Governance matters on non-performing loans: Evidence from emerging markets

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Abstract:

In this study, new determinants of non-performing loans (NPL) for the MSCI emerging countries were investigated. For this purpose, a new index was formed using the World Bank's Worldwide Governance Indicator data from 2002 to 2018. To test the effect of governance on NPL, we used the GMM technique. As a robustness test for GMM results, we employed the DOLSMG technique. According to the results, NPL was affected negatively by the governance index. This result could be of interest to policymakers and regulators as a macroprudential policy tool.

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Especially with the 2008 financial crisis, average bank asset quality has deteriorated sharply due to the global economic recession. This effect has been observed especially in emerging countries, since the banking system plays an important role in the performance of these economies. Therefore, some studies have been conducted regarding the efforts to control bank loan activities, but the financial crisis has shown an increased interest by academicians in the credit quality and the credit portfolios of industry employees (Castro, 2013; Yang, 2017; Rachid, 2019). The most important and frequently used indicator of credit quality is non-performing loans (NPL).[1]

There are a few dimensions for NPL. First, the increase in non-performing loans can lead to a decrease in economic growth and increase resource inefficiency. Second, the meltdown of

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[1] It is possible to see different definitions and classifications of NPL. The most important of these has been made by the Bank for International Settlement (BIS), which divides loans into five categories: pass, special mention, substandard, doubtful and virtually loss. Substandard, doubtful, and virtually lost categories are called NPL. The IMF defines loans that cannot be collected within 90 days as NPL.

capital reduces the ability of banks to finance enterprises that require funds. The increase in NPL will increase the capital requirement for banks (Morakinyo and Sibanda, 2016). NPL prevents economic activities more especially in countries where financial institutions are the cornerstones of the economic system (Rachid, 2019). In addition, the deterioration of loans entails several costs for the economy and banks, including a decrease in bank profitability, a deterioration of asset quality, a decrease in credibility, an increase in liquidity risk, and possible cash flow disturbances. These negative developments also affect the loans extended by banks to the real sector.

All of this makes it difficult for companies with financing problems to find resources. On the other hand, it increases the resource costs of firms when banks prefer to increase their interest rates as their profitability decreases due to an increase in NPL. For such reasons, the NPL is closely monitored by the economy and bank administrations as a leading indicator. In addition, when the loan portfolio is not well-structured, a crisis in the economy will rapidly increase NPL in a short time and will cause a domino effect from banks to other sectors with its leverage feature. As a result of some research, a high number of NPL has been considered to be an early warning indicator of a possible banking crisis (Demirgüç-Kunt and Detragiache, 1998).

The existence of a high NPL level in a country is a phenomenon that poses a threat to the banking systems of many economies around the world (Idris and Nayan, 2016). Determinants of NPL can be divided into three main groups: macroeconomic factors, bank-level factors, and institutional factors.

The most important macroeconomic factors that influence growth in NPL are: GDP, (un)employment rate, exchange rate, inflation, interest rate, stock prices and housing prices (Svetozar and Maja, 2015). Bank-level factors that influence growth in NPL are mainly associated with bad management, moral hazard and skimping (Klein, 2013). One of the institutional factors is governance indicators or the institutional quality of a country.

The quality of institutions, such as political stability, control of corruption, regulatory quality and rule of law, can significantly influence investments in physical and human capital, technology, and industrial production, which in turn lead to economic growth (Epaphra and Kombe, 2017). Similarly, a country's political governance and institutional quality influence the banks' activities.

Governance indicators have an important role in the economic environment in terms of economic growth and development (Mohammadi et al., 2017). Physical and human capital, investment, and technical changes that cause economic growth also affect other determinants of growth (Epaphra and Kombe, 2017). There are studies which show that strong legal institutions and investor protections improve the financial market and facilitate its development (La Porta et al., 1997; La Porta et al., 1998). In addition, the existence of these institutions is associated with more financing, lower bank financing costs for firms, and more favorable financial contracts (Lin et al., 2014). The economic rationale for analyzing institutional factors is based on the assumption that inadequate supervision and judicial systems and underdeveloped support institutions can affect market competitiveness and thus worsen the situation of borrowers and lenders (Svetozar and Maja, 2015). As a matter of fact, Breuer (2006) and Boudriga et al. (2010) found that the impacts of the institutional environment on NPLs were found to be statistically significant. However, a more precise link between the quality of institutions and the loan-portfolio quality of banks can be found in previous research that is mainly intended for a single country.

