International Journal of Managerial Studies and Research (IJMSR)
Volume 10, Issue 9, September 2022, PP 20-38
ISSN 2349-0330 (Print) & ISSN 2349-0349 (Online)
https://doi.org/10.20431/2349-0349.1009003
www.arcjournals.org

Factors Affecting Non-Performing Loans in Europe Before and After Global Financial Crisis

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Abstract: *Non-performing loans is a major importance issue that banks need to keenly consider for banking system's viability and economies sustainability, as banking sector's stability is the foundation of macroeconomic policy. There are several macroeconomic and banking factors affecting non-performing loans and this paper aims to investigate the deterministic factors from both perspectives.*

For the purposes of our paper, we applied dymanic panel data analysis, using both macroeconomic and banking factors, in order to examine their impact on non-performing loans for the period 2005-2019 for 10 European countries (Greece, Italy, Portugal, Switzerland, Belgium, Germany, Ukraine, Spain, France and Austria).

According to empirical results unemployment, lending interest rates and household consumption expenditure affect in positive statistical significant way non-performing loans. Moreover, our results indicate that economies with solid systems are more favorable to overcome crises, related to weaker economies. The non-performing loans in strong economies didn't overcome their average even after the outbreak of global financial crisis, in contrary to weaker economies. Thus, it is derived a strong linkage between healthy banking systems and robust economies. Our findings consist a good basis for policymakers and investors, in order to plan their policy, make decisions and take the necessary measures to mitigate the risk derived from the factors affecting the launch of non-performing loans, cracking the foundation of the banking system and threating economic stability.

Keywords: *non-performing loans, dynamic panel data, banking stability, banking regulation, economic recovery.*

1. INTRODUCTION

A non-performing loan (NPL) is defined as a loan in which the borrower is in default and hasn't made any scheduled payments of principal or interest for a certain period of time. In banking, commercial loans are considered as non-performing if the borrower is 90 days past due. (Avetisyan, 2019; Syed & Tripathi, 2020).

Non-performing loans are also called as "bad loans" because they have little chance of being paid off. For the borrower, debt deriving from a non-performing loan makes it difficult to get access to new financing in order to invest, while it cuts off lender's possibility to provide new loans. A loan is not considered anymore as non-performing, whether it is renegotiated and settled or paid off over 90 days past due.

In general, the increase in NPL ratio is due to both banking and macroeconomic factors, some of which will be thoroughly examined in the empirical part of the paper.It's very possible a performing loan to become non-performing in case individuals are unemployed, or firms face financial difficulties, fact that does encumbers them to be consistent with their loan obligations.

When banks register in their balance sheets a large percentage of non-performing loans, it can significantly affect their cash flow, their performance, their outlook and consequently their shares price. For such reason, banks should ensure that there are funds available in case a part of loans

provided won't be paid off according to the contractual terms. Furthermore, the more non-performing loans a bank keeps on its books, the less attractive is to potential investors, as its future profitability will be affected in case borrowers default. Consequently, non-performing loans represent a major challenge for the banking sector as they affect banks' profitability and may act as a retarder of economic growth (Syed & Tripathi, 2020).

Moreover, banks keeping too high levels of non-performing loans will have a negative impact on their profitability as their credit activities will no longer be enough profitable. Thus, banks having accumulated a large percentage of non-performing loans in their portfolio choose to sell them to asset management companies, which have been established for this purpose, in order to free up capital and focus on performing loans that can generate profits (Avetisyan, 2018).

Increased levels of non-performing loans keep putting pressure on banks' balance sheets in many European countries, intensifying banks' vulnerability and at the same time affecting in a negative way their lending activities. Over the past two decades, non-performing loans have been one of the major problems banks are facing. In fact, there are studies calling non-performing loans as "economic pollution" with harmful effects (Makri et al. 2014). Although the increase in non-performing loans is not considered as a direct destabilizing factor, their impact on economic activities undermine economy's recovery, sustainability and growth.

The upward trend in non-performing loans began right after the 2008 financial crisis outbreak, but its sharp increase occurred one year later, when GDP in most European economies shrank. Since then, non-performing loans continued to increase, even in slower rates, exhibiting a strong and negative correlation with economic recovery's pace. This global upward trend was due to increased unemployment, currency depreciation and restrictive fiscal policy, which in turn reduced borrowers' ability to pay off their debt. Moreover, the prevailing conditions negatively affected banks' profitability and increased capital requirements to cover possible losses (Hakimi et al., 2020).

Empirical studies results show that non-performing loans are affected by both macroeconomic and banking environment. The most important macroeconomic factors determine the non-performing loans increase seem to be high unemployment rate, exchange rate depreciation and high inflation, while on the contrary, higher GDP growth rates lead to lower levels of non-performing loans (Klein, 2013).

Banks should pay attention to the provided loans and identify at an early stage the loans that are likely to become non-performing. Thus, they are obliged to settle a proper monitoring system so to be able to early identify the case a borrower is facing financial difficulties and is likely to default. This mechanism will assist banks to obtain all necessary tools in order to prevent the process of ending up to non-performing loans. In addition, banks should develop an advanced risk analysis mechanism in order to avoid providing risky loans, especially when the conditions are not met. It is necessary to assess borrowers' solvency and be applied reliable credit criteria in order to ensure borrowers' creditworthiness and the timely repayment of loans provided.

Consequently, the health of financial sector, and the share of non-performing loans on banks' balance sheets, are inextricably linked to macroeconomic conditions. Unfavorable macroeconomic conditions tend to have negative impact on financial sector (Jacobson et al., 2005). During recessions and periods of reduced economic growth, companies and households are more likely not to timely pay off their loans, contributing to the increase in the share of non-performing loans on banks' balance sheets. So on, problems in the financial system, and specifically in the banking sector, may negatively affect the macroeconomic environment (Balta &Vašíček, 2016).

This study aims to assess the determinants of non-performing loans of 10 European economies, taking into consideration banking data and macroeconomic indicators during the period 2005-2019.

The article is developed as follows: Section 2 presents a brief literature review, section 3 presents the theoretical background of the variables affecting non-performing loans, the sample of the study and the hypotheses examined. Section 4 describes methodology followed, while section 5 and section 6 present the empirical approach and the empirical results, respectively. Finally, at the end of the paper, important conclusions are discussed and further research propositions are suggested.

