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TÍTULO: Determinaciones de los préstamos no redituables en los Estados miembros de la economía mundial, la UE, el G10 y el G20: análisis agregado y desagregado.

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RESUMEN: El objetivo del estudio es investigar empíricamente los determinantes clave de los préstamos no redituables (NPL en inglés) en la economía mundial y a través del análisis de desagregación. Se toman submuestras de estados miembros de la UE, el G10 y el G20. Se consideran 148 países con economías regionales en el período 2009-2016. Se examinan modelos de regresión de panel y ecuaciones agrupadas. Los determinantes más significativos son los NPL rezagados, la relación entre el capital bancario y el activo, la inflación y el crecimiento del PIB. El efecto de la tasa de interés de préstamos en miembros de la UE sobre los NPL se considera significativo. Los miembros del G20 rezagados NPL, el crédito interno al sector privado y la tasa de crecimiento del PIB se suponen determinantes significativos.

PALABRAS CLAVES: NPL rezagados, tasa de crecimiento del PIB, UE, G10 y G20.

TITLE: Determinations of Non-Performing Loans in World Economy, EU, G10 and G20 Member States: Aggregrated and Disaggreated Analyis.

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ABSTRACT: The objective of the study is to empirically investigate the key determinants of non-performing loans (NPLs) in the world economy and through disaggregate analysis while taking EU, G10 and G20 member states as subsamples. 148 countries with regional economies are under consideration in the period 2009-2016. Panel regression models and pooled equations are examined. The most significant determinants are the lagged NPLs, bank capital to asset ratio, inflation, and GDP growth, except the fixed effect for the bank capital to asset ratio. The effect of lending interest rate in EU members over NPLs is found significant. G20 members lagged NPLs, domestic credit to private sector, and GDP growth rate are assumed significant determinants.

KEY WORDS: lagged NPLs, GDP growth rate, EU, G10, and G20.

INTRODUCTION.

Overview of NPLs.

After the recent global financial crisis (GFC) in last decade, a key trend has been recorded in the balance sheet of the banks under the title of non-performing loans (NPLs) with the increasing level of credit risk. Such significant drift is recorded in most of the nations around the globe including US, Europe and other emerging economies with deterioration of financial stability and liquidity position for the banks (Chiorazzo et al., 2017; Saba et al., 2012; Škarica, 2014; Zikai, 2018).

Since GFC, issues related to NPLs have attained intense attention from the regulators, country representatives and banking officials. The decline in the value of the bank assets, its earning capacity and low advancement in future have been recorded as aftershocks due to increasing level of NPLs for the banks. The proxy of NPLs is significantly used for the measurement of asset quality of the banks, hence its corrosion is not only a baseline shock for the banks, but also for the regional economies which are interlinked.

The term "financial pollution" is introduced for the NPLs due to its uneven economic consequences (Barseghyan, 2010; lizadeh & Lahiji, 2018; Jinadu et al, 2017; Tandel & More, 2018). As per International Monetary Fund (IMF), the concept of NPLs can be explained as "when the payments for the principal and interest are past due by the three months or 90 days or more," or "interest payment equal to three months or 90 days or more have been reinvested into the principal amount, refinanced or finally rolled over". In addition, NPLs are also explained by the Banks for International Settlement (BIS) in the following: "a default is considered to have occurred about a particular obligor when he is past due more than 90 days on any material credit obligation to the banking group".

In the world economy, the trend for the NPLs over the last 1.5 decades has demonstrated a mixed trend. Since 2000 to 2015, the trends in NPLs is reflected through regional economies and financial factors. The highest movement in NPLs is recorded in 2000 with the ratio of 9.05 about NPLs to gross loans. The highest change in NPLs ratio is recorded in 2003 with a decline of 2.05 comparatively to 2002.

The shaded area in Figure 1 reflects the recession time during 2001-02 and 2008-09. However, the NPLs average for 2016 is recorded as 7.11% with the highest value in Cyprus was 48.68 % and lowest in Macao which is .2 %. Figure 2 explains the trend of NPLs in 2016 for countries at world glance, whose data is available for 2016.

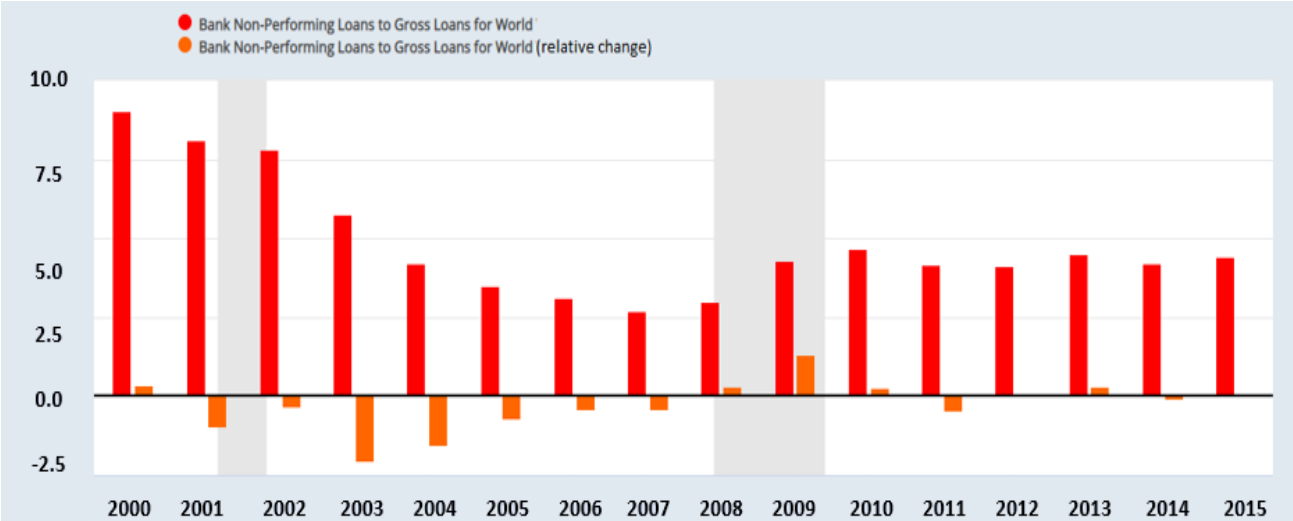

Figure 1: Bank NPLs to Gross Loans (World). Source: Al-fred, (2018).

Numerous studies measure the NPLs with different determinants in various regions; for instance, Umar & Sun (2018) have considered the determinants of NPLs in Chinese banks, Ghosh (2015) has explored determinants of NPLs for both the banking sector and regional economic perspective in United States (US), for the Greece banking by Louzis et al. (2012), and by Espinoza & Prasad (2010) for the GCC banking industry. The key focus of these studies is on the both the macroeconomic and banking specific indicators.

As the banking industry in the world economy link through a complex financial system, the impact of these indicators has been reflected in the global economy with their direct and indirect impact on the regional financial institutions.

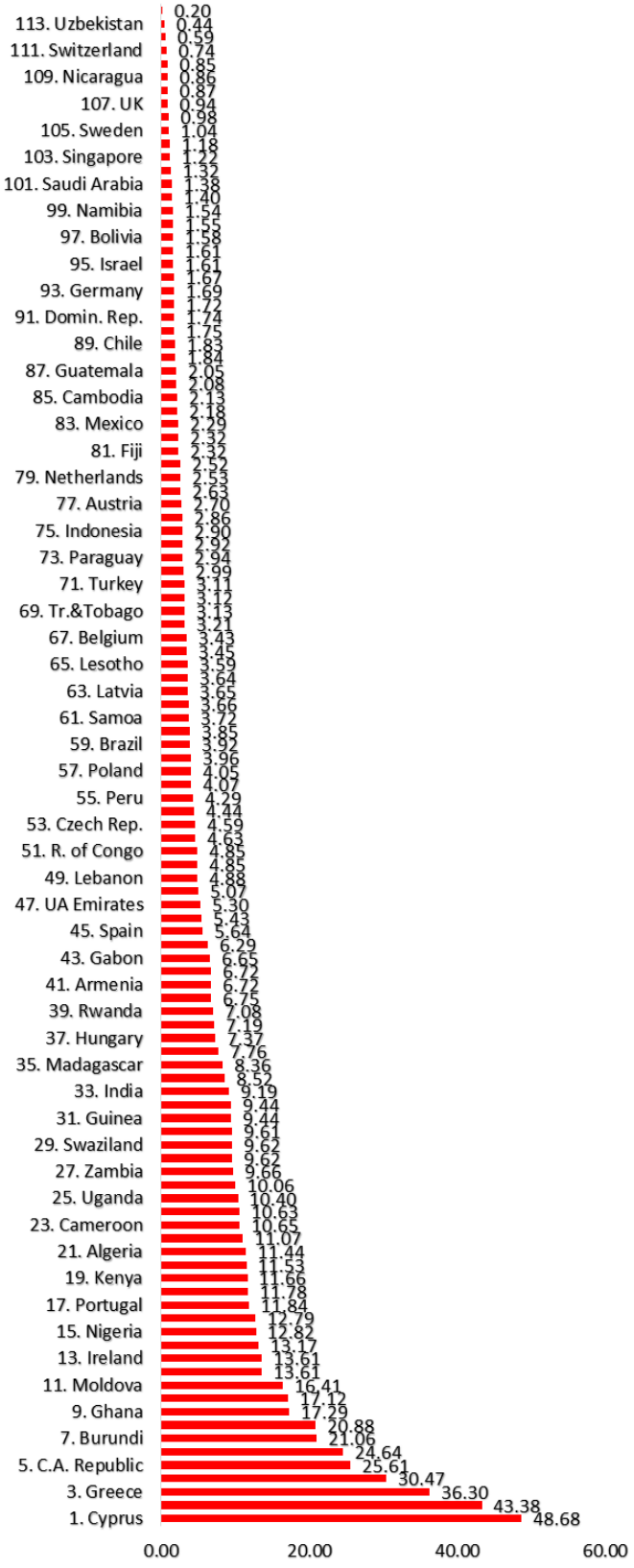

Figure 2: NPLs at World Glance 2016. Source: Authors calculation based on data from WDI.

DEVELOPMENT.

Review of related studies.

The idea of NPLs is covered through numerous thermotical and empirical studies. Such work ranges from both microeconomic to regional indicators. Two key theories under the title of financial accelerator theory and life cycle consumption are covering the title for the NPLs while considering macroeconomic dials. The idea of financial accelerator theory (FCT) as explained by (Bernanke & Gertler, 1990) focuses on the financial fragility and quality of investment projects. It covers that financial market conditions & economy can reinforce each other (Bernanke, Gertler, & Gilchrist, 1994). In the words of (Umar & Sun, 2018), business cycle plays a significant role in explaining the NPLs of banks. Meanwhile, the concept of life cycle consumption predicts that default probabilities of the borrowers held responsible for increasing NPLs in banking firms (Umar & Sun, 2018; Bahremand, 2015).

The literature work under consideration from the perspective of NPLs has focused on the factors responsible for the financial instability. Such condition depends upon the bank failure, situation of financial crisis, and quantity of NPLs; for instance, the study of (Keeton & Morris, 1987) examines the indicators involved in NPLs during 1979 to 1985 in the US. The ratio of the NPLs net off charges is used as a key measure for the loan losses for 2470 commercial banks.

Poor regional performance and some local economic predictors have explained the variation in the loan losses of the banks. Meanwhile, banks with the greater risk exposure have faced more amount of loan losses. Another study by (Sinkey & Greenawalt, 1991) investigates the loan loss exposure for risk-taking behaviour for the US banks while employing the simple regression model from 1984 to 1987. They express that economic condition, external factors, loan rates & volume with volatile funds cause 94 % variation in the loss value. However, banks with adequate capital ratio experience a lower rate of losses.

Keeton (1999) focuses on the US banking industry to analyze the impact of loan delinquencies and credit growth on loan losses from 1982 to 1996. Strong association between the credit growth and loan standards is found as higher credit growth leads to lower loan standards.

Saba et al. (2012) consider NPLs from 1985 to 2010 for both firm level and macroeconomic measures like inflation, real GDP per capita, and total loans. It is found that all the selected indicators have their significant impact on NPLs in US banking industry. It is suggested that banks should amend their credit advancement policy for lower NPLs. Ghosh, (2015) examines the regional and bank level specific determinants of NPLs for the commercial banks and saving institutions in 50 US states from 1984 to 2013. By using the fixed effect and dynamic generalized method of moments (DGMM), it is found that liquidity risk, poor quality of credit, cost inefficiency and size of the banking industry, inflation, unemployment and public debt has significantly increased the value of NPLs. However, greater bank's earning, real GDP and change in housing price lower the NPLs. Bank's management should consider the state level indicators of NPLs for better cost management and financial health.

Another contribution by (Tarchouna, Jarraya, & Bouri, 2017) aims to estimate the effect of corporate governance indicators on NPLs for US commercial banks. By applying DGMM panel model with principal component analysis, it is found that small banking firms with the sound CG system, significantly reduce the NPLs. However, medium and large banks are failed to sustain their position because of higher risk-taking and quality of loans, most likely during the global financial crisis.

Dimitrios, Helen, and Mike (2016) focus on the Euro area from 1991Q1 to 2015Q2. It is hypothesized that increasing unemployment, income tax as % of GDP, Government budget balance and debt with the inflation as CPI are significantly affecting the NPLs in the selected countries. While unemployment, debt, income tax, and ROE have their significant impact on NPLs in Euro countries. It is suggested that findings could be meaningful while designing the fiscal and macro-

prudential policies in the target economies. Škarica (2014) analyzes the determinants of NPLS in European emerging market.

By applying the panel data using fixed effect estimator for the central and eastern European states (CEES) from 2007Q3 to 2012Q3, empirical contributions explain that primary reasons for the high level of NPLs are the slowdown of the economic growth regarding GDP, inflation and unemployment. However, key suggestions include the proactive approach for the debtors, creditors and regulatory system can help in outgrowth economic recovery. Such steps can in return help the policymakers to get the stability in the banking industry during post-crisis time.

Christodoulou-Volos and Hadjixenophontos (2017) narrate that higher level of NPLs weighs significantly in the investment and banking sector ability to meet their financing obligations in the society. Their study considers the Cypriot commercial banking firms for both macro and micro level indicators of NPLs from 2008Q4 to 2014Q2. It is found that level of public debt, unemployment, and GDP significantly affect the NPLs in selected banks.

Klein (2013) highlights the NPLs in central, Eastern and South Eastern Europe (CESEE) during the period of 1998 to 2011. It is found that level of NPLs can be attributed to both micro and macro factors like unemployment, GDP growth, inflation with the strong feedback effect on the real economy from the banking sector. Makri, Tsagkanos, and Bellas (2014) examines the trend of NPLs during 2000 to 2008 for Eurozone banks when the region was in a financial crisis. Overall findings explain that there exists a strong correlation between the NPLs, unemployment, annual growth of GDP, public debt, return on equity and capital ratio.

For the Japanese economy, (Vithessonthi, 2016) examines the link between the credit growth and NPLs where the deflationary power exists. For the sample of 82 commercial banks during 1993 to 2013, application of panel regression and GMM express the time-varying link between the NPLS and credit growth. This association is positive prior to the financial crisis of 2007, but negatively

associated with the crisis. Meanwhile, the notion that large banks play their role for credit growth of NPLs is also supported by the findings. However, both credit growth and NPLs has no effect on the earning capacity of the banks but increasing the supply of loans upsurge the value of NPLs.

Variables of the study.

Dependent variable: Non-performing Loans (NPLs).

For the banking firms, NPLs is the core indication of bad loans or loan loss due to inefficient management practices. For the regional economies. NPLs are explained as per the Government announcements and regulatory criteria; for instance, in China NPLs are clarified under the standard issued by the Chinese Government since 2007 with "Guideline of Bank Loan Risk Classification" which considers the five classes for the loans (Wan, 2018; Iravani et al, 2015). These include normal, special mention, substandard, doubtful and loss/unrecoverable. However, the last three categories are entitled to the NPLs in the region. While for the US economy, Ghosh (2017) conducts the sector-specific analysis and explains NPLs as log(NPLs/(1-NPLs)). Jesús and Gabriel (2006) take the total value of NPLs to total loans ratio to express the % of bad loans and credit risk.

For the present study, NPLs ratio explains the credit risk for the banking sector and for the economy in a specific region. The literature support for the NPLs is derived from the contribution of (Betz, Krüger, Kellner, & Rösch, 2017; Dimitrios et al., 2016; Espinoza & Prasad, 2010; Ghosh, 2015, 2017; Konstantakis, Michaelides, & Vouldis, 2016; Louzis et al., 2012; Umar & Sun, 2018; Us, 2017; Wan, 2018; Abayeva, 2018; Piteira et al, 2018; Rohini et al, 2017). These studies focus NPLs for the measurement of credit risk, specifically in the banking sector. Resulting the most cited definition, NPLs are explained the aggregate of the loan amount, due over past 90 days and are non-accruals (Ghosh, 2015). This value is divided by the gross value of total loans. Figure 2 explains the value of NPLs for the various regions in the world economy during 2016.

Explanatory variables.

In recent literature, numerous indicators have been presented to predict the NPLs. Detail for the considered explanatory variables in the present study is here below:

Lagged NPLs (NPLL1).

The lagged values of NPLs is the first explanatory variable to predict the NPLs. Numerous studies have obtained the lagged values of NPLs to get its significant effect on NPLs (Radivojevic & Jovovic, 2017). They express that lagged values have their significant influence over NPLs along other macroeconomic indicators. Another study by (Dimitrios et al., 2016) takes the lagged NPLs to predict the NPLs in Euro-area countries through NPL ratio (-1) to predict the loan impairment for the various industries like construction, commerce, manufacturing, the primary sector, services, and mortgage. The lagged values of NPLs are likewise used to predict the NPLs in Baltic states along with macroeconomic indicators (Kjosevski & Petkovski, 2017). Results indicate a significant and positive influence of lagged NPLs on NPLs.

Bank capital to asset Ratio (BCAR).

As per the world bank, the bank capital to asset ratio considers the capital amount, reserve funds as contributed by the owners, general and specific reserve, retained earnings, valuation adjustments, provisions and finally total assets. The value of capital covers the tier I capital which shelters both common shares stock capital and paid-up share (WDI, 2018). Besides, regulatory capital with several types of subordinated debt instruments will not be paid if there is a need of keeping a minimum level of capital. Such capital covers the tier 2 and tier 3 capital. The total value of the assets includes all the financial and non-financial assets of the banking firms over a time. In the existing literature, the impact of capital ratio on NPLs in mixed; for instance, Berger & DeYoung (1997) argue that low capital ratio increases the value of NPLs. Conversely, it is expressed that those banks which have

higher capital ratio are engaged in more risk-taking activities with riskier portfolio, hence higher NPLs (Kjosevski & Petkovski, 2017).

Ghosh (2017) takes the capital to asset ratio to describe the NPLs for the US economy. Based on the findings, the author states a positive and significant effect of capital to asset ratio on NPLs, which indicates risky lending by the banking firms. Likewise, it is suggested that greater diversification in the loan model will reduce the NPLs in the real estate sector. Some other studies have also used capital ratio with NPLs (Dobson & Kashyap, 2006; Foos, Norden, & Weber, 2010; Haq & Heaney, 2012; Kauko, 2014; Tan & Floros, 2013).

Inflation: Consumer Price Index (CPI).

To measure the effect of macroeconomic indicators on NPLs, various studies ponder the effect of inflation through consumer price index (CPI). However, the argument for the effect of inflation over NPLs is mixed. Ghosh (2017) narrates that higher inflation is playing a significant role in reducing the total, individual and real estate NPLs in the US. The reason is that Inflation has a beneficial effect on the borrowers by making the debt payments cheaper over time. Same results are supported by (Škarica, 2014) for the Central and Eastern European countries. However, (Wan, 2018) predicts that inflation along with macroeconomic regional indicators has not significant impact on NPLs. A study by (Ghosh, 2015) depicts that inflation rate tends to play their role in the growth of NPLs as higher prices reduce the loan serving capacity of the borrower and negatively affects the real income.

Exchange Rate (ERATE).

The relationship between exchange rate (ERATE) and NPLs is also empirically examined in the existing literature. De Bock and Demyanets (2012) explains that asset quality through NPLs tends to down or increasing NPLs in emerging market at the time when the ERATE is depreciated over 1996 to 2010. Another study by (Beck, Jakubik, & Piloiu, 2013b) in 75 countries express that the exchange rate is significantly affecting the NPLs in all regions. Meanwhile, (Babouček & Jančar,

2005) explains that appreciation in the real effective exchange rate is not impairing the NPLs ratio. Some notable studies like (Kumarasinghe, 2017; McKinnon et, al., 2010; Quagliariello, 2007; Škarica, 2014) also take the NPLs and ERATE for the empirical association as well.

GDP growth rate (GDPGR).

The association between GDP growth rate (GDPGR) and NPLs is inspected by various researchers. The affiliation between GDPGR and NPLs is expected to be negative as higher economic activities tend to lower the bad loans and more repayment capacity by the borrowers. The same negative and significant association is derived (Ghosh, 2017) for residential and commercial values of NPLs. However, this association is rejected by (Wan, 2018) in the case of Chinese banks where GDP has no significant impact on NPLs. Some other studies have considered the growth of GDP and NPLs with the mixed output (Cincinelli & Piatti, 2017; Ghosh, 2015; Jesus & Gabriel, 2006; Radivojevic & Jovovic, 2017).

Lending Interest Rate (LIR).

The lending interest rate is known as the bank rate at which both short and medium size financing needs for the private sectors are met. Both creditworthiness and objectives of the borrowing differentiate LIR. However, terms and conditions for LIR may be different in each country as expressed by the world bank.

Literature supports to predict the association between LIR and NPLs. For the period of 2000 to 2013, (Donath, Cerna, & Oprea, 2014) considers the bad loans and their association with LIR in Romania and Baltic states. Findings of their study explain the positive and significant correlation between both factors in all the states except Romania. Beck et al., (2013) predict the relationship between LIR and NPLs for 75 countries along with other regional economic indicators. It is found that LIR is significantly affecting NPLs. Sander and Kleimeier (2004) found that reflection of credit risk in the form of NPLs leads to the risk premium demand by the banking firms, hence higher lending rates

and higher NPLs. Some other studies have examined the association between LIR and NPLs (Godallawaththa & Ekanayake, 2016; Savic et. al., 2013).

Liquid Reserve to Assets Ratio (LR2AR).

The ratio of liquid reserve to measures the local holdings and deposits held with the monetary authorities, some nonpublic financial enterprises, banking institutions and the private sector. The effect of liquidity on NPLs is not as much examined as of other bank-specific and regional economic indicators. However, the threshold effect of liquidity on NPLs is empirically inspected by (Pop et. al., 2018), explains that low liquid or risk-seeking banking firms have the greater threat to their stability. Another study (Wan, 2018) by analyzes liquidity creation by Chinese banks and its association with NPLs ratio.

Though, the findings reveal that there is no association between the liquidity creation for aggregate, small and large sample of selected banks from 2005 to 2012. For the US economy, Ghosh (2015) finds that higher liquidity risk significantly increases the NPLs. Meanwhile, the relationship between liquidity and NPLs is also addressed by (Ali, Hajja, & Iqbal-Hussain, 2015; Nimalathasan, 2008; Stakić, 2014).

Unemployment (UNMP).

Unemployment refers to the % of the total workforce which is available and willing for the work but has no opportunity to do work. As a macroeconomic indicator, numerous studies have considered unemployment as a key determinant for NPLs in different economies. However, the impact of unemployment over NPLs is not on a trend but varied. Wan (2018) takes the unemployment for the Chinese economies to predict NPLs and found an insignificant impact. While the findings of (Ghosh, 2015) narrates a significant increase in NPLs of US states due to unemployment.

Makri and Papadatos (2014) identifies the determinant of loan loss provision and found that unemployment is positively affecting credit risk in Greece economy. Mileris (2012) considers cross-country panel analysis and found a strong relationship between unemployment and loan quality. Some other researchers like (Bacha, 2004; Charalambakis et. al., 2017; Louzis et al., 2012; Makri & Papadatos, 2014).

Research methodology.

To estimate the effect of various determinants of NPLs in the present study, we have implemented a panel regression approach. Four techniques under the title of the pooled regression model (PRM), least square dummy variable model (LSDVM), fixed effect model (FEM) and random effect model (REM) are applied. The first equation represents the pooled regression model which can cover the effect of error terms in the following way:

$$Y(\text{NPLs}) = \partial + \beta_1 NPLL1_1 + \beta_2 BCAR_2 + \beta_3 CPI_3 + \beta_4 DC2PS_4 + \beta_5 ERATE_5 + \beta_6 GDPGR_6 + \beta_7 LIR_7 + \beta_8 LR2CR_8 + \beta_9 UNMP_9 + \varepsilon$$

(Eq.1).

where β_1, $\beta_2 \sim \beta_9$ represents regression coefficients, ∂ constant coefficient and € for the control of error terms. To control the effect of years, on the relationship between explanatory and outcome variables, least square dummy variable is added in the regression models. The effect of years will be separated over year dummies with the help of regression equation 2.

$$Y_{it}(\text{NPLs}) = \beta_0 + \beta_1 NPLL1_{1,it} + \beta_2 BCAR_{2,it} + \beta_3 CPI_{3,it} + \beta_4 DC2PS_{4,it} + \beta_5 ERATE_{5,it} + \beta_6 GDPGR_{6,it} + \beta_7 LIR_{7,it} + \beta_8 LR2CR_{8,it} + \beta_9 UNMP_{1,it} + \partial_2 YE_{2it} + \partial_8 YE_{8it} + \varepsilon_{it}$$

(Eq.2).

The primary reason for using the fixed effect model (FEM) is that it helps the researchers to analyze the impact of those variables which can vary over time. Also, FE explores the association between the set of predictors and outcome(s) variables within the entity or unit of observation *i*. Each unit of

observation has its dimensions which may or may not influence the predictors of the study. based on these characteristics, equation 3 will be tested for the fixed effect model

$$Y_{it}(\text{NPLs}) = \beta_0 + \beta_1 NPLL1_{1,it} + \beta_2 BCAR_{2,it} + \beta_3 CPI_{3,it} + \beta_4 DC2PS_{4,it} + \beta_5 ERATE_{5,it} + \beta_6 GDPGR_{6,it} + \beta_7 LIR_{7,it} + \beta_8 LR2CR_{8,it} + \beta_9 UNMP_{1,it} + + \gamma_2 E_2 + \ldots + \gamma_{148} E_{30} + \delta_2 T_2 + \delta_8 T_8 + u_{it}$$

(Eq.3).

The fundamental assumption for random effect is that across the selected entities i, the level of variation is supposed to be random. Therefore, it is not linked to the set of predictors or significant explanatory variables of the model. Additionally, the significant difference between the random effect and the fixed effect is that whether individual effect (unobserved) exemplifies the factors which are correlated with the predictors of the model. based on the assumptions of random effect equation 4 will be empirically examined.

$$Y(\text{NPLs}) = \mu + \beta_1 NPLL1_1 + \beta_2 BCAR_2 + \beta_3 CPI_3 + \beta_4 DC2PS_4 + \beta_5 ERATE_5 + \beta_6 GDPGR_6 + \beta_7 LIR_7 + \beta_8 LR2CR_8 + \beta_9 UNMP_9 + U_i + W_{ij}$$

(Eq.4).

Data nature and descriptive outcomes.

Data is obtained from the official web source of world development indicators (WDI) which allows us to get maximum observations for the stated explanatory variables and NPLs.

As we focus on the world economy, all the countrywide/regional list available on the WDI is considered for the data set. The available list helps us to collect the relevant data from the reliable source of the world bank. However, due to missing observations for some countries, a final time duration of 2009 to 2016 is selected, restricted our sample size to 148 countries/regional economies worldwide. Besides our dataset includes, G20, G10, and EU member states with the maximum observations of 1184, significantly larger than any of the earlier studies as per our best findings. For the stated variables of the study, we focus on the country level macroeconomic indicators of NPLs

from the financial and economic sector in the selected countries as expressed in Table 1 for the descriptive statistics.

On average, the highest mean value is found for the exchange rate (ERATE), followed by liquid reserve to capital ratio (LR2CR), and lending interest rate (LIR). For GDP growth rate (GDPGR), the lowest mean value is experienced in the overall sample of the study. To analyze the impact of lagged values of NPLs on current ones, NPLL1 is generated with the mean value of 6.13 in the overall sample. Besides, the mean value of NPL is reported as 6.18, indicating an annual average value consider as bad load with the deviation of 6.30. For the EU member states, G10 member states, and G20 member states, average annual NPL is noted as 8.15, 3.44, and 3.15. The maximum value for the NPLs in the overall sample went up to 48.67 during the analysis period. The same trend is recorded for the EU member states.

Over the time of the study, the world economy has an annual average GDP growth rate (GDPGR) of 3.02, for EU member states is 1.12, for G10 is .94, and for G20 is 2.41. The average trend for the bank capital to asset ratio (BCAR) is 10.15 for the whole sample, for EU is 7.71, for G10 members is 6.13 and finally for G20 members is 2.93. To measure the inflation in the world economy, Consumer Price Index (CPI) is added in the data explains an average inflation of 3.73 for the whole sample. However, the highest inflation is recorded at 48.72 for the world economy. The trend of CPI on average for EU members is 1.40 with the maximum limit of 6.09.

For G10 members, the maximum level of inflation (CPI) is 4.48 and for G20 members 15.52 respectively. The value of domestic credit to private sector (DC2PS) is measured as % of GDP has a mean value of 67.69 for the 8 years of the study.

For EU members, DC2PS explains an average of 96.36 with the standard deviation of 49.95. Meanwhile, in G10 and G20 member states, on average DC2PS is 124.80, and 95.84 correspondingly. For the exchange rate (ERATE), an average of 620.17 is experienced over the last

8 years in the whole sample. However, for EU, G10 and G20 member states, the average trend for the ERATE is experienced as 24.64, 17.92, and 94.73. For the lending interest rate (LIR), an average value of 11.40 is recorded from 2009-2016 for the whole sample of the study. For EU members, an average LIR of 3.64 is experienced.

Table 1: Descriptive Statistics for whole sample, EU, G10 and G20 member states.

Whole sample						**EU member states**					
Variable	Obs	Mean	Std. Dev.	Min	Max	Variable	Obs	Mean	Std. Dev.	Min	Max
NPL	1,109	6.189694	6.308412	0.092335	48.67585	**NPL**	205	8.1508	7.694596	0.145589	48.67585
CR	1,053	10.15423	3.271362	1.490407	23.71158	**CR**	184	7.715867	2.606775	4.098411	14.22418
CPI	1,158	3.735952	3.759222	-8.11517	48.72428	**CPI**	206	1.402972	1.641411	-4.47994	6.094216
DC2PS	1,151	67.69122	48.50775	3.931026	253.262	**DC2PS**	206	96.36886	49.95225	28.17604	253.262
ERATE	761	620.1788	2442.199	0.501233	21935	**ERATE**	93	24.64994	64.70231	0.501233	281.5233
GDPGR	1,184	3.027389	4.025929	-36.7	25.55727	**GDPGR**	208	1.124881	3.857228	-14.8142	25.55727
LIR	600	11.40345	8.038397	0.5	60	**LIR**	63	6.364487	3.649205	0.5	17.275
LR2CR	850	21.06675	15.67191	0.204755	145.5289	**LR2CR**	72	13.32115	9.68729	0.204755	37.26551
UNMP	1,152	7.824067	5.592443	0.16	34.384	**UNMP**	208	9.595625	4.182621	3.41	26.09
NPLL1	971	6.135865	6.121185	0.092335	47.74784	**NPLL1**	179	8.264619	7.40321	0.145589	47.74784
G10 member states						**G20 Member States**					
Variable	Obs	Mean	Std. Dev.	Min	Max	Variable	Obs	Mean	Std. Dev.	Min	Max
NPL	87	3.443814	3.83936	0.5	18.06437	**NPL**	139	3.514508	3.338599	0.484156	18.06437
CR	76	6.136853	2.152976	4.098411	12.73931	**CR**	131	8.32491	2.932032	4.098411	14.79819
CPI	88	1.072945	1.181703	-1.35284	4.48424	**CPI**	141	3.720726	3.253777	-1.35284	15.52633
DC2PS	80	124.8043	41.65841	54.55147	194.8622	**DC2PS**	136	95.84922	52.45518	12.41621	194.8622
ERATE	48	17.97219	36.14116	0.60773	121.044	**ERATE**	114	94.73922	289.6609	0.60773	1276.93
GDPGR	88	0.948882	2.266151	-5.61886	5.988927	**GDPGR**	144	2.4173	3.592397	-7.82089	11.1135
LIR	50	2.560684	1.259075	0.5	5.2225	**LIR**	106	9.033231	10.51401	0.5	52.1
LR2CR	24	8.569154	7.956406	0.204755	29.80839	**LR2CR**	68	10.33736	8.0336	0.466272	29.80839
UNMP	88	7.068977	2.148933	3.13	12.68	**UNMP**	144	7.525736	4.786907	3.12	26.55
NPLL1	76	3.48915	3.72465	0.5	18.06437	**NPLL1**	122	3.484233	3.199625	0.484156	18.06437

The mean value for Liquid reserve to capital ratio (LR2CR) is 21.06 for the whole sample and 13.32 for EU members. Meanwhile, for G10, and G20 members, the trend for LR2CR on average is 8.56 and 8.03 respectively. At global context, over last 8 years, an average unemployment (UNEMP) is 6.013 with the maximum value of 47.74 for 148 countries. The trend of unemployment in EU members is 9.59 on average, for G10 is 7.06 and G20 is 4.78 with a maximum value of 29.80. the log values for NPL (NPLL1) assumes the mean of 6.13 in the overall sample of the study.

Apart from the selected determinants of NPLs, evaluation of interdependency between the variables is very important. Table 2 explains the correlational matrix between the variables of the study. The level of high correlation is only experienced between NPLs and NPLL1, significant at 1%. The rest of the variables are presenting a reasonable level of association. Meanwhile, the association between NPLs and GDPGR is supporting the argument of economic theory which narrates a negative link between them (Kjosevski & Petkovski, 2017). To check the tolerance, VIF test is applied. Individual and mean VIF is below the tolerance level of 10 as expressed by (Niresh & Thirunavukkarasu, 2014), indicating the considered variables have no problem for the correlation.

Table 3 indicates the results for the NPLs for the whole sample of the study. Column 1 explains the pooled regression model (PRM), column 2 for least square dummy variable model (LSDVM), column 3 for fixed effect model (FEM), and column 4 shows the random effect model (REM). Lagged value of NPLs (NPLL1) explains the significant and positive impact on NPLs for the whole sample. It indicates that the present value of NPLs are significantly explained by previous values when the first difference is calculated through L operator. This increasing effect is reflected in all the stated models (1-4).

Table 2: Correlation Matrix & VIF of the variables.

	NPL	NPLL1	BCAR	CPI	DC2PS	ERATE	GDGR	LIR	LR2CR	UNMP
NPL	1									
NPLL1	0.9268	1								
	0.0000									
BCAR	0.1343	0.1563	1							
	0.0000	0.0000								
CPI	0.0914	0.0596	0.2583	1						
	0.0025	0.0662	0.0000							
DC2PS	-0.129	-0.1625	-0.4728	-0.3619	1					
	0.0000	0.0000	0.0000	0.0000						
ERATE	-0.1029	-0.11	-0.0013	0.0806	0.0245	1				
	0.0058	0.0059	0.9735	0.0278	0.5061					
GDGR	-0.2092	-0.1344	0.1223	0.1476	-0.1952	0.1109	1			
	0.0000	0.0000	0.0001	0.0000	0.0000	0.0022				
LIR	0.1933	0.1701	0.3303	0.3893	-0.4813	0.082	0.0282	1		
	0.0000	0.0001	0.0000	0.0000	0.0000	0.0507	0.4902			
LR2CR	0.1142	0.1267	0.1442	0.0367	-0.3684	0.0633	0.0908	0.1303	1	
	0.0013	0.0008	0.0001	0.2865	0.0000	0.1161	0.0081	0.0035		
UNMP	0.2315	0.2316	0.0347	-0.1163	-0.0152	-0.1615	-0.1856	-0.0383	-0.144	1
	0.0000	0.0000	0.2665	0.0001	0.6112	0.0000	0.0000	0.3585	0.0000	
	DC2PS	**LIR**	**LR2CR**	**NPLL1**	**UNMP**	**BCAR**	**CPI**	**GDGR**	**ERATE**	**Mean VIF**
VIF	1.62	1.37	1.24	1.21	1.21	1.2	1.2	1.14	1.11	1.26
1/VIF	0.618607	0.728342	0.803335	0.825986	0.828299	0.830416	0.833536	0.873809	0.904749	

Table 3: Regression results (whole sample of the study).

	PRM	LSDVM	FEM	REM
	NPL	NPL	NPL	NPL
NPLL1	0.829***	0.832***	0.451***	0.775***
S.E	-0.0233	-0.0231	-0.0389	-0.0257
BCAR	0.111***	0.108**	-0.116	0.116**
S.E	-0.0332	-0.033	-0.0778	-0.0382
CPI	0.0873**	0.108***	0.116***	0.0970**
S.E	-0.0291	-0.0294	-0.0326	-0.0299
DC2PS	-0.00165	-0.00105	0.014	-0.0022
S.E	-0.00337	-0.00334	-0.022	-0.00404
ERATE	8.11E-07	-6E-06	0.000451	-2.2E-05
S.E	-6.6E-05	-6.5E-05	-0.00032	-8.1E-05
GDPGR	-0.201***	-0.178***	-0.0925*	-0.203***
S.E	-0.0366	-0.0374	-0.0433	-0.0377
LIR	-5E-05	-0.00261	0.101	0.00567
S.E	-0.0143	-0.0142	-0.0571	-0.0168
LR2CR	-0.00927	-0.0081	0.0112	-0.00732
S.E	-0.00707	-0.007	-0.0155	-0.00807
UNMP	0.014	0.0186	0.0824	0.0205
S.E	-0.0166	-0.0165	-0.0974	-0.0201
_Iyears_2010		-0.494		
S.E		-0.426		
_Iyears_2011		-1.353**		
S.E		-0.412		
_Iyears_2012		-0.349		
S.E		-0.396		
_Iyears_2013		-0.191		
S.E		-0.392		
_Iyears_2014		-0.709		
S.E		-0.392		
_Iyears_2015		-0.292		
S.E		-0.395		
_cons	0.24	0.488	1.071	0.346
S.E	-0.602	-0.64	-2.091	-0.701
R-sq	0.832	0.838	0.624	0.831
adj. R-sq	0.828	0.832	0.600	0.820
rmse	2.043	2.02	1.67	1.929
Fixed / Random effect: Hausman test				
chi2(9) =83.81***				
Ramsey RESET test using powers of the fitted values of NPLs				
F(3, 356) = 10.14 * p<0.05, ** p<0.01, *** p<0.001				

The variation in NPLs through NPLL1 is maximum under LSDVM; .832 followed by PRM; .829, REM; .775 and FEM; .451. The coefficient for the CR explains a significant increase in the value of NPLs for all the selected countries under model 1,2&4. These findings provide the evidence that more CR for the banking firms is not contributing towards lowering the credit risk in a global sample of the study. The effect of CR on NPLs under FEM is found to be negatively insignificant.

Another macroeconomic indicator is CPI significantly increasing the NPLs under all models. This positive and significant effect of CPI on NPLs implies that higher inflation in the economy, tends to further value of NPLs as higher inflation reflects in consumption pattern and finally lower purchasing and payment capacity of the borrowers. Next, DC2PS and ERATE have no significant influence on the value of NPLs in all the stated models. In contrast, the effect of GDPGR on NPLs is negative and significant. The effect of GDPGR on NPL is consistent with the (Ghosh, 2017) in the US economy. This indicates that higher value of growth in GDP negatively affects the NPLs as more growth in the economy leads to the lower loan loss and default rates from the borrowers. The effect for LIR, LR2CR and UNEMP on NPLs is not significant under any of the applied models. The explained variation under PRM is 83.2 with the adjusted value of 82.8. The same findings under LSDVM are 83.8 and 83.2. The explanatory power of selected predictors of NPLs under FEM is 62.4 and 60.0 respectively. For the year's dummy, only 2011 has explained a significant effect on NPLs. For the comparative findings between the stated models, Hausman (HM) test is applied, which compares the fixed and random effect coefficients of the selected regressors. A null hypothesis supports the argument that the preferred model is a random effect, while the alternative is a fixed effect. The probability value of HM explains the significant difference between the coefficients, so the preferred model for the whole sample is a fixed effect. After the selection of FEM, the test for the omitted variables is applied. For this purpose, a null hypothesis is that all the regressors for the NPLs are included in the regression equations, while the alternative is all the regressors are not included in the model.

Table 4: Regression results (EU member states).

	PRM	LSDVM	FEM	REM
	NPL	NPL	NPL	NPL
NPLL1	0.578***	0.550**	0.451***	0.578***
S.E	-0.149	-0.179	-0.0389	-0.149
BCAR	-0.226	0.122	-0.116	-0.226
S.E	-0.358	-0.478	-0.0778	-0.358
CPI	-0.106	-0.172	0.116***	-0.106
S.E	-0.335	-0.433	-0.0326	-0.335
DC2PS	-0.00952	-0.0239	0.014	-0.00952
S.E	-0.0275	-0.0322	-0.022	-0.0275
ERATE	0.0502	0.166	0.000451	0.0502
S.E	-0.122	-0.158	-0.00032	-0.122
GDPGR	0.398	0.453	-0.0925*	0.398
S.E	-0.252	-0.29	-0.0433	-0.252
LIR	1.048*	1.477**	0.101	1.048**
S.E	-0.379	-0.503	-0.0571	-0.379
LR2CR	0.0707	-0.076	0.0112	0.0707
S.E	-0.096	-0.159	-0.0155	-0.096
UNMP	0.519	0.235	0.0824	0.519
S.E	-0.306	-0.386	-0.0974	-0.306
_Iyears_2011		0.0711		
S.E		-1.294		
_Iyears_2012		1.772		
S.E		-1.381		
_Iyears_2013		2.545		
S.E		-1.772		
_Iyears_2014		1.006		
S.E		-1.858		
_Iyears_2015		2.227		
S.E		-2.236		
_Iyears_2016		2.43		
S.E		-2.413		
_cons	-7.464	-10.09	1.071	-7.464
S.E	-4.931	-5.488	-2.091	-4.931
R-sq	0.952	0.964	0.421	.952
adj. R-sq	0.933	0.931	0.292	.924
rmse	1.592	1.63	1.67	1.592
Fixed / Random effect: Hausman test				
chi2(9) =56.62***				
Ramsey RESET test using powers of the fitted values of NPLs				
F(3, 13) = 1.26 * p<0.05, ** p<0.01, *** p<0.001				

After considering the whole sample of the study, we have extracted the sample of EU members states for disaggregated analysis over the same time (2009-2016) to explore the determinants of NPLs. Table 4 predicts its outcome. NPLL1 is explaining the significant and positive impact on NPLs likewise the whole sample. The positive and significant effect is recorded for NPLL1 for all the models, however, for PRM, and REM the effect is the same; .578 significant at 1 %. This outcome indicates that like in the whole sample, the present values of NPLs are depending on the past values; higher present NPLs are due to increasing past values of NPLs. For the CR, the effect on NPLs is insignificant in all the cases.

CPI has explained the significant and positive impact on NPLs under FEM. The reason is that higher inflation leads to the lower paying capacity for the borrowers, hence increasing the bad loans in the economy. The rest of the indicators like DC2PS, ERATE, LR2CR and UNEMP has no significant influence on NPLs in EU member states. Yet, the effect of LIR is positive and significant in all the regression models except FEM.

The same contrast is found for the GDPGR under FEM which assumes negatively significant effect over NPLs in EU. The explanatory power for the PRM is 95.2 with the adjusted value of 93.3, and for LSDVM is 96.4 and 93.0 respectively. For the FEM, explained variation is 42.1% with the adjusted value of 29.2 %. For comparing the fixed and random effect coefficients; HM test is applied which explains fitted model as a fixed effect. The value of ovtest clarifies that FEM has no omitted variables as F-value is insignificant, symmetrical to the whole sample of the study.

Table 5: Regression results (G10 member states).

	PRM	LSDVM	FEM	REM
	NPL	NPL	NPL	NPL
NPLL1	0.839***	0.723***	1.010***	0.839***
	-0.0754	-0.0646	-0.0942	-0.0754
CPI	-0.0233	0.00754	0.0223	-0.0233
	-0.0766	-0.0643	-0.0712	-0.0766
DC2PS	0.0153*	0.0187**	0.0264***	0.0153*
	-0.00647	-0.00586	-0.00585	-0.00647
ERATE	-0.00152	0.000409	-0.0009	-0.00152
	-0.00186	-0.0015	-0.0117	-0.00186
GDGR	-0.174	-0.063	-0.0349	-0.174
	-0.0954	-0.0951	-0.0832	-0.0954
LIR	-0.195	-0.224*	0.74	-0.195*
	-0.0961	-0.0795	-0.873	-0.0961
UNMP	0.3886**	0.4272*	0.7412**	0.3781**
S.E	-0.1755	-0.20835	-0.3114	-0.1912
_Iyears_2010		0.0755		
S.E		-0.213		
_Iyears_2011		0		
S.E				
_Iyears_2012		-0.0704		
S.E		-0.169		
_Iyears_2013		-0.335		
S.E		-0.186		
_Iyears_2014		-0.600**		
S.E		-0.194		
_Iyears_2015		-0.409		
S.E		-0.228		
_Iyears_2016		-0.451		
S.E		-0.21		
_cons	-1.733	-1.990*	-6.286*	-1.733
S.E	-0.997	-0.858	-2.556	-0.997
R-sq	0.954	0.983	0.941	
adj. R-sq	0.938	0.966	0.905	
rmse	0.297	0.221	0.23	0.297
Fixed / Random effect: Hausman test				
chi2(9) =17.52***				
Ramsey RESET test using powers of the fitted values of NPLs				
F(3, 24) = 2.45 * p<0.05, ** p<0.01, *** p<0.001				

After the EU member states, we have considered the third sample, based on the G10 member states. Table 5 depicts the outcomes for this sample over the same time. The robustness findings explain that once again lagged values of NPLs (NPLL1) significantly and positively predicting the NPLs in G10 member states. It means that the assumption of depending on current NPLs on past values assumes to be correct for G10 as well, hence consistent with the earlier findings.

Value of NPLs remains sensitive for DC2PS in all the models, explains a significant positive influence on NPLs. It means that NPLs are increasing in G10 due to more advances to domestic credit by the banks. CPI, ERATE, and GDPGR explain insignificant influence over NPLs in 2009 to 2016. LIR explains the significant and negative influence of -.224 and -.195 on NPLs under LSDVM and REM respectively. Year dummy for 2014 has also explained the negative and significant impact on NPLs. Increasing UNEMP in G10 member states has explained positive and significant influence on NPLs, means that more unemployment leads to the increasing bad loans because of low/no earning capacity of the borrowers. However, for the sample of G10 members, LR2CR is excluded due to missing observations in the data. Hausman test is in favour of the fixed effect, with the insignificant findings of Ramsey RESET for the missing variables.

In Table 6, a final sample of G20 member states is developed. The impact of NPLL1 suggests the same positive and significant influence over NPLs as predicted under overall sample, EU, and G10. The influence of DC2PS is negative and significant under PRM and LSDVM, while its impact is positive and significant under FEM and REM. The effect of GDPGR on NPLs is negative and significant under all the regression models. LIR is explaining an insignificant negative impact on NPLs in all the models. However, robust findings for UNEMP also predicts the negative and significant influence over NPLs over the same sample of the study. For the HM test, once again fixed effect model is accepted for the final consideration with no omitted variables as clarified by Ramsey RESET for the fitted values of NPLs.

Table 6: Regression results (G20 member states).

	PRM	LSDVM	FEM	REM
	NPLs	NPLs	NPLs	NPLs
NPLL1	1.020***	1.025***	1.010***	.9880***
S.E	-0.0451	-0.0473	-0.0942	-0.0580
BCAR	-0.0124	-0.00191		-.0672
S.E	-0.025	-0.0254		-0.0377
CPI	0.0289	0.0335	0.0223	0.07057
S.E	-0.0397	-0.042	-0.0712	-.04025
DC2PS	-0.00366*	-0.00390*	0.0264***	0.0012*
S.E	-0.00152	-0.00158	-0.00585	-0.0036
ERATE	0.0337	0.0380*	-0.0897	0.0001
S.E	-0.0174	-0.0178	-0.0117	-0.00020
GDPGR	-0.147***	-0.113*	**-0.0349	***-.10647
S.E	-0.033	-0.0411	-0.0832	-0.0339
LIR	0.000255	3.05E-05	0.74	.00841
S.E	-0.00719	-0.00737	-0.873	-0.0961
LR2CR	-0.016	-0.0181		
S.E	-0.0089	-0.00904		
UNMP	-0.0241*	-0.0246*		
S.E	-0.00944	-0.00953		
_Iyears_2010		-0.247		
S.E		-0.245		
_Iyears_2011		-0.283		
S.E		-0.213		
_Iyears_2012		-0.188		
S.E		-0.209		
_Iyears_2013		-0.343		
S.E		-0.199		
_Iyears_2014		-0.241		
S.E		-0.183		
_Iyears_2016		0.0845		
S.E		-0.19		
_cons	0.888*	0.919*	-6.286*	-1.733
S.E	-0.327	-0.36	-2.556	-0.997
R-sq	0.98	0.984	0.942	.980
adj. R-sq	0.975	0.975	0.905	.862
rmse	0.315	0.314	0.23	0.297
Fixed / Random effect: Hausman test				
chi2(9) =20.66***				
Ramsey RESET test using powers of the fitted values of NPLs				
F(3, 25) = 1.81 * p<0.05, ** p<0.01, *** p<0.001				

CONCLUSIONS.

For various economies, the problem of NPLs is significantly affecting the financial stability of their economy and the banking sector too. Considering the sample of 148 countries/regional economies during 2009 to 2016 with applying the panel regression models including fixed and random effect, the present study provides a detailed review of the key determinants of NPLs.

To add significant contribution in existing literature, this study also comes with disaggregated analysis for EU, G10 and G20 members to provide a detailed insight into the NPLs and its explanatory variables. The significant and positive impact of lagged NPLs on current NPLs explains that higher past bad loans predicts the present loan losses.

The effect of bank capital to asset ratio on NPLs indicates that higher CR is not contributing towards lowering the NPLs in the world economy. However, for the EU, G10, and G20 member states, this hypothetical association seems to be insignificant. Increasing inflation (CPI) is also contributing towards the significant upsurge of NPLs in the global sample, but not for the rest of regions.

The effect of domestic credit to the private sector on NPLs in the world economy and EU members is incorrect. However, testing of the same assumption under G10 and G20 member states is found to be significantly correct. It is also reflected that for all the regional economies, exchange rate volatility has no significant indication for the increase/decrease in NPLs during the period of study. GDP growth reflects in more economic output, causes a significant decline in NPLs for the whole sample. Yet, this supposition is proved to be incorrect for the rest of disaggregated analysis. The results suggest world economies, should try to increase their economic output to reduce the loan losses.

While exploring the effect of lending interest rate over NPLs, the heterogenous effect is recorded. For the global sample, LIR has no significant effect under all the applied regression models, but for the EU members, the effect of LIR over NPLs is positive and significant except the fixed effect

estimator. While for the G10 members this effect is negative under least square and pooled regression model. This association strongly supports the argument that higher lending rate leads to the lower bad loans in the selected economies. The same assumption is corrected in G20 members in REM.

For the liquidity reserves to capital ratio, it is found that loan losses are not predicted by the liquidity in any of the given samples of the study. Finally, for the unemployment, empirical facts illustrate the insignificant effect in global economies and EU members. Though, for the G10 members, the assumption of higher unemployment leads to increasing value of NPLs proves significantly correct. However, in G20 members the effect of unemployment on NPLs is negatively significant.

Overall findings propose some meaningful guidelines for the regulators of NPLs, regional economic indicators. It is suggested that lagged NPLs, economic growth, bank capital to asset ratio, inflation and unemployment are playing their major policy when needs some serious attention in selected regions.

A significant contribution of our study exists that maximum regional economies both in aggregate and disaggregate level are considered. However, the core limitations exist within the limited time span and missing observations for some of the variables in the disaggregated analysis. Future research can be conducted while considering these limitations along modern panel data models like the generalized method of moments (GMM) while taking the lagged values of the key explanatory variables.

Table 7: Overall sample based on regions, income levels, lending groups, demographic groups, small states, and other country groups (categorized by WDI).

Algeria	East Asia & Pacific	Indonesia	Middle income	South Africa
Argentina	East Asia & Pacific (excluding high income)	Ireland	Moldova	South Asia
Armenia	East Asia & Pacific (IDA & IBRD countries)	Israel	Namibia	South Asia (IDA & IBRD)
Australia	Ecuador	Italy	Netherlands	Spain
Austria	El Salvador	Japan	Nicaragua	Sri Lanka
Belgium	Equatorial Guinea	Kazakhstan	Nigeria	Sub-Saharan Africa
Bhutan	Estonia	Kenya	North America	Sub-Saharan Africa (excluding high income)
Bosnia and Herzegovina	Euro area	Korea, Rep.	Norway	Sub-Saharan Africa (IDA & IBRD countries)
Brazil	Europe & Central Asia	Kosovo	OECD members	Swaziland
Brunei Darussalam	Europe & Central Asia (excluding high income)	Kyrgyz Republic	Other small states	Sweden
Bulgaria	Europe & Central Asia (IDA & IBRD countries)	Late-demographic dividend	Pakistan	Switzerland
Cambodia	European Union	Latin America & Caribbean	Panama	Tajikistan
Cameroon	Fiji	Latin America & Caribbean (excluding high income)	Papua New Guinea	Tanzania
Canada	France	Latin America & the Caribbean (IDA & IBRD countries)	Paraguay	Thailand
Caribbean small states	Gabon	Latvia	Peru	Trinidad and Tobago
Central African Republic	Gambia, The	Lebanon	Philippines	Turkey
Central Europe and the Baltics	Georgia	Lesotho	Poland	Uganda
Chad	Germany	Lithuania	Portugal	Ukraine
Chile	Ghana	Low & middle income	Post-demographic dividend	United Kingdom
China	Greece	Lower middle income	Romania	United States
Colombia	Guatemala	Luxembourg	Russian Federation	Upper middle income
Comoros	High income	Macao SAR, China	Rwanda	Uruguay
Congo, Rep.	Honduras	Macedonia, FYR	San Marino	Uzbekistan
Costa Rica	Hong Kong SAR, China	Madagascar	Saudi Arabia	Vanuatu
Croatia	Hungary	Malaysia	Seychelles	Vietnam
Cyprus	IBRD only	Maldives	Singapore	West Bank and Gaza
Czech Republic	IDA & IBRD total	Malta	Slovak Republic	World
Denmark	IDA blend	Mauritius	Slovenia	Zambia
Dominican Republic	IDA total	Mexico	Small states	
Early-demographic dividend	India	Micronesia, Fed. Sts.	Solomon Islands	

Table 8: Variables description and expected signs.

Name of Variable	Measure	Source	Hypothesized sign			
Non-performing loans (NPLs)	Bank NPLs to gross loans %	WDI	Full sample	EU	G10	G20
NPLs Lagged (NPLL1)	Lagged NPLs	Authors calculation	+	+	+	+
Capital ratio (CR)	Bank capital to asset ratio	WDI	+	+		+
Inflation (CPI)	Consumer price index (CPI)	WDI	_	_	_	_
Domestic credit to private sector (DC2PS)	% of GDP	WDI	+	+	+	+
Exchange rate (EXRATE)	Official exchange rate (LCU per US$, period average)	WDI	+/-	+/-	+/-	+/-
GDP growth rate (GDPGR)	GDP growth (annual %)	WDI	_	_	_	_
Lending interest rate (LIR)	Lending interest rate (%)	WDI	_	_	_	_
Liquid reserve to capital ratio (LR2CR)	Bank liquid reserves to bank assets ratio (%)	WDI	_	_	_	_
Unemployment (UNMP)	Unemployment, female (% of female labor force) (modeled ILO estimate)	WDI	+/-	+/-	+/-	+/-

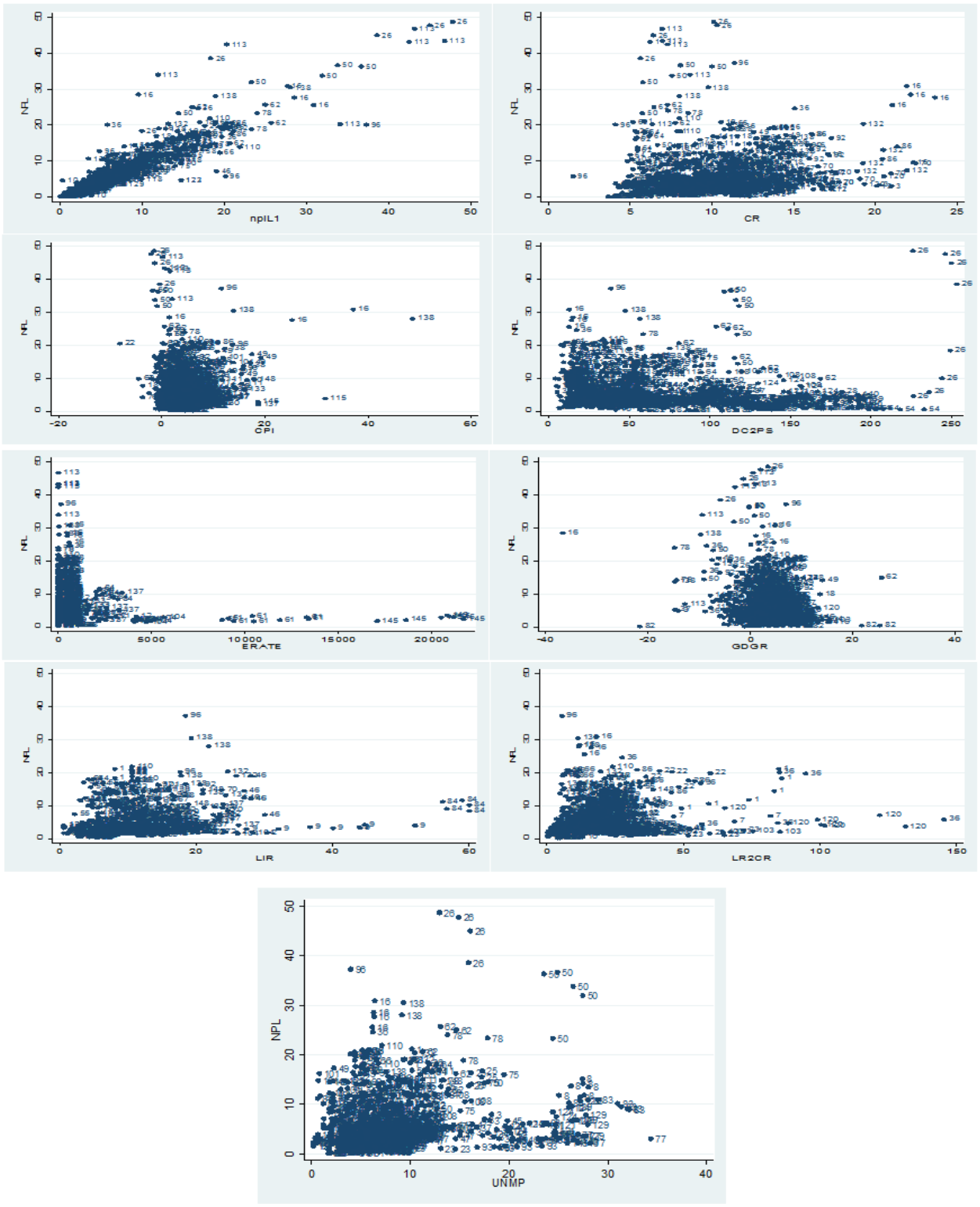

Figure 3(A-I): Trends of NPLs with each explanatory variable (overall sample).
Source: Authors calculation.

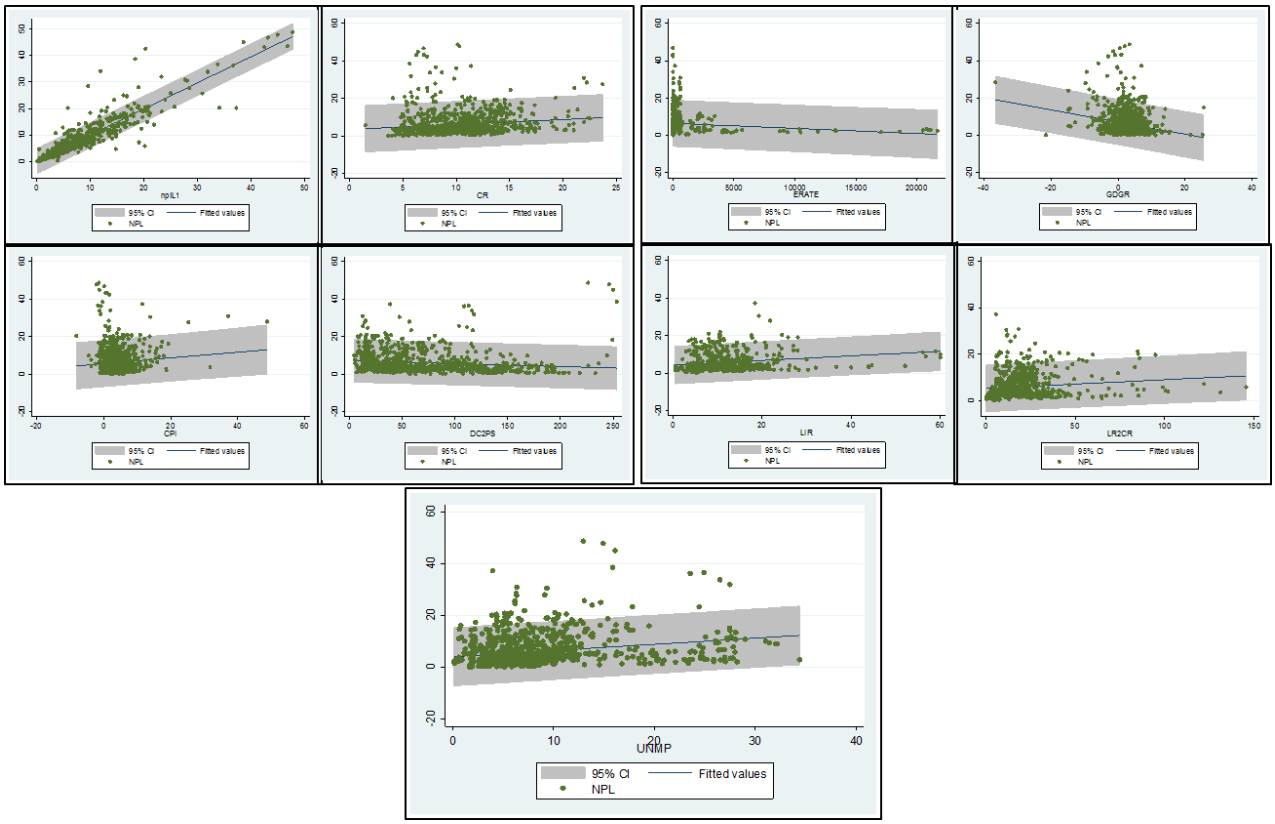

Figure 4: Linear prediction graph plots of NPLs (overall sample). **Source:** Authors calculation.

BIBLIOGRAPHIC REFERENCES.

1. Al-fred. (2018). Bank Non-Performing Loans to Gross Loans for World. Retrieved 15-05-2018, 2018, from: https://alfred.stlouisfed.org/series?seid=DDSI021WA156NWDB&utm_source=series_page&utm_medium=related_content&utm_term=related_resources&utm_campaign=alfred#0
2. Ali, A., Hajja, Y., & Iqbal-Hussain, H. (2015). Impact of credit risk (NPLs) and capital on liquidity risk of Malaysian banks. Paper presented at the Proceedings of the International Conference on Accounting Studies (ICAS) 2015 17-20 August 2015 Johor Bahru, Johor, Malaysia. https://ssrn.com/abstract=2862255
3. Babouček, I., & Jančar, M. (2005). Effects of macroeconomic shocks to the quality of the aggregate loan portfolio. Working Paper Series 1.

4. Bacha, O. I. (2004). Lessons from East Asia's crisis and recovery. Asia Pacific Development Journal, 11(2), 81-102.
5. Barseghyan, L. (2010). Non-performing loans, prospective bailouts, and Japan's slowdown. Journal of Monetary Economics, 57(7), 873-890.
6. Beck, R., Jakubik, P., & Piloiu, A. (2013a). Non-performing loans: What matters in addition to the economic cycle?
7. Beck, R., Jakubik, P., & Piloiu, A. (2013b). Non-performing loans: What matters in addition to the economic cycle? Working paper series, no 1515.
8. Berger, A. N., & DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. Journal of Banking & Finance, 21(6), 849-870.
9. Bernanke, B., & Gertler, M. (1990). Financial fragility and economic performance. The Quarterly Journal of Economics, 105(1), 87-114.
10. Bernanke, B., Gertler, M., & Gilchrist, S. (1994). The financial accelerator and the flight to quality. Working pape no. 4789.
11. Betz, J., Krüger, S., Kellner, R., & Rösch, D. (2017). Macroeconomic effects and frailties in the resolution of non-performing loans [Press release]. Retrieved from https://doi.org/10.1016/j.jbankfin.2017.09.008
12. Charalambakis, E., Dendramis, Y., & Tzavalis, E. (2017). On the determinants of NPLs: lessons from Greece. working paper by Bank of Greece, 289-309.
13. Chiorazzo, V., D'Apice, V., Fiordelisi, F., Masala, F., & Morelli, P. (2017). NPLs in Europe: The Role of Systematic and Idiosyncratic Factors. (January 23, 2017). Available at SSRN: https://ssrn.com/abstract=2903851

14. Christodoulou-Volos, C., & Hadjixenophontos, A. (2017). Empirical Determinants of the Non-Performing Loans in the Cypriot Banking System. Journal of Finance and Investment Analysis, 6(4), 1-1.
15. Cincinelli, P., & Piatti, D. (2017). Non Performing Loans, Moral Hazard & Supervisory Authority: The Italian Banking System. Journal of Financial Management, Markets and Institutions(1), 5-34.
16. De Bock, R., & Demyanets, M. A. (2012). Bank asset quality in emerging markets: Determinants and spillovers: International Monetary Fund. Working Paper No. 12/7.
17. Dimitrios, A., Helen, L., & Mike, T. (2016). Determinants of non-performing loans: Evidence from Euro-area countries. Finance research letters, 18, 116-119.
18. Dobson, W., & Kashyap, A. K. (2006). The contradiction in China's gradualist banking reforms. Brookings Papers on Economic Activity, 2006(2), 103-148.
19. Donath, L., Cerna, V. M., & Oprea, I. M. (2014). Macroeconomic determinants of bad loans in baltic countries and romania. Sea: Practical Application of Science, 2(4), 71-80.
20. Espinoza, R. A., & Prasad, A. (2010). Nonperforming loans in the GCC banking system and their macroeconomic effects: International Monetary Fund. Working Paper No. 10/224
21. Foos, D., Norden, L., & Weber, M. (2010). Loan growth and riskiness of banks. Journal of Banking & Finance, 34(12), 2929-2940.
22. Ghosh, A. (2015). Banking-industry specific and regional economic determinants of non-performing loans: Evidence from US states. Journal of Financial Stability, 20, 93-104.
23. Ghosh, A. (2017). Sector-specific analysis of non-performing loans in the US banking system and their macroeconomic impact. Journal of Economics and Business, 93, 29-45.

24. Godallawaththa, G., & Ekanayake, E. (2016). The impact of bank specific and macroeconomic factors on non-performing loans in commercial banks. International Research Conference on Management and Finance, Faculty of Management and Finance, University of Colombo, Sri Lanka, Volume: 10.
25. Haq, M., & Heaney, R. (2012). Factors determining European bank risk. Journal of International Financial Markets, Institutions and Money, 22(4), 696-718.
26. Jesus, S., & Gabriel, J. (2006). Credit cycles, credit risk, and prudential regulation.
27. Kauko, K. (2014). Do bailouts cause moral hazards or franchise value in banking? Kyklos, 67(1), 82-92.
28. Keeton, W. R. (1999). Does faster loan growth lead to higher loan losses? Economic review-Federal reserve bank of Kansas City, 84, 57-76.
29. Keeton, W. R., & Morris, C. S. (1987). Why do banks' loan losses differ? Economic Review, 72(5), 3-21.
30. Kjosevski, J., & Petkovski, M. (2017). Non-performing loans in Baltic States: determinants and macroeconomic effects. Baltic Journal of Economics, 17(1), 25-44.
31. Klein, N. (2013). Non-Performing Loans in CESEE: Determinants and Macroeconomic Performance IMF Working Paper. WP13/72.
32. Konstantakis, K. N., Michaelides, P. G., & Vouldis, A. T. (2016). Non performing loans (NPLs) in a crisis economy: Long-run equilibrium analysis with a real time VEC model for Greece (2001–2015). Physica A: Statistical Mechanics and Its Applications, 451, 149-161.
33. Kumarasinghe, P. J. (2017). Determinants of Non Performing Loans: Evidence from Sri Lanka. International Journal of Management Excellence, 9(2), 1113-1121.

34. 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 & Finance, 36(4), 1012-1027.
35. Makri, V., & Papadatos, K. (2014). How accounting information and macroeconomic environment determine credit risk? Evidence from Greece. International Journal of Business and Economic Sciences Applied Research (IJBESAR), 2014, 7(1), 129-143.
36. Makri, V., Tsagkanos, A., & Bellas, A. (2014). Determinants of non-performing loans: The case of Eurozone. Panoeconomicus, 61(2), 193-206.
37. McKinnon, R., Lee, B., & Wang, Y. D. (2010). The global credit crisis and China's exchange rate. The Singapore Economic Review, 55(02), 253-272.
38. Mileris, R. (2012). Macroeconomic determinants of loan portfolio credit risk in banks. Engineering Economics, 23(5), 496-504.
39. Nimalathasan, B. (2008). A comparative study of financial performance of banking sector in Bangladesh. An application of CAMELS rating system. (July 25, 2008). Annals of University of Bucharest, Economic and Administrative Series, Number 2 (2008) pp. 141-152. Available at SSRN: https://ssrn.com/abstract=2117189.
40. Niresh, A., & Thirunavukkarasu, V. (2014). Firm size and profitability: A study of listed manufacturing firms in Sri Lanka. International Journal of Business and Management; Vol. 9, No. 4; 2014. Available at SSRN: https://ssrn.com/abstract=2422441
41. Pop, I. D., Cepoi, C. O., & Anghel, D. G. (2018). Liquidity-threshold effect in non-performing loans. Finance research letters.
42. Quagliariello, M. (2007). Banks' riskiness over the business cycle: a panel analysis on Italian intermediaries. Applied Financial Economics, 17(2), 119-138.

43. Radivojevic, N., & Jovovic, J. (2017). Examining of Determinants of Non-Performing Loans. Prague Economic Papers, 26(3).

44. Saba, I., Kouser, R., & Azeem, M. (2012). Determinants of Non Performing Loans: Case of US Banking Sector. The Romanian Economic Journal, 44(6), 125-136.

45. Sander, H., & Kleimeier, S. (2004). Convergence in euro-zone retail banking? What interest rate pass-through tells us about monetary policy transmission, competition and integration. Journal of International Money and Finance, 23(3), 461-492.

46. Savic, N., Pitic, G., & Barjaktarovic, L. (2013). Forced Changes in Banks Financing Growth in East European Countries. Financial Aspects of Recent Trends in the Global Economy Volume II, 190.

47. Sinkey, J. F., & Greenawalt, M. B. (1991). Loan-loss experience and risk-taking behavior at large commercial banks. Journal of Financial Services Research, 5(1), 43-59.

48. Škarica, B. (2014). Determinants of non-performing loans in Central and Eastern European countries. Financial theory and practice, 38(1), 37-59.

49. Stakić, N. (2014). Determinants of the nonperforming loans level movement in the banking sector of Serbia. Bankarstvo, 43(4), 122-145.

50. Tan, Y., & Floros, C. (2013). Risk, capital and efficiency in Chinese banking. Journal of International Financial Markets, Institutions and Money, 26, 378-393.

51. Tarchouna, A., Jarraya, B., & Bouri, A. (2017). How to explain non-performing loans by many corporate governance variables simultaneously? A corporate governance index is built to US commercial banks. Research in International Business and Finance, 42, 645-657.

52. Umar, M., & Sun, G. (2018). Determinants of Non-performing Loans in Chinese Banks. Journal of Asia Business Studies Vol. 12 Issue: 3, pp.273-289, https://doi.org/10.1108/JABS-01-2016-0005.

53. Us, V. (2017). Dynamics of non-performing loans in the Turkish banking sector by an ownership breakdown: The impact of the global crisis. Finance Research Letters, 20, 109-117.
54. Vithessonthi, C. (2016). Deflation, bank credit growth, and non-performing loans: Evidence from Japan. International Review of Financial Analysis, 45, 295-305.
55. Wan, J. (2018). Non-performing loans and housing prices in China. International Review of Economics & Finance. doi:10.1016/j.iref.2018.02.01.
56. Zikai, T. (2018). An Overview of Economical Corruption in USA and Analysis of its Future. Journal of Humanities Insights, 02(01), 43-50.
57. Alizadeh, F., & Lahiji, M. (2018). Suitable Delivery System in Small E-Commerce Companies. Journal of Humanities Insights, 02(04), 167-71.
58. Jinadu, O., Oluwafemi, S., Soyinka, M., & Akanfe, K. (2017). Effects of International Financial Reporting Standards (IFRS) on Financial Statements Comparability of Companies. Journal of Humanities Insights, 01(01), 12-6.
59. Bahremand, A. (2015). The concept of translation in different teaching approaches and methods. UCT Journal of Social Sciences and Humanities Research, 3(1), 5-9.
60. Iravani, M. R., Niknejadi, F., & Jahandoost, Z. (2015). The Relationship Between Age And Job Satisfaction Consultants Government Girls High School In Isfahan In 2012-2013 Academic Year. Health, 70(22.65), 24.
61. Abayeva, G. (2018). Modern teacher role for increasing the students' competence in pedagogical specialty. Opción, 34(85-2), 415-440.
62. Piteira, M., Costa, C. J., & Aparicio, M. (2018). Computer Programming Learning: How to Apply Gamification on Online Courses?. Journal of Information Systems Engineering & Management, 3(2), 11.

63. S. Rohini, M. Sharanya, A. Vidhya, S. Viji and P. Poornima (2017). Proximity Coupled Microstrip Antenna for Bluetooth, WIMAX and WLAN Applications . International Journal of Communication and Computer Technologies, 5 (2), 48-52.

64. TANDEL, F., & MORE, P. (2018). Stability Indicating HPLC Method for Simultaneous Estimation of Nicotinamide and Salicylic Acid . International Journal of Pharmacy Research & Technology, 8 (2), 43-47.

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