The main objective of this paper is to examine the impact of institutional factors on the NPL levels in emerging countries. For this aim, we used a panel of 22 emerging countries over 17 years, from 2002 to 2018. When identifying a sample, we depend on the MSCI (Morgan Stanley Capital International) Emerging Markets Index. There are 24 countries in these indices from different regions, such as America, Europe, Africa, and Asia. However, since the data for Qatar and Taiwan are not adequate, our sample consists of 22 countries.

The countries in the sample have some common points. First of all, they were severely affected by the 2008 global crisis. Although the non-performing loans/total loans variable increased in all MSCI countries during this period, it increased by a multiple of approximately three in some of the countries in the sample (such as Chile, Hungary, and Russia). On the other hand, the capital adequacy of the countries in the sample is also low. The ratio of bank capital to assets is between 5% and 10%. In this sense, the only country that differentiates positively from its counterparts is Colombia, whose ratio is around 13-15%. The private sector's dependence on bank loans is high in these countries, and the value of domestic credit to private sector by banks (% of GDP) is at the level of 60-70%. Especially in recent years, serious increases have been observed in these rates. Similarly, the variables – firms using banks to finance investment (% of firms) and firms using banks to finance working capital (% of firms) – are also at higher levels. Even in some sample countries such as Peru and Thailand, this rate is around 60%. Finally, for the observed countries, the financial sector rating (the financial sector's assessment of the structure of the financial sector and the policies and regulations that affect it) variable calculated by the World Bank (WB) regarding the institutionalization levels of the financial sectors of the countries is also at low levels.

The other variables of the observed countries are given in figure 1, where we compare the averages of the basic criteria of the countries analyzed between 2002 and 2018.

Figure 1 – *Main characteristics of the sample*
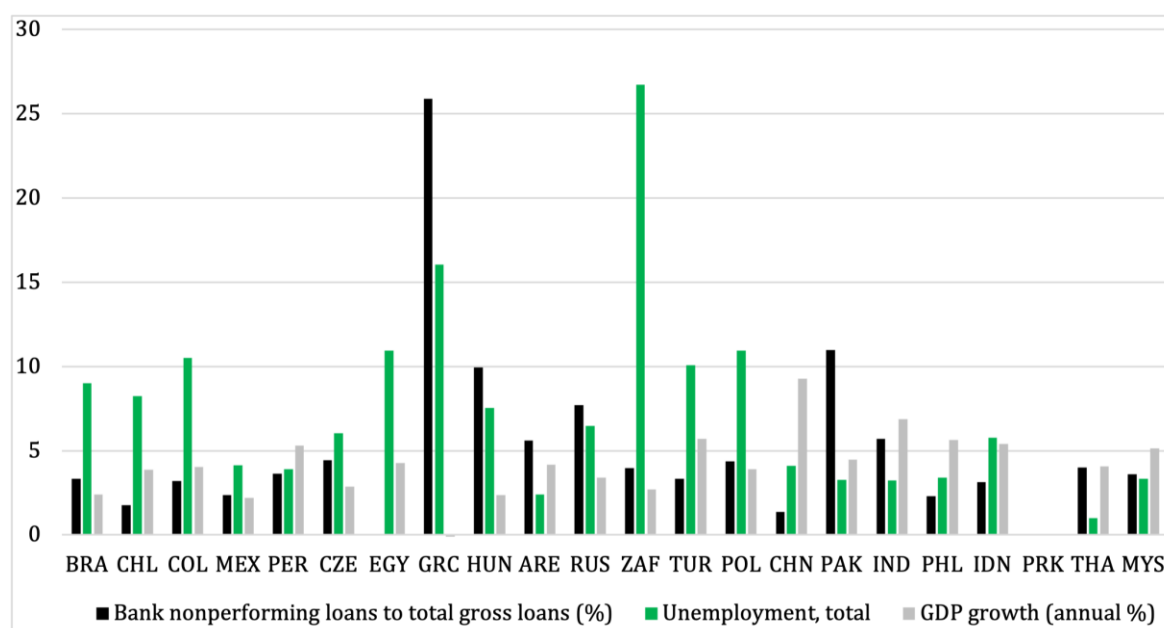
Given the importance of the banking sector in sustainable development and the need for further research, this study aims to frame the institutionalization positions for developing

countries.[2] Researchers generally use governance indicators separately. For example, Boudriga et al. (2010), Han et al. (2014), and Rashid (2019) included governance variables in their models separately as capital stringency, rule of law, democracy index, regulatory quality, and corruption indices. Our contribution is that we did not use these WB indicators separately. Following Anastasiou et al. (2019) and Boubakri et al. (2020), we derived a new governance indicator variable using six variables published by the WB. For this aim, we employed principal component analysis.

With principal component analysis, fewer new variables may be created by using more than one variable since the high number of variables makes it difficult to make various evaluations. Here, the basic components are independent of each other. With this method, the dependency structure between variables disappears and it is a recommended method against the multiple linear connection problem. Thus, the advantage of the generalized method of moments (GMM), which takes into account the cross-sectional dependence that may occur in the series. (Joliffe, 2002; Ersungur et al., 2007)

Little attention has been paid to the effect of different factors on a disparate evolution of NPL in countries belonging to different regions. Therefore, to fill this void, this study explores the effect of institutions on NPL in emerging countries. We also have reasons to believe that banking regulations in developing countries are lax and therefore banks decision-making will be affected more by their institutional quality (Haq and Zia, 2009; Uddin et al., 2020).

We believe that this study is one of the few papers that analyzed the relationship between NPL, a financial development, and the institutional quality of emerging countries. Besides, recent political unrest and social tensions in many of these countries add to the importance of our study. Lastly, in terms of policy implications, the results of this research will guide policymakers in designing policies aimed at better institutional quality, which is potent in ensuring the effectiveness of financial development.

The study also considers structural factors such as GDP, unemployment, bank concentration, concentration, crisis dummy, and bank deposit as a proxy as control variables.

1. Theory and literature

If, in one country, the institutional structure is insufficient, the benefits of reneging on a financial contract can be so pronounced that they prevent the realization of the contract itself. Furthermore, strong institutions are required both to ensure the ability of the financial markets and to channel resources to finance productive activities. For this reason, the relation between the quality of institutional and financial development is openly critical (Law and Saini, 2012).

International and local institutions have been attempting to improve countries' government levels for years. One of these institutions is the WB. The World Governance Indicators (WGI) developed by the WB, first introduced by Kaufmann and Kraay (2007), are aggregate indicators that are based on hundreds of specific and disaggregated individual

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[2] MSCI indices show the development of financial markets and are also a leading indicator. MSCI indices are significant tools for financial market investors in evaluating investment opportunities in different countries, portfolio diversification, and risk distribution. They enable exchange performance analysis based on regional and selected countries and enable foreign investors or funds to follow the performance of the markets they are interested in. One of the important MSCI indices is the MSCI Emerging Markets Index. This index represents the development of the developing financial markets, covering 85% of publicly traded companies in each of the 26 countries (Kaya and Yarbaşı, 2020).

variables describing various dimensions of governance, taken from 33 data sources provided by 30 different organizations. The data reflect the quality of governance, as reflected in the views of the public sector, the private sector, and non-governmental organizations, as well as citizens and firms.

The WGI dataset contains six dimensions: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption (Kaufmann et al., 2010). These are explained in detail as follows:

1. Voice and Accountability (VA) – capturing perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
2. Political Stability and Absence of Violence/Terrorism (PV) – capturing perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
3. Government Effectiveness (GE) – capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
4. Regulatory Quality (RQ) – capturing perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
5. Rule of Law (RL) – capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
6. Control of Corruption (CC) – capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Good governance not only contributes to sustainable economic growth by making a country preferable for savings and investment, providing confidence in the markets, removing the barriers to international trade-developing situations, and increasing market volumes. It also improves the competitiveness of countries (Haq and Zia, 2009).

Many researchers have shown that the institutional environment has an important impact on the functioning of the financial sector, and they highlight the importance of property rights institutions that have a crucial power in determining long-run growth, investment, and financial development, whereas contractual institutions shape financial intermediation and slightly influence growth and financial development as well as the development of institutions and financial markets' contributions to economic growth (Levine et al., 2000; Acemoglu and Johnson, 2005; Tressel and Detriagiache, 2008).

While there are many articles determining the impact of institutions on economic and financial development, there are limited studies on the effect of factors such as economic growth, unemployment, and banking performance (Narayanan et al., 2020; AlShiab et al., 2020; Aiza et al., 2019; Balde and Dicko, 2018). A few studies in the literature have investigated the effect of governance indicators on NPL (Rashid, 2019; Angahar and Mejabi, 2014; Nyor and Mejabi, 2013; Anastasiou et al., 2019). Our study differs from these in terms of the sample and methodology.

The important effect of NPL, especially on economic growth, has pushed researchers to analyze them from different viewpoints. Studies have investigated the determinants of NPL in

different countries. In literature, NPL is often used as an exogenous variable to explain other banking outcomes, such as bank performance, failures, and bank crises. Some of the prominent studies in the literature are given in the table below.

Table 1 – *Literature summary*

	Aim	Variables	Method	Results
Anayiotos and Toroyan (2009)	To assess the effects of certain institutional factors on financial sector development in Sub-Saharan Africa (SSA)	NPL, ROA, depth of credit information index, legal rights of borrowers, political stability, violence, control of corruption, private credit/GDP, composite measure of access to financial services, return on equity, NPL/total loans	Data envelopment analysis	The results suggest that the depth of credit information has the strongest influence on the NPL ratio, and political stability affects access the most.
Law and Azman-Saini (2012)	To examine the effect of institutional quality on financial development in developed and developing countries	Financial development, institutional quality, real gross domestic product (GDP) per capita, trade openness, financial openness, and the subscripts	GMM dynamic panel analysis	The results demonstrate that a high-quality institutional environment is important in explaining financial development, specifically for the banking sector.
Nyor and Mejabi (2013)	To examine the impact of corporate governance on NPL with bank-levels	Board size, board composition, composition of audit committee and power separation, non-performing loans	Regression analysis	It was concluded that none of the variables affected NPL.
Angahar and Mejabi (2014)	To explain the impact of corporate governance variables and NPL on bank-levels	Board size, board composition, power separation, composition of audit committee, NPL	Regression analysis	Corporate governance variables of board size, board composition, the composition of the audit committee, and power separation have no significant impact on non-performing loans.
Ahmad et al. (2016)	To examine the role of corporate governance on NPL with bank-levels	NPL, board size, board independence, ownership concentration	Regression analysis	The study reveals that corporate governance does matter significantly for NPL.
Balagobei (2019)	To examine the influence of corporate governance on NPL of listed banks	Board size, board independence, CEO duality, board activities, NPL	Multiple regression analysis	The study shows that board activities have a significant influence on NPL.
Rachid (2019)	To explain the determinants of NPL in the Middle East and North Africa (MENA) and in Central and Eastern European (CEE) countries	NPL, GDP, inflation rate, unemployment, financial crisis, ROA, domestic credit provided by the banking sector and six indicators that measure the quality of institutions	GMM dynamic panel analysis	The increase in NPL in Central and Eastern European countries depends on financial developments.
Lee et al. (2020)	To investigate NPL determinants from the perspectives of macroeconomic factors, dimensions of country governance and bank-specific characteristics of conventional banks	NPL, real GDP growth, the growth rate of private credit to GDP, foreign portfolio and bank flows, net capital flows, foreign direct investment, growth in/of? US dollars per national currency, growth in the real exchange rate, growth in terms of trade	GMM dynamic panel analysis	NPL is driven by not only macroeconomic factors and bank-specific characteristics but also the dimensions of country governance.

It is seen in the literature that this issue has been studied for different periods and various countries. Most of the studies were conducted with bank-level data. Since the study makes comparisons between the countries studied within the specific period, it is expected that it will make an authentic contribution to the literature.

2. Data, methodology and empirical model

2.1 Data

The annual data for 22 emerging markets for the 2002-2018 period was obtained from the WB database. Countries used in the analysis were taken from the MSCI Emerging Markets Index. The countries in this index are: (America) Brazil, Chile, Colombia, Mexico and Peru; (Europe-Middle East-Africa) Czech Republic, Egypt, Greece, Hungary, United Arab Emirates, Russia, South Africa, Turkey and Poland; (Asia) China, Pakistan, India, Philippines, Indonesia, South Korea, Thailand and Malaysia. Annual data was used in the study since monthly, quarterly or semi-annual data could not be obtained.

This study investigates the impact of country governance indicators on the country's NPL level. For this aim, we use the ratio of non-performing loans to total gross loans (NPLGL) as the dependent variable and the corporate governance index (INX) as an independent variable. Furthermore, to test the effect of macro variables on the country's NPL level, we used control variables such as bank concentration (CON), bank deposits to GDP (DGDP), GDP growth (GDPG), unemployment rate (UER), crisis dummy variable (DUM), and return on assets (ROA).

We determined the variables based on studies in the literature on the topic, such as Rachid (2019) and Lee et al. (2020). The correlation matrix between the six governance indicators is presented in table 2. Following Boubakri et al. (2020), the principal component analysis (PCA) was chosen to isolate the common component for all these variables, since the variables were highly correlated with each other. The main advantage of PCA is that, once the patterns in data have been identified, the data can be compressed, i.e., the number of dimensions is reduced, without much loss of information. Some variables related to the corporate governance of countries were transformed into a corporate governance index with PCA. PCA has some key advantages; first, this analysis aggregates the current information in these six different governance indicators into a unique governance index; also, PCA has the ability to deal with multicollinearity problems that may emerge if there is a condition for many highly correlated variables to be separately introduced in the same regression (Datta et al., 2010; Anastasiou et al., 2019). This new variable was named INX.

Table 2 – *Summary statistics*

	Observations	Mean	Std. deviation	Minimum	Maximum
NPL	374	6.288	6.147	0.484	45.572
Index	374	-0.011	0.983	-1.757	2.697
Concentration	374	0.558	0.161	0.208	1
Deposits to GDP	374	52.969	25.368	13.122	128.839
ROA	374	1.215	1.018	-8.522	4.021
Crisis dummy	374	0.032	0.176	0	1
GDP	374	4.136	3.117	-9.132	14.231
Unemployment	374	7.224	6.090	0.398	33.473

Considering the ratio of the countries' NPL to total loans, the ratio rising up to 45% in some countries shows that the receivables quality of those countries is low. It can be argued that

index values do not contain extreme values. In addition, it is seen that the ratio of deposits to GDP in some countries exceeds 100%. It can be concluded that savings are valued in deposits due to the high interest rates in these countries.

Table 3 – *Correlation matrix between the six worldwide governance indicators*

	VA	PSV	GE	RQ	RL	CC
VA	1.000					
PSV	0.509	1.000				
GE	0.458	0.813	1.000			
RQ	0.663	0.804	0.868	1.000		
RL	0.632	0.821	0.891	0.869	1.000	
CC	0.523	0.790	0.863	0.874	0.880	1.000

Note: VA – Voice and Accountability; PSV – Political Stability and Absence of Violence/Terrorism; GE – Government Effectiveness; RQ – Regulatory Quality; RL – Rule of Law; CC – Control of Corruption.

2.2. Methodology

GMM was used as a model in the study. In this study, endogeneity between variables eliminates the possibility of obtaining reliable results. Integrity in corporate governance, risk and performance relationship is important. Therefore, it would be appropriate to use GMM, which eliminates the endogeneity problem.[3] The difference of GMM from other estimators is that it allows a dynamic panel analysis by adding the lag of the dependent variable to the model, taking into account the possible inherence of one or more regulators (Yemba et al., 2020). Besides, the Mean Group Dynamic Least Squares (DOLSMG), one of the second-generation heterogeneous estimators developed by Pedroni (2001), was used to support the GMM method. In the DOLSMG estimator, the model transformed by taking the difference from the cross-sectional mean of the variables is estimated with Dynamic Least Squares (DOLS) for each unit, and then the results are combined for the whole panel using the Pesaran and Smith (1995) Mean Group (MG) method. The DOLSMG estimator is obtained by taking the average of the DOLS estimators obtained for each unit. Thus, the DOLSMG estimator produces more reliable estimates than both the DOLS and the FMOLS methods. DOLSMG DOLS uses past and future values of ΔXit as additional regressors to correct for endogeneity and serial correlation (Bulut and Karakaya, 2018).

We applied the following model in our study:

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[3] The endogeneity problem arises when the dependent variable, which is included in the model as an explanatory variable, is related to the error term of a period lag. In such a case, the standard estimators used for estimating the dynamic panel data model will be biased and inconsistent (Baltagi, 2005, p. 136). The Hausman method investigates whether there is an endogeneity problem among variables. A probability value below 5% in the Hausman test indicates that there is no internality problem among the variables. When the probability value is 0.24 which is above 5%, the hypothesis stating that there is no internality problem among the variables is rejected. For this reason, it is seen that there is an endogeneity problem between variables. The existence of an endogeneity problem in the series revealed that (GMM) gives consistent estimates for count data models with intrinsic explanatory variables (Dam and Karakara, 2014; Windmeijer and Santos Silva, 1997).

NPLGLit = α NPLGL$i,t-1$ + β1 INXi,t + β2 CONi,t + β3 DGDPi,t + β4 UERi,t + β5 DUMi,t + β6 GDPGi,t + β7 ROAi,t + εit [1]

Here $NPLGL_{it}$ depends on variable NPL, $NPLGL_{i,t-1}$ dependent variable with a lag of one period, $INX_{i,t}$ corporate governance index, $CON_{i,t}$ bank concentration, $DGDP_{i,t}$ bank deposits to GDP ratio, $UER_{i,t}$ unemployment rate, $DUM_{i,t}$ dummy variable, $GDPG_{i,t}$ GDP growth rate, $ROA_{i,t}$ asset profitability ratio and ε_{it} the error term.

Table 4 – *Variable list*

Variable	Symbol	Source
NPL to total gross loans	NPLGL	
Governance index	INX	
Bank concentration	CON	World Bank database,
Bank deposits to GDP	DGDP	https://info.worldbank.org/governance/wgi/
GDP growth	GDPG	
Unemployment rate	UER	
Crisis dummy variable	DUM	
Bank return on assets	ROA	

The unemployment rate is one of the major determinants of NPL, as stated by Nkusu (2011) and Louzis et al. (2012). GDP growth causes lower NPL in the countries where there is higher GDP growth. Demirguc-Kunt and Detragiache (1998) investigated the effect of macroeconomic variables on banking crises. They found that GDP growth has a negative impact and that real interest rates and inflation have a positive impact on NPL.

While the crisis dummy in the variables was given the value 0 before the financial crisis in 2008-2009, the value 1 was given to this dummy in the years after the crisis. Finally, the priorities of this study are that NPL increases in financial crisis periods; thus, a positive relationship between NPL and crisis periods is expected (Anastasiou et. al., 2019).

The bank deposits/GDP variable was used to measure the development and importance of the financial system (Beck and Demirgüç-Kunt, 2009; Beck et al., 2010). A greater ratio of deposits to GDP indicates the existence of a prosperous country that has a reliable banking system and a country that has a lower NPL level. Therefore, a negative sign is expected.

ROA is expected to have a negative impact on NPL, for a higher ROA means that a bank has higher profitability, a better performance, and a lower NPL level (Berger and DeYoung, 1997; Louzis et al., 2012).

3. Results

First of all, the correlations between the variables are given in table A1. There is no high correlation between the variables used in the analysis. This result is of significance for further analyses. To test whether or not there is a heteroscedasticity problem, the Breusch-Pagan/Cook-Weisberg test was performed. In the same way, to question the presence of an autocorrelation problem, the Wooldridge (2002) test was used, and to determine the cross-section dependence, Pesaran's test was applied. The results of assumption tests were given in

table A2.[4] Looking at panel CADF and CIPS unit root test results, it is seen that the NPL/total loans variable, which is the dependent variable at the level, is stationary at the level (I(0)), and the other variables are stationary at I (1). Considering the CIPS unit root test results, it is seen that the panel is not stationary at the level in general, it has a unit root, and when the first differences are taken, the panel becomes stationary. The method by which variables should be analyzed also depends on whether the variables are homogeneous/heterogeneous. Accordingly, the Swamy S homogeneity test results are as shown in table A4.[5] According to the results of the Swamy S homogeneity test, the H0 hypothesis is rejected and there is a heterogeneous distribution in the series. Therefore, tests suitable for heterogeneous distribution should be performed (Yaman and Sungur, 2020).

Table 5 – *Difference GMM and system GMM results*

	Difference GMM		System GMM	
	Coef.	Std. Err.	Coef.	Std. Err.
NPL ($t-1$)	0.541	0.034	0.496	0.166
Concentration	2.235	1.410	3.464	1.766
Deposits/GDP	0.019	0.017	0.033	0.029
ROA	-0.387	0.161	-0.493	0.322
Crisis dummy	0.128	0.850	0.998	1.713
GDP	-0.018	0.053	-0.056	0.113
Unemployment	0.568	0.073	0.660	0.290
Index	-3.227	0.521	-2.236	0.405
Cons	3.490	1.500	5.252	1.337
N. of Groups	*22*		*22*	
Number of obs.	*330*		*330*	
Wald c²	*533.64*		*1352.48*	
Prob c²	*0.000*		*0.000*	
Sargan test	*75.822*		*60.025*	
Sargan p-value	*0.183*		*0.242*	
AR(1)	*0.106*		*0.149*	
AR(2)	*0.448*		*0.663*	

Note: *** and ** indicate the significance levels of 1% and 5% respectively.

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[4] In this part of the study, cross-sectional dependence was tested to be used in dynamic panel data analysis, since the presence of a cross-sectional dependency is a major problem encountered in the estimation of the model. Cross-sectional dependency means that the shock that occurs in any country participating in the analysis will affect other countries as well. To avoid this problem, methods that take into account the cross-sectional dependency are used. Considering the variable-based cross-sectional dependency, it was seen that all other variables, except the corporate governance index, show the cross-sectional dependency problem. In other words, the corporate governance index does not change structurally. At the end of the analyses, heteroscedasticity problems, autocorrelation problems and cross-sectional dependence were found. Because of the cross-sectional dependence, a second-generation unit root test was performed. The results of the unit root test are given in table A3.

[5] The Swamy S test tests the stability of the parameters, that is, whether the parameters change from unit to unit. In the Swamy S test, while the H0 hypothesis states that the coefficients are homogeneous, the H1 hypothesis states that they are heterogeneous (Yerdelen Tatoğlu, 2018).

Looking at the Difference GMM results in the table, there was a strong relationship between the dependent variables NPL and ROA and the corporate governance index at a significance level of 5%, and unemployment at a significance level of 1%. According to System GMM results, there was a strong relationship at a 5% significance level between the dependent variables NPL, deposits to GDP and the corporate governance index; a strong relationship was found between NPL and concentration, ROA and unemployment at the 1% significance level.

Before the analysis, it was expected that there is an inverse relationship with NPL growth, in accordance with some studies in the literature (Espinoza and Prasad, 2010; Yağcılar and Demir, 2015). As a result of the GMM analysis, it is seen that different results have been obtained from the studies examined. A probability value over 5% indicates that there is no relationship between NPL and growth.

As a result of GMM analysis, it was seen that there was a significant inverse relationship between ROA and NPL. In other words, it has been concluded that a one-unit increase in the return on assets of the countries causes a 0.38 decrease in NPL.

It is expected that there will be an equilateral relationship between the unemployment rate and NPL (Khan et al., 2018; Nkusu, 2011; Makri et al., 2014). Similar findings were obtained as a result of the study. In other words, there is a strong correlation between the unemployment rate and NPL, and a 1% change in the unemployment rate causes a 0.56 increase in NPL.

It is expected that there will be an inverse relationship between the management quality of the countries and NPL. The results were realized in line with expectations. In other words, as the management quality of countries increases, NPL decreases. A one-unit increase in the management quality of countries causes a decrease of 3.22 in NPL.

A robustness test was used to support GMM results in the study. The DOLSMG estimator developed by Pedroni is used as a robustness test. The DOLSMG test results are shown in table 6.

When the relationship between the dependent and independent variables of the panel was examined, it was proven that there is a relationship between NPL, which is a long-term dependent variable, and the corporate governance index at a 1% significance level, between deposits/GDP at a 1% significance level, with ROA at a 1% significance level, and with GDP and unemployment at a 1% significance level. It has also been found that a 1% increase in NPL causes a 3.12% decrease in the corporate governance index, a 0.3% increase in deposits/GDP, a 1.75% decrease in ROA, a 0.54% decrease in GDP, and a 0.27% increase in the unemployment rate.

In terms of the country-based relationship, there is a strong relationship between NPL and the corporate governance index: in Czech Republic, Indonesia, Philippines, India, Poland, Chile, Thailand and Greece at a 1% significance level; in South Africa, Egypt and Turkey at a 5% significance level; and in China at a 10% significance level. It was concluded that there is a strong relationship between NPL and concentration at a 1% significance level in Indonesia, Philippines, India, Malaysia, Egypt, Peru, Thailand and Greece and a relationship at a 5% significance level in China and Colombia. A strong relationship was also found between NPL and deposits/GDP: in Brazil, Indonesia, South Africa, Egypt, Poland, and Russia; and in Hungary (Europe-Middle East-Africa), Malaysia (Asia), and Peru (America) at a 1% significance level; and in Turkey at a 5% significance level. In China, South Korea and Chile, a relationship was determined at a 10% significance level.

Table 6 – *Results of DOLSMG*

	Index	Concentration	Deposits/GDP	ROA	GDP	Unemployment
Panel	-3.121***	-11.97	0.033 ***	-1.758***	-0.549***	0.271***
	0.571	92.718	0.005	0.170	0.083	0.022
UAE	-1.609	-7.768	-0.110**	1.972***	0.546**	-2.197
	-2.663	5.262	0.044	0.504	0.220	1.492
Brazil	0.209	0.2574	0.219***	0.924	0.291 ***	0.073
	0.835	3.091	0.058	1.272	0.098	0.492
Czech Rep.	-10.99***	-20.86	0.125	4.492***	-0.743***	0.404
	2.668	25.909	0.638	1.192	0.159	0.656
China	-5.085*	30.33**	0.698*	-9.306***	0.247	-4.652**
	2.889	13.135	0.396	1.017	0.467	0.196
Indonesia	-3.832***	-167.6***	0.184 ***	-3.819***	-1.032***	1.03***
	1.28	63.629	0.061	0.853	0.358	0.094
Philippines	-8.823***	-138.6***	-0.647	-8.624***	-2.386***	0.568
	2.948	31.069	0.046	2.910	0.249	2.015
S. Korea	-3.076	0.01614	-0.019*	-1.858***	0.362	0.478
	4.055	1.296	0.011	0.687	0.361	0.614
S. Africa	-3.371**	15.71	0.441***	11.9*	1.195	-1.037***
	1.661	36.982	0.115	7.02	1.144	0.150
India	11.36***	80.01***	-0.587 ***	-5.636***	1.041*	4.87*
	2.296	21.771	0.208	1.037	0.601	2.842
Colombia	-0.123	13.79**	0.260	0.439	0.45	0.238
	2.255	6.743	0.185	1.417	0.435	0.187
Hungary	-6.716	30.92	0.674**	-6.21***	-1.226***	2.278***
	6.341	19.458	0.326	0.343	0.364	0.118
Malaysia	-5.18	13.34***	-0.504 **	-4.266**	-3.962***	-2.81
	7.952	2.587	0.206	1.673	0.463	4.975
Mexico	0.819	6.317	0.016	2.558**	-0.107	1.359***
	1.141	25.953	0.265	1.047	0.351	0.173
Egypt	-28.67**	-157.3***	0.486***	-8.284***	0.083	-2.513***
	12.896	24.984	0.024	1.507	1.677	0.891
Pakistan	-10.04	8.615	-0.224	-0.861	-1.707*	0.533
	7.974	6.175	0.166	0.547	0.905	0.963
Peru	1.568	-51.18***	0.659**	-2.128***	-0.347	0.978**
	2.221	9.632	0.282	0.513	0.207	0.408
Poland	-5.256***	10.33	-1.097 ***	1.733*	-1.545*	0.587***
	0.294	11.336	0.319	0.884	0.915	0.101
Russia	-3.389	-5.238	0.457 ***	-5.057***	-1.223***	-1.562
	5.371	4.457	0.115	0.879	0.260	1.047
Chile	2.986***	8.928	-0.127*	3.947*	0.599	0.079
	0.405	6.958	0.072	2.12	0.543	0.316
Thailand	33.89***	-95.61***	-0.045	-7.931***	-1.245	5.348**
	11.614	11.837	0.097	0.946	1.839	2.51
Turkey	2.621**	-0.4261	0.242**	2.348***	-0.443**	0.027
	1.035	8.364	0.112	0.345	0.196	0.863
Greece	-25.94***	162.6***	-0.376	-5	-0.936	1.881***
	4.147	15.397	0.56	4.038	1.439	0.109

Note: ***, **, and * indicate the significance levels at 1%, 5%, and 10%, respectively.

It was determined that there is a strong relationship between NPL and ROA: in the United Arab Emirates, Czech Republic, China, Indonesia, the Philippines, South Korea, India, Hungary, Egypt, Peru, Russia, Thailand and Turkey at a significance level of 1%; in Malaysia and Mexico at a significance level of 5%; and in South Africa, Poland and Chile at a significance level of 10%.

It was also found that there was a strong relationship between NPL and GDP: in Brazil, Czech Republic, Indonesia, Philippines, Hungary, Malaysia and Russia at a 1% significance level; in the United Arab Emirates and Turkey at a 5% significance level; and in India, Pakistan and Poland at a 10% significance level.

Finally, it was seen that there was a strong relationship between NPL and the unemployment variable: in Indonesia, South Africa, Hungary, Mexico, Egypt, Poland and Greece at a 1% significance level; in China, Peru and Thailand at a 5% significance level; and in India at a 10% significance level.

4. Conclusion

Especially for emerging countries, NPL determinants – both at the bank and the macroeconomic levels – are a popular topic among the academic community and policymaker institutions. Many studies have been presented on the impact of NPL on the financial stability of countries and economic crises. This research aims to contribute to the literature by searching how the aggregate level of NPL in 22 emerging countries included in the MSCI Emerging Markets Index is affected by governance indicators, along with additional macro factors like deposit amount, GDP, unemployment, ROA, crisis dummy, and concentration. Using aggregate annual data for the years 2002-2018, a PCA was made for the WGI for the observed countries instead of using the six governance dimensions separately. Thus, we created a new variable named INX. To test this relationship, we used the GMM technique considering the purpose of the study, data set and literature (Rachid, 2019; Lee et al., 2020). Secondly, we used the DOLSMG technique to test the GMM results.

Our main finding is that governance quality is statistically significant and it has a negative sign, as expected on both tests. This result means that higher levels of these governance indicators signify both a relatively stronger and more stable banking system and lower levels of NPL. In this paper, we empirically show that the quality of governance is an important determinant of the NPL level of emerging countries. To decrease the NPL level, policymakers should take into consideration better governance indicators. It is also possible to suggest that the governance practices implemented by the countries in the sample for about 30 years have yielded positive results. This result encourages the countries in the sample to further their governance practices.

The improvement of the governance quality of the legal framework and its implementation in these countries can exert a negative effect on NPL. Emerging countries should undertake some institutional and structural reforms, such as control of corruption through the assessment of heavy penalties on those engaged in corrupt practices, which will reduce corruption, instability and NPL.

The limitations of the study are that only MSCI countