1. The VECM model*

VECM system, lag order 2, observations 2009:4-2021:4			
Cointegration rank = 1, Case 3: Unrestricted constant			
	$\beta$ (cointegrating vectors, standard errors in parentheses)		$\alpha$ (adjustment vectors)
d_NPL	1.00000000	(0.000000)	0.003979
d_GDP	-0.00016200	(1.7367e-005)	2996.900
d_CPI	0.85891000	(0.16988)	0.033845
d_WIBOR	0.55756000	(0.46830)	0.013416
d_ROAC	0.00024900	(2.3832e-005)	-84285.00
d_CROAC	-0.00025000	(2.5030e-005)	-78706.00
d_GFCF	2.5807e-005	(2.7929e-005)	18765.00
d_GTPR	-3.83350000	(0.457030)	-0.032702
d_AIRCL	-0.56276000	(0.531870)	-0.001631
d_CAR	-0.52482000	(0.540560)	0.029559
d_TOFSP	2.7142e-005	(5.0592e-005)	-186.3200
d_CRofCR	-1.5653e-007	(1.2032e-006)	1770.100
Specification	EC1	R2	DW
d_NPL	0.0039786	0.651156	1.870413
d_GDP	2996.9000	0.925976	2.504727
d_CPI	0.0338452	0.539619	1.777390
d_WIBOR	0.0134158	0.260813	1.964910
d_ROAC	-84285.400	0.952997	2.845320
d_CROAC	-78705.600	0.952637	2.845786
d_GFCF	18765.100	0.502046	1.298878
d_GTPR	-0.0327022	0.667980	2.236949
d_AIRCL	-0.0016309	0.270642	1.639750
d_CAR	0.0295587	0.559291	2.244385
d_TOFSP	-186.32200	0.456752	2.328057
d_CRofCR	1770.1500	0.396276	2.267642

Source: The author's own calculations.

**Figure 1.** VAR inverse roots in relation to the unit circle



**Source:** *The author's own calculations.*