2. LITERATURE REVIEW

Empirical studies examine the existence of a significant relationship between macroeconomic developments, assets quality and credit risk. In most cases, real GDP growth and lending conditions are recognized as major drivers of NPLs. In addition, other determinants being identified are, the past increased credit, stock prices, current account deficits and the exchange rate for debt due in foreign currency and significant currency mismatches (Borio et al., 2014). Apart from these determinants, there are studies that point to other banking factors such as cost efficiency and the level of capital adequacy. From the available data for the euro area, it is argued that GDP growth and unemployment are also among the most important factors affecting the increase of non-performing loans (Makri et al., 2014).

Driven by the depiction so far of the process of bad loans and their influence on the banking system and hence the economic sustainability, the purpose of this paper is to investigate the factors affecting non-performing loans in specific European countries. According to bibliography, the most important factors affecting the increase of non-performing loans are summarized in the macroeconomic and banking view. More specifically, as the most influential factors are considered GDP growth, unemployment and inflation rates, household consumption, capital adequacy and lending rates. In order to ensure a healthy banking system, capable of supporting economic growth, it is important to discover the most substantial determinants impact on non-performing loans. This is why, this issue has gained the increased interest of academics, bankers, policymakers, governments, investors and individuals during the last decade and especially after the global financial crisis.

According to Boudriga et al. (2009), the stability of the banking system is one of the most important prerequisites for societies' economic development. The structural changes that occurred in the international financial markets during the last years of the previous century, accompanied by the deregulation and globalization of banking activities, contributed to the increase in competition between banks. This resulted in the relaxation of lending criteria and control procedures, which negatively affected the quality of banks' credit activity and led to an increase in non-performing loans (NPL). In addition, the deterioration in the quality of banks' portfolios, especially after the global financial crisis, also contributed to the increase of non-performing loans.

As is has already stated, the existing studies focus on general economic conditions, while others analyze the impact of both the banking and macroeconomic environment on non-performing loans.

2.1. Macroeconomic Factors

Makri et al. (2014) proved that there are strong correlations between non-performing loans and various macroeconomic and banking factors. Specifically, the findings of their study indicate that GDP growth has a significant negative impact on non-performing loans in Latin American countries. Correspondingly, the findings of more other studies are moving to the same direction and end up to the existence of a significant statistical negative relationship between GDP and non-performing loans (Radivojevic & Jovovic, 2017; Louzis et al., 2012;Klein, 2013; Skarica, 2014).

Similarly, Amuakwa-Mensah & Boakye-Adjei (2015), found a significant and negative impact of real GDP per capita on non-performing loans in the Ghana, while Dutta (2021)ended up at the same result for Indian economy. According to Abdolshah et al. (2020) findings, GDP rate is negatively related to NPLs as higher GDP growth indicates that there is auspicious outlook. Borrowers are in a better financial position and therefore it is more likely to pay off their debts, while conversely, when there is a fall in GDP rates, borrowers are more likely to default due to ominous economic conditions. The same conclusions were derived by Ahmed et al. (2021) study, as they argue that the increase in GDP reduces the percentage of non-performing loans.

Wood & Skinner (2018) findings also show that GDP growth has a significant negative impact on non-performing loans and concludes that an improvement in the real economy enhances borrowers' debt servicing capacity and contributes to the reduction of non-performing loans. On the contrary, Agić & Jeremić (2018) showed that the real GDP growth rate does not have a statistically significant impact on non-performing loans. In their turn, Sembiringet al. (2019) argued that economic growth has a negative but not statistically significant impact on non-performing loans.

As far as, the impact of unemployment on non-performing loans is concerned, many recent studies argued that there is a positive and statistically significant relationship between unemployment rate and non-performing loans (Nkusu, 2011; Louzis et al., 2012; Makri, 2014; Radivojevic & Jovovic, 2017; Agić & Jeremić, 2018; Wood & Skinner, 2018; Bayar, 2019; Abdolshah et al. 2020). Their argument is that higher unemployment rates imply less disposable income, which may hinder borrowers to meet their debt obligations and in turn affect countries' economic stability.

In fact, according to Szarowska (2018) unemployment is the most important macroeconomic factor affecting non-performing loans, as an increase in the unemployment rate by 1% leads to an increase in non-performing loan index by 0.54%. However, Klein (2013) argued that the impact of the unemployment rate on non-performing loans is not statistically significant.

Related to the impact of inflation rates on non-performing loans, the results are contradictory. Radivojević et al. (2019) and Bayar (2019) focused their studies on the impact of inflation rates on non-performing loans and they found that there a negative relationship between inflation rates and NPLs while the recent financial crisis had a positive impact. Szarowska (2018) study is consistent with the above findings, as she proved the existence of the same relationship in Central and Eastern European countries. Moreover, Kojuet al. (2018) ended up to the same result in the case of Nepal.

However there are some studies conducted that find the existence of a negative relationship between inflation rates and NPLs, but the result is not likely to be statistically significant (Sembiring et al., 2019; Wood & Skinner,2018 for the case in Barbados). On the contrary, there are several studies arguing that inflation affects non-performing loans in a positive way (Nkusu, 2011; Mileris, 2012, Radivojevic & Jovovic 2017).

Klein (2013) argued that non-performing loans are strongly affected by an increase in inflation rate as in case inflation rate increases, it will affect the economic conditions of a country or region and lead to NPLs increase. Likewise, the results of Koskei (2020) study show that there is a positive statistically significant relationship between inflation rates and NPLs. On the contrary, Abdolshah et al. (2020), ended up that the inflation rate is positively related to non-performing loans, although the impact is not statistically significant.

According to the impact of household consumption expenditures on non-performing loans, Radivojevic & Jovovic (2017), reveal the existence of a negative relationship between household consumption and non-performing loans in Latin American countries. The results of this research are in accordance with those of Boudriga et al. (2009) who argued that household consumption expenditure has a strong negative impact on NPLs.

Another one important factor affecting NPLs, according to studies conducted is exchange rates. More specifically, findings by De Bock & Demyanets (2012) research, suggest that exchange rates is one of the main determinants of NPLs, in contrast to Klein's (2013) finding that exchange rates do not indicate any significant impact on non-performing loans. More specifically, De Bock & Demyanets (2012), focusing their study in the case of Ghana, they found a negative statistically significant effect of real GDP growth on assets quality and that a real depreciation of the local currency increases bank NPLs. The findings of Abdolshah et al. (2020) show a negative and significant relationship between exchange rates and the probability of loans default. On the other hand, Ahmed et al. (2021) found that exchange rates have a statistically positive significant impact on non-performing loans in the banking system of Pakistan.

2.2. Banking Factors

According to Radivojevic & Jovovic (2017) in addition to macroeconomic variables, interesting results appear for specific banking factors. Their results argue that there is a negative statistically significant relationship between return on assets (ROA) ratio and non-performing loans rate. Similarly, Wood & Skinner (2018) found that there is a significant and negative impact of ROA on non-performing loans, which suggests that risk is reduced in banks that exhibit high performance levels, while Muhović et al. (2019) didn't find any statistically significant relationship between ROA and NPLs. On the contrary, there are studies, whose findings exhibit the existence of a significant positive impact of ROA on non-performing loans (Ahmad & Bashir, 2013; Rahaman et al., 2014; Kamande, 2017).

Moreover, there are observed contradictory results between the existence of dependence relationship between capital adequacy and non-performing loans. More specifically, Wood & Skinner (2018) indicate that there is a positive and significant impact of increasing capital adequacy on non-performing loans. However, according to Gashi &Mojsoska-Blazevski (2016) an increase in capital adequacy by 1% will reduce non-performing loans by 0.2%. This is justified as banks with higher profitability and adequate capital reserves have better asset quality and hence they keep in their portfolios low of non-performing loans levels (Swamy, 2012; Shingjerji et al., 2013a, Muhović et al., 2019, Kojuet al., 2018 specified in Nepal).

The lending rates in one more factor that can affect non-performing loans evolution in multiple ways. Before the outbreak of financial crisis and after the creation of EMU, cost of capital was very low and favorable for firms (Basdekis, 2010).Szarowska (2018) showed that global financial crisis had a positive impact on lending rates. Curak et al. (2013) empirically investigated the determinants of non-performing loans in Southeast European banking systems and proved that higher interest rates are accompanied by higher non-performing loans. The above results are similar to those of Rinaldi &Sanchis-Arellano (2006) and Sembiring et al. (2019), who found a significant and positive correlation between non-performing loans and lending rates.

Ahmed et al. (2021), in turn, concluded that an increase in lending rates significantly increases non-performing loans in the Pakistani banking system. Similarly, Dutta (2021) proved that in India, lending rates affect significantly non-performing loans accumulation as whether interest rate increases, both individuals and investors will not pay off loans interests and this will lead to the increase in non-performing loans. In the contrary, Agić & Jeremić (2018) argued that lending rates do not have a statistically significant impact on NPLs, while Wood & Skinner (2018) found a negative statistically significant relationship between lending rates and non-performing loans, which implies that an increase in interest rates causes a decrease in loans demand and consequently it leads to a decrease in non-performing loans.

Taking into consideration the contradictory results of the above studies and given that till today no corresponding research has been conducted for such a long time period (2005-2019) for the specific geographical area (European counties), we consider that it would be more than worthy to study such a great issue related to the most important factors affecting non-performing loans. It is a vital issue for firms' operation and individuals' survival, with great extensions on investors, banks and economies current condition and outlook.

3. SAMPLE AND HYPOTHESES

Sample and Variables

The data were derived from World Bank for the period 2005 to 2019, and the sample includes ten European countries; Greece, Italy, Portugal, Belgium, Germany, Spain, France, Ukraine, Switzerland and Austria and the empirical analysis was carried out in EVIEWS 8 software. These are countries with different economic conditions and potential, social and cultural background, different currencies. The sample period covers both periods of economic boost and recession due to global financial crisis and that makes the current study even more interesting.

It is very useful to attempt determining the variables used, in order to approach their definition understand their potential on banking's system performance and economic growth.

I). GDP Growth Rate

GDP Growth is defined as the annual percentage growth rate of GDP at market prices based on local currency (Waqas et al., 2017). It is one of the main factors in our model because it provides information about economies' size, activity and outlook (Katsampoxakis et al., 2015, 2018, Basdekis et al., 2020). The growth rate of real GDP is often used as an indicator of economies' well-being. When real GDP grows, employment is likely to increase, the produced outcome increases and part of it will move to meet debt obligations. On the contrary, in case economic activity shrinks, as happened in most countries during the recent global financial crisis, employment often falls, causing serious problems among others and in debt repayments. For the purposes of our study, we use this indicator in order to extract whether economies' growth rate affects non-performing loans and with which way.

II). Unemployment

Unemployment, according to OECD, reports to people above a specified age (usually 15) not being in paid employment or self-employment but currently available for work during the reference period.

Unemployment is measured by the unemployment rate, which is the number of people who are unemployed as a percentage of the labour force, which is measured by the sum of people both employed and unemployed.

III). Inflation

Inflation is the rate of increase in prices over a given period of time. Inflation is typically a broad measure, such as the overall increase in prices or the increase in the cost of living in a country.

The increased rate of inflation reduces the real rates of return on bank assets and therefore restricts credit (Bohachova, 2008). In fact, inflation not only erodes the exact value of loans, but also has an impact on borrowers' profits. In case the creditworthiness effect turns out to be stronger, higher inflation rates may result in banks taking less risk on their balance sheets.

On the other hand, not only high inflation, but deflation as well affect negative the financial system. Rapid deflation will have a negative impact on the economy due to high real interest rates and lead to an increase in credit risk (Bohachova, 2008).

IV). Capital Adequacy

The capital adequacy ratio measures a bank's solvency and ability to absorb risk. It is used to protect depositors and promote stability and efficiency in the financial system (Wood & Skinner, 2018). It shows the percentage of minimum capital reserves banks must have to be able to absorb losses and thus be viable. A low capital adequacy ratio indicates that the bank does not have enough capital to absorb its assets risk, while higher ratios signal safer bank operation.

V). Household Consumption Expenditures

Household final consumption expenditure covers all purchases made by resident households (home or abroad) to meet their everyday needs. It also includes a number of imputed expenditures, for example agricultural products produced for own consumption, but the most significant imputation is typically owner-occupiers' imputed rents. However, it excludes households' investments in house purchase.

VI). Lending Rates

The lending rate is the bank rate that usually covers the short and medium - term private sector's financing needs. This interest rate usually varies depending on the lenders creditworthiness and financing goals. The terms and conditions that accompany these rates vary by country. Interest rate is one of the critical determinants of NPLs. An increase in interest rates indicates an increase in borrowers' debt and makes debt servicing more difficult (Ahmed et al., 2021).

Hypotheses

Based on the concepts presented above as well as the existing literature, we concluded that the international bibliography ends up to contradictory findings according to the factors affecting the evolution of non-performing loans, the way affecting them and whether any impact is significant or not. Nevertheless, we will attempt to proceed to some hypotheses and test them whether they hold in the case of our study.

- GDP growth rate affects NPLs in a negative way
- Unemployment rates affects NPLs in a positive way
- Inflation rates affect NPLs in a positive way
- Lending rates affect NPLs in a positive way
- Household Final Consumption Expenditure affect NPLs in a positive way
- Banks' capital adequacy affect NPLs in a negative way.

Based on economic theory, it is estimated that if GDP growth rates increase, economic activity will increase as well and, this will lead to on average fall of non-performing loans. On the contrary, in case unemployment rates increase, non-performing loans will tend to increase, as the unemployment will hinder lenders to meet their debt obligations. On the other hand, according to bibliography, the effect of inflation on non-performing loans is not clear enough and the results are to somewhat ambiguous. According to the economic theory, inflation can have a negative impact on non-performing loans, as higher inflation rates can boost borrowers' ability to pay off their debts by reducing the real value of outstanding debt. However, since high inflation levels are considered as an indicator of macroeconomic instability, financial institutions will demand a higher risk premium resulting in higher interest rates and so increased interest payments. Thus, this situation leads to a decrease in borrowers' cash flow, which tends to reduce their ability to pay off their obligations. As far as the banks' capital adequacy indicator is concerned, we estimate to have a negative relationship with NPLs, as banks indicate the appropriate capital reserves to acierate their structures. Related to lending rates, it is considered as a factor that affects NPLs in a positive way, as in case of interest rates increase, both individuals and firms will not be able to pay off their loans obligations and this will lead to an increase in non-performing loans. Finally, household final consumption expenditure is estimated to have a positive effect on non-performing loans, as higher consumption will restrict the disposal income to cover other liabilities.

4. METHODOLOGY

Our study's purpose is to interpret the issue of non-performing loans and to empirically examine which are the most important macroeconomic and banking variables affect non-performing loans in selected European countries before and after the global financial crisis of 2008.

For our empirical approach, in order to estimate the impact of the main determinants on NPLs, we will apply panel data analysis.

The initial form of the model under examination takes the following form:

$$Y_{i,t} = \beta_0 + \beta_1 * X1_{i,t} + \beta_2 * X2_{i,t} + \beta_3 * X3_{i,t} + \beta_4 * X4_{i,t} + \beta_5 * X5_{i,t} + \beta_6 * X6_{i,t} + \varepsilon_{i,t} \quad (1)$$

where: $Y_{i,t}$ corresponds to the dependent variable (in our case, non-performing loans) for i country, at time t ,β_j is the coefficient of each independent variable (j taking values from 1…to 6) and $Xj_{i,t}$corresponds to each variable j=1,..,6 as will be specialized right now.

So on, our regression model is specialized as follows:

$$NPL_{i,t} = \beta_0 + \beta_1 * GDP_{i,t} + \beta_2 * UNEMPL_{i,t} + \beta_3 * INF_{i,t} + \beta_4 * CAR_{i,t} + \beta_5 * HFC_{i,t} + \beta_6 * LIR_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where:

- i and t imply the country under examination (i), according to the time period (t).
- $NPL_{i,t}$: is the ratio of non-performing loans to total gross loans provided for country i, at time t and is expressed in %.
- $GDP_{i,t}$: is the growth rate of real GDP for country i, at time t and is expressed in %.
- $UNEMPL_{i,t}$ is the unemployment rate for country i, at time t and is expressed in %
- $INF_{i,t}$: is the inflation rate for country i, at time t and is expressed in %
- $CAR_{i,t}$: is bankbs' capital adequacy for country i, at time t and is expressed in %
- $HFC_{i,t}$: is the households' consumption cost for country i, at time t and is expressed as % of GDP
- $LIR_{i,t}$: is the lending rate for country i, at time t and is expressed in %.
- $\varepsilon_{i,t}$: is the residuals for country i, at time t

The model's independent variables are GDP growth rate, inflation rate, unemployment rate, lending rates, banks' capital adequacy and households' consumption cost, while non-performing loans is used as the dependent one. Moreover, the study applies panel data method in order to identify the

relationship between the independent variables and non-performing loans. Panel data analysis is applied in case of checking variability across time and variables (Maddala, 2001).

Panel data provide more informative data, greater variability, reduced multicollinearity between variables, increased accuracy of estimates, more degrees of freedom, and greater efficiency. Panel data is better for detecting and measuring effects that are not detectable in pure time series data. A panel data regression has a double index on its variables, with i denoting countries and t the time (Baltagi, 2021).

5. EMPIRICAL PROCESS

Before proceeding to our empirical analysis, we will take the necessary actions and test, in order to verify that our model does not have any construction problems.

Sample and Variables

The first step is to proceed to the necessary stationarity tests for each variable of the model. Stationarity tests allow verifying whether a series is stationary or not. A time series is stationary if it has the property that the mean, variance and autocorrelation structure do not change over time. On the other hand, a time series is not stationary when it indicates trends, or seasonality. Trend and seasonality will affect the value of the time series at different times. In order to be sure for our model integrity, we should test for time series stationarity, proceeding to unit root tests, so to test whether a time series variable is non-stationary and possesses a unit root. The null hypothesis is generally defined as the presence of a unit root and the alternative hypothesis is either stationarity, trend stationarity or explosive root depending on the test used.

In order to know whether our time series are stationary, we proceeded to the unit root tests of Im-Pesaran- Shin, ADF-Fisher and PP-Fisher.

Table1. *Im-Pesaran-Shin Unit Root Test*

The results of Im-Pesaran-Shin - Test			
		Statistic	p-value
NPL	Level	0,55555	0,7107
	1st Difference	-2,70698	0,0034
GDP	Level	-5,19863	0
	1st Difference	-	-
UNR	Level	-1,59066	0,0558
	1st Difference	-3,4945	0,0002
INF	Level	-4,2248	0
	1st Difference	-	-
HFC	Level	-0,0825	0,4671
	1st Difference	-7,78185	0
CAR	Level	1,94082	0,9739
	1st Difference	-7,41512	0
LIR	Level	-0,05809	0,4768
	1st Difference	-7,16519	0

From the unit root test through the lm-Pesaran-Shin test (Table 1), there was detected that the series NPL, UNR, HFC CAR and LIR were non-stationary as the probability value is greater to 5% (p-value> 5%.) For the cases of these time series, we computed their first differences , in order to achieve stationarity. Thus, these series are difference stationary.

Likewise, for verification reasons, we tested time series stationarity, using and other unit root tests as ADF - Fisher Chi-square and PP - Fisher Chi-square tests as seen below (Tables 2 and 3).

Table2. *ADF- Fisher Chi-square Unit Root Test*

The results of ADF - Fisher Chi-square			
Variables		Statistic	p-value
NPL	Level	18,0761	0,5824
	1st Difference	37,3984	0,0105
GDP	Level	62,7942	0
	1st Difference	-	-

UNR	Level	29,2508	0,0829
	1st Difference	45,6226	0,0009
INF	Level	51,7253	0,0001
	1st Difference	-	-
HFC	Level	18,7564	0,5377
	1st Difference	86,6885	0
CAR	Level	12,0409	0,9147
	1st Difference	85,2846	0
LIR	Level	19,7037	0,4766
	1st Difference	82,2	0

Table3. *PP- Fisher Chi-square Unit Root Test*

The results of PP - Fisher Chi-square			
Variables		Statistic	p-value
NPL	Level	13,8944	0,8358
	1st Difference	51,223	0,0001
GDP	Level	71,316	0
	1st Difference	-	-
UNR	Level	28,0675	0,1078
	1st Difference	39,0737	0,0065
INF	Level	47,3949	0,0005
	1st Difference	-	-
HFC	Level	37,7978	0,0094
	1st Difference	77,6229	0
CAR	Level	18,5567	0,5508
	1st Difference	115,593	0
LIR	Level	16,3086	0,6973
	1st Difference	81,573	0

As we can see from the above tables (Tables 2 and 3), our results are verified and from the other unit root tests applied and so we can proceed to the specialization of our model.

Elaborating the Most Efficient Model

As has already being analyzed, this study's purpose is to examine the impact of specified macroeconomic and banking indicators, on non-performing loans in ten (10) European countries for the period 2005-2019.

Before preceding to our empirical analysis, extracting the results of our model, commenting on them and highlighting their importance for society, investors, banks and economy, it is outstanding to focus on the best fit model, which provides us with the most objective and unbiased results. More specifically,the basic methods of estimating β_j parameters of models' regressors are the following:

- Pooled OLS
- Fixed Effects
- Random Effects

The first analysis conducted on the possible effect of the independent variables on non-performing loans was based on the Pooled Ordinary Least Squares (Pooled OLS) methodology. According to Wooldridge (2010), pooled least squares are used while selecting a different sample for each time period of the table's data. If it is used the same sample in all periods, then Fixed or Random effects models are recommended. This model is considered quite restrictive and is not widely used in econometric studies.

An analysis was then conducted applying a fixed effect model. Fixed-effects are applied whenever we are only interested in analyzing the impact of variables that vary over time. Fixed effects explore the relationship between predictor and outcome variables within a country.

In addition, a Random Effects model was applied. In the random effects model, the individual specific outcome is a random variable unrelated to the explanatory variables. According to Radivojevic & Jovovic (2017), the use of this method is recommended when we believe that cross-country

differences have some effect on the dependent variable (i.e non-performing loans). An advantage of this method is that we can include time-invariant variables, while in the fixed effects model, these variables are absorbed by the model's constant.

In order to investigate which of the above methods is the most appropriate to describe the relationship between non-performing loans and the factors affecting it, it is necessary to proceed to the following tests:

- The Redundant Fixed Effect statistical test in order to examine whether the Fixed Effect model is more appropriate than the Pooled OLS method and
- The Hausman statistical test in order to examine whether the Random Effect model is more appropriate than the Fixed Effect model.

More specifically, Hausman (1978) proposed the application of a test, which importance consists whether there is any correlation of the regression's model entities (i.e. country and time) individual effects with the independent variables' coefficients. If there is no correlation, then it is recommended the Random Effect model as the best model to be applied. Otherwise, if there is observed correlation, then it should be applied the Fixed Effect model for optimal results. Researchers have interpreted rejection of the null hypothesis (H0) as admission of the fixed-effects model, otherwise the admission of alternative hypothesis (H1) is suggested as adoption of the random-effects model.

More specifically, according to Hausman test we will estimate the null hypothesis:

- H0: The $b_i$coefficients of the random effects model are effective while the $b_i$coefficients of the fixed effects model are ineffective. Both coefficients are consistent.

Against the alternative

- H1: The b_i coefficients of the fixed effects model are consistent and inefficient, while the b_i coefficients of the random effects model are inconsistent.

It should be mentioned that throughout the analysis, there are used the first time series differences as the stationary tests presented above, indicated that most series were not stationary at their initial level.

The results of Redundant Fixed Effects tests and Hausman test showed that the most appropriate method for estimating the coefficients of the model is Random Effects as

1. The Redundant Fixed Effect statistical test did not reject the null hypothesis that the Fixed Effect model is more appropriate than pooled OLS method (Table 4) and
2. The Hausman test did not reject the null hypothesis that the Random Effect method is more appropriate than the Fixed Effect method (Table 5).

Therefore, overall the Random Effect model appeared to be better for parameter estimation for the case of our model.

More specifically, from Table 4 we conclude that the null hypothesis according to which the Fixed Effect method is more efficient over the Pooled OLS method cannot be rejected (p=0.9523>0.05).

Table4. *Redundant Fixed Effects Tests Results*

RedundantFixedEffectsTest			
Equation: Untitled			
Test cross-section fixed effect			
EffectsTest	statistics	d.f.	Prob.
Cross-section F	0.358709	-9,124	0.9523
Cross-sectionChi-square	3.598.302	9	0.9358

Moreover, from Table 5 we conclude that the null hypothesis according to which Random Effect method is more appropriate than the Fixed Effect method cannot be rejected (p=0.7888>0.05). Therefore, the random effects method is considered more efficient than the fixed effects method.

Table5. *Hausman Test Results*

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
TestSummary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-sectionrandom	3.157.720	6	0.7888

Thus, the above tests show us the way to end up that the most appropriate method to describe the relationship between non-performing loans and the factors affecting it, it's the one resulting from the parameter estimation based on the random effects method.

6. Empirical Results

Descriptive Statistics

Table 6 presents the descriptive statistics of all variables (dependent and independents) of our model.

Table6. *Descriptive Statistics*

	NPL	GDP	UNR	INF	CAR	LIR	HFC
Mean	0.090618	0.009346	0.092591	0.026381	0.068038	0.066615	0.584426
Median	0.037740	0.015933	0.077500	0.015310	0.063790	0.055500	0.569199
Max	0.597566	0,075935	0.275000	0.486999	0.150564	0.218229	0.753180
Min	0.006393	-0.147586	0.032000	-0.017360	0.027000	0.017000	0.496457
St. dev.	0.126271	0.029678	0.055312	0.051965	0.024590	0.041795	0.061593
Skewness	2.395669	-1.933366	1.628915	5.675503	1.531399	1.850084	0.653516
Kurtosis	8.216826	9.311411	5.059565	45.16411	5.315993	6.151782	2.235380
Jarque-Bera	313.5763	342.4096	92.84541	11916.61	92.15348	147.6560	14.33110
P-value	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000773
Sum	13.59264	1.401951	13.88860	3.957181	10.20563	9.992187	87.66385
Sum of St. Dev.	2.375726	0.131240	0.455855	0.402355	0.090096	0.260277	0.565253
Obs.	150	150	150	150	150	150	150

The average price of non-performing loans (NPL) is approximately 9.06%, the minimum value is 6.39% while the maximum one equals to 59.75%. This is due to the economic and political instability resulted from the global financial crisis as the borrowers' disposable income unexpectedly decreased, making it hard to service their debt. It is worth noting that Switzerland records the lowest rates of non-performing loans over time and is followed by Germany and Austria two EMU countries that haven't be affected by the financial crisis. From these results we can perceive that countries that solid economies, that were imperceptibly affected by the crisis. The countries indicating the highest rates of non-performing loans are Ukraine and Greece. Especially for Greece, since 2009, there has been a launch in non-performing loans rates, due to the intense and persistence of the financial crisis. Italy and Portugal, two EMU countries, being affected by the crisis and were required to implement reform packages, seem to be intensively affected by the crisis as they also indicate high percentages of non-performing loans, especially during the years 2009-2019. Thus, as it can be observed, countries with weaker economies affected the most form the financial crisis and indicated high non-performing loans rates after the financial crisis outbreak.

The maximum price of GDP variable is 7.59%, which is an indication of a high rate of economic growth. However, on the other hand, this indicator also records negative values, which means that many European countries experienced a severe recession. It is worth noting that the negative values appear during the years 2008-2016, a period when the economic crisis was at its peak, mainly in Southern EU countries.

The average unemployment rate (UNR) is around 7.75%, however its highest value reaches around 27.5%. This shows that some countries face an outbreak of unemployment (i.e. Ukraine, Greece, Portugal, Italy).

Inflation values range between −1.73% and 48.70%. It is worth noting that the country with the highest inflation rates over time is Ukraine. High inflation (INF) is one of the main problems of many

European countries. However, the unconventional monetary policy measures implemented by ECB, contributed to the constriction of inflation rates and the economies' recovery (Katsampoxakis, 2021). On the other hand, negative inflation rates indicate the occurrence of deflation.

Despite different prudential regulations of the countries taking into consideration in the study, the average value of capital adequacy ratio (CAR) is encouraging. It provides security and allows banks to deal with macroeconomic shocks. This proves that ECB's measures were moved to the right direction, especially during the financial crisis outbreak period (Katsampoxakis, 2021).

As far as the household consumption cost (HFC) is concerned, its values range from 49.64% to 75.31%, while the lending rate (LIR) records a relatively high difference between minimum and maximum, which may indicate that the banks have consciously differentiated their lending rates depending on the borrowers creditworthiness.

Correlations

At the table 7 and 8, there are presented the correlation matrices, indicating the correlation coefficients all model's variables at both level and their first differences.

Table7. *Correlation Matrix at levels*

CorrelationProbability	NPL	GDP	UNR	INF	CAR	LIR	HFC
NPL	1.00000						
	…….						
GDP	-0.004405	1.00000					
	0.9573	…….					
UNR	0.283231	0.270017	1.00000				
	0.0004	0.0008	…….				
INF	0.361662	-0.212876	-0.206532	1.00000			
	0.0000	0.0089	0.0112	…….			
CAR	0.618196	0.39533	0.028960	0.362763	1.00000		
	0.0000	0.6310	0.7250	0.0000	…….		
LIR	0.595500	-0.204257	-0.127855	0.696127	0.627798	1.00000	
	0.0000	0.0122	0.1189	0.0000	0.0000	…….	
HFC	0.615664	-0.309519	0.443652	0.252663	0.485291	0.542833	1.00000
	0.0000	0.0000	0.0000	0.0018	0.0000	0.0000	…….

From the analysis of the above table, we can see the correlations of countries selected in our sample for all years examined. It is observed a negative but not significant correlation between non-performing loans and the annual GDP growth rate, that is, as GDP increases, non-performing loans decrease and vice versa. We also see that there is a positive and strong correlation of non-performing loans with unemployment, inflation, capital adequacy ratio, lending rates and household final consumption expenditure.

More specifically, we observe that the higher the inflation, the higher the ratio of non-performing loans. Furthermore, a positive and significant correlation is observed between unemployment and non-performing loans, which means that as unemployment increases, is reduced borrowers' ability to pay off their loans, thus increasing non-performing loans. There is also a strong and significant correlation between household consumption costs and non-performing loans, which imply that as household costs increases, their ability to serve their contractual obligations decreases, resulting in an increase in non-performing loans.

Correspondingly, at the table 8, there are presented the correlations between our model's variables after transforming them into first differences, due to no stationarity reasons.

Table8. *Correlation Matrix at first differences*

CorrelationProbability	DNPL	GDP	DUNR	INF	DCAR	DLIR	DHFC
DNPL	1.00000						
	…….						
GDP	-0.348050	1.00000					
	0.0000	…….					
DUNR	0.210239	-0.586821	1.00000				

	0.0127	0.0000	…….				
INF	-0.065452	-0.227454	0.013847	1.00000			
	0.4423	0.069	0.8710	…….			
DCAR	-0.022699	0.15591	0.029189	-0.272377	1.00000		
	0.7901	0.2596	0.7321	0.0011	…….		
DLIR	-0.226900	-0.185335	-0.104051	0.354716	-0.292910	1.00000	
	0.0070	0.0000	0.2212	0.0000	0.0004	…….	
DHFC	-0.178036	-0.146117	0.206916	-0.004195	0,210483	0.068328	1.00000
	0.0353	0.0860	0.0142	0.9608	0.0126	0.4225	…….

From the correlation matrix presented in table 8, it is derived a negative correlation between non-performing loans and GDP growth rate, inflation, capital adequacy ratio, lending rates and households expenditures, while there is a positive correlation between non-performing loans and unemployment.

Regression Analysis

In order to clarify whether there are significant differentiations between the 3 methods (Pooled OLS, Fixed Effects and Random Effects) related to the conclusions derived, we will run our regression model through all methods, although the random effects method is the most effective, as indicated through the Redundant fixed effects test and Hausman test.

Pooled OLS method for panel data was first conducted to examine the possible impact of the independent variables of the model on non-performing loans. From the table 9 we can extract that according to the pooled OLS method, our model is statistically significant ($F=4.056$, $p<0.05$). Moreover, it seems that, household consumption costs unemployment rate and lending rates affect non-performing loans to a positive statistically significant way. On the other hand, GDP growth rates, capital adequacy and inflation rates do not seem to significantly affect non-performing loans.

Summing up, the most important outcome from the analysis of table 9 are:

1. An increase in the unemployment rate by one unit is related with an increase in the non-performing loan ratio by 0.697,
2. An increase in household consumption costs by one unit leads to an increase in the NPL ratio by 1.170 and
3. An increase in the lending rate by one unit increases the non-performing loan ratio by 1.075.

Table9. *Output with Pooled OLS method*

DependentVariable: NPL				
Method: PanelLeastSquares				
Sample: 2005 2019				
Periodsincluded: 15				
Cross-sectionsincluded: 10				
Totalpanel (balanced) observations: 150				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002242	0.004105	0.546146	0.5859
D(CAR)	0.442793	0.576075	0.768638	0.4435
D(GDP)	0.215078	0.144081	1.492760	0.1379
D(HFC)	1.170256	0.411386	2.844666	0.0051
D(INF)	0.121558	0.098915	1.228912	0.2213
D(LIR)	1.075127	0.457621	2.349383	0.0203
D(UNR)	0.697099	0.293011	2.379085	0.0188
R-squared	0.154676	Meandependentvar		0.001556
Adjusted R-squared	0.116541	S.D. dependentvar	0.049934	
S.E. of regression	0.046934	Akaikeinfocriterion	-3.231438	
Sum squaredresid	0.292974	Schwarzcriterion	-3.084356	
Loglikelihood	2.332007	Hannan-Quinncriter.	-3.171668	
F-statistic	4.056012	Durbin-Watsonstat	1.951086	
Prob (F-statistic)	0.000912			

The second analysis conducted related to the potential impact of our model's independent variables on non-performing loans is through the use of Fixed Effect method for panel data. From the table 10 we can observe that the regression model using the Fixed Effects method is statistically significant ($F=1.767$, $p<0.05$).

According to the Fixed Effect method results, household consumption costs, lending rates, unemployment rates and GDP growth rates (at 10% significance level) seem to affect in a statistically significant positive way non-performing loans. However, inflation rates and banks capital adequacy ratio do not show any significant impact on non-performing loans.

Thus, the most important output deriving from using fixed effects method in order to estimate the coefficients of our model are:

1. An increase in GDP by one unit is leads an increase in non-performing loan ratio by 0.252,
2. an increase in the unemployment rate by one unit records an increase in the NPL ratio by 0.641
3. An increase in the lending rate by one unit is associated with an increase in the non-performing loans index by 1.156.
4. An increase in the household consumption by one unit is accompanied by an increase in non-performing loans by 1.347

Table10. *Output with Fixed Effects method*

Sample: 2005 2019				
Periodsincluded: 15				
Cross-sectionsincluded: 10				
Totalpanel (balanced) observations: 150				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002290	0.004200	0.545176	0.5866
D(CAR)	0.433234	0.597498	0.725079	0.4698
D(GDP)	0.252058	0.150765	1.671867	0.0971
D(HFC)	1.347145	0.464658	2.899220	0.0044
D(INF)	0.125649	0.101408	1.239044	0.2177
D(LIR)	1.155887	0.475778	2.429467	0.0166
D(UNR)	0.641241	0.306163	2.094443	0.0383
EffectsSpecification				
Cross-section fixed (dummy variables)				
R-squared	0.176126	Meandependentvar		0.001556
Adjusted R-squared	0.076463	S.D. dependentvar		0.049934
S.E. of regression	0.047987	Akaikeinfocriterion		-3.128569
Sum squaredresid	0.285540	Schwarzcriterion		-2.79281
Loglikelihood	2.349998	Hannan-Quinncriter.		-2.991952
F-statistic	1.767225	Durbin-Watsonstat		1.983025
Prob(F-statistic)	0.046702			

The third regression analysis conducted to test for the potential impact of independent variables of our regression model on the evolution of non-performing loans is through using the Random Effects method for panel data. According to the results of Table 11, even the regression model using the Random Effect method is statistically significant ($F=4.056$, $p<0.05$). As far as the factors that seem to affect non-performing loans are household consumption costs, unemployment rates and lending rates in a positive statistically significant way at 5% significance level. On the other hand, capital adequacy ratio, GDP growth rates and inflation rates do not seem to affect non-performing loans in a significant way and therefore their positive effect cannot be commented, as a special finding. The results deriving from the use of random effects method in our model regression analysis summarize that:

1. An increase in the unemployment rate by one unit will lead to an increase in the non-performing loans ratio by 0.697,
2. An increase in household consumption costs by one unit will positively affect non-performing loans ratio by 1.170 and

3. An increase in the lending rates by one unit will positively influence the non-performing loans ratio by 1.075.

Table11. *Output with Random Effects method*

DependentVariable: D(NPL)				
Method: Panel EGLS (Cross-section random effects)				
Sample (adjusted): 2006 2019				
Periodsincluded: 14				
Cross-sectionsincluded: 10				
Totalpanel (balanced) observations: 140				
Swamy and Arora estimator of component variances				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002242	0.004197	0.534164	0.5941
D(CAR)	0.442793	0.588996	0.751776	0.4535
D(GDP)	0.215078	0.147313	1.460.011	0.1466
D(HFC)	1.170256	0.420614	2.782258	0.0062
D(INF)	0.121558	0.101133	1.201952	0.2315
D(LIR)	1.075127	0.467886	2.297841	0.0231
D(UNR)	0.697099	0.299584	2.326891	0.0215
EffectsSpecification				
			S.D.	Rho
Cross-sectionrandom			0.000000	0.0000
Idiosyncraticrandom			0.047987	10.000
WeightedStatistics				
R-squared	0.154676	Meandependentvar		0.001556
Adjusted R-squared	0.116541	S.D. dependentvar		0.049934
S.E. of regression	0.046934	Sum squaredresid		0.292974
F-statistic	4.056012	Durbin-Watsonstat		1.951086
Prob(F-statistic)	0.000912			
UnweightedStatistics				
R-squared	0.154676	Meandependentvar		0.001556
Sum squaredresid	0.292974	Durbin-Watsonstat		1.951086

Summarizing our regression analysis results deriving from the aforementioned tests carried out and taking into consideration that the most appropriate model for our case in order to estimate our model's coefficients is through random effects method, our model is transformed as follows:

$d(Y_i)$=0.0022+0.0442· $d(CAR_{it})$ + 0.215·$d(GDP_{it})$+1.170·$d(HFC_{it})$+0.121

·()+1.075 ·()+0.697·$d(UNR_{it})$ (3)

From the above empirical analysis and the results occurred, we ended up to some very interesting and important conclusions to economic point of view, most of them are in accordance with the global bibliography.

First of all, the unemployment rate has a positive and statistically significant effect on non-performing loans. This does make sense as unemployment reduces households' disposable income and restricts borrowers' ability to meet their loan obligations. More specifically, an increase in unemployment rate will negatively affect borrowers' cash flows and may lead to debt increase. As far as firms is concerned, rising unemployment may be a sign of output's reduction as a consequence of falling real demand. This may also lead to incomes' decrease and debt increase. In both cases, there is an emerging risk of debt default. Our results related to the impact of unemployment rate on non-performing loans are similar with those of Louzis et al. (2012), Makri et al. (2014), Radivojevic & Jovovic (2017), Agić & Jeremić (2018), Szarowska (2018), Bayar (2019) and Abdolshah et al. (2020).

Moreover, household consumption costs seem to affect in a statistically significant positive way non-performing loans. This results should considered as expected, taking into our mind that the costs arising from loans payments are not included in this index. Thus, the higher the household spending,

the more difficult it becomes for a household to pay off its debt. However, this result is not in accordance with the results of Boudriga et al. (2010) and Radivojevic & Jovovic (2017), who argued of the existence of a negative relationship between the household spending and non-performing loans.

Another important finding of our study is that lending rates have a positive and significant effect on non-performing loans. Due to the increase in interest rates, the amount for interest payments increase as well, boosting the risk of non-paid debts, which leads to the increase in non-performing loans. Furthermore, when there is no cap on lending rates, it is easier for banks to charge a higher risk premium and therefore providing more loans, thus increasing the risk of NPLs. These results are in accordance with those of of Curak et al. (2013), Szarowska (2018), Sembiring et al. (2019), Ahmedet al. (2021) and Dutta (2021) and in contradiction with those of Agić & Jeremić (2018) and Wood & Skinner (2018).

Finally, the remaining variables (GDP growth rate, inflation rate and banks' capital adequacy) used in our model do not seem to affect non-performing loans to a statistically significant way. Our results related to these variables related to their impact on non-performing loans ate similar with the finding of Jovovic (2014), Agić & Jeremić (2018), Wood & kinner (2018), Sembiring et al. (2019), Abdolshah et al. (2020)

7. CONCLUSIONS AND FURTHER IMPLICATIONS

In the present study, we applied an econometric model that contributed to factors identification affecting non-performing loans rate in 10 European countries, including Greece, Italy, Portugal, Belgium, Germany, Spain, France, Ukraine, Switzerland and Austria for the period 2005-2019. More specifically, we applied a panel data analysis, based on random effects method, as after conducted the necessary tests it proved to be the most efficient method for estimating our model's coefficients, related to pooled OLS and Fixed Effects methods. Moreover, we constructed a correlation matrix to investigate the existence of any correlations between the variables of our model. Our results indicate strong and positive correlations between non-performing loans and the most of macroeconomic and banking factors used.

Our findings deeply agree with the international literature confirming that non-performing loans tend to increase when unemployment increases, making it harder for unemployed to be consistent with their debt obligations. Thus, it can be stated that the economies' state in European countries is clearly linked to the quality of loans portfolio.

Furthermore, our study revealed the existence of a positive and significant relationship between lending rates and non-performing loans, which is consistent with most studies conducted worldwide. An increase in lending rates implies higher cost of loans, which appears to reduce borrowers' ability to pay off their debt and increase the likelihood of default. Likewise, lowering lending rates contributes to financial liberalization, which enhances competition, increases efficiency and ultimately reduces non-performing loans.

Moreover, the non-performing loans levels are rising, as households confine their ability of being consistent with their debt obligations due to increased consumption. This is likely to be related to supply-side factors as well, which play a key role in determining the stability of economic conditions and, therefore, the optimal equilibrium of households' debt.

It can be mentioned that the significance of our results is even greater, as they include all business cycle's phases; expansion, peak, contraction, and trough. Moreover, the paper's results are of great importance for bankers, policymakers, investors and governors, as they can penetrate to the exact factors mainly affect non-performing loans and can take important decisions related to the loans' types, kind of borrowers, interest rates level, repayment period etc. However, as it has already stated, non-performing loans affect economic and financial stability.

From the above analysis and the empirical results of our study, it is obvious that the increase in non-performing loans will affect the amount of bank credits and loans provision in the coming years, thus confirming the perception that healthy and sustainable growth cannot be achieved without a healthy and resilient banking system. Macroeconomic stability and economic growth is a key condition for a healthy financial system. Therefore, proper regulation and supervision of the banking sector is vital.

All the above theoretical approach comes in accordance with our findings. Our results lead us to perceive that countries with solid economies, structural reforms, adequate regulation and fiscal discipline were imperceptibly affected by the crisis (i.e.Switzerland, Germany, Austria) and the level of non-performing loans was about their average, even after the global financial crisis outbreak. On the other hand, countries with weaker economies being affected significantly from the financial crisis and indicated high non-performing loans rates after the financial crisis outbreak (i.e. Greece, Portugal, Italy).

Last but not least, it can be pointed out that this study focuses only on some of the determinants of non-performing loans. There could be even more macroeconomic and banking indicators that can influence the growth of non-performing loans and is worth to be studying especially after the effects of the healthy crisis, caused by the pandemic Covid-19 and the energy crisis due to the war in Ukraine. Both the recession caused by Covid-19 and energy crisis is expected to sharply increase non-performing loans, especially when government support and the implementation of unconventional monetary policy tools are phased out. Thus, future research could be extended by adding the effect of the two recent crises and investigate whether the evolution and impact of factors examined keep indicating the same attitude on non-performing loans. Another way of expanding this study is through applying specific VaR models and related methodologies (Basdekis et al. 2021, 2022) in order to assist policy makers, investors, bankers, government, analysts and the other stakeholders to find ways to mitigate risk undertaken.

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Citation: *Ioannis Katsampoxakis & Charalampos Basdekis. "Factors Affecting Non-Performing Loans in Europe Before and After Global Financial Crisis" International Journal of Managerial Studies and Research (IJMSR), vol 10, no. 9, 2022, pp. 20-38. DOI: https://doi.org/10.20431/2349-0349.1009003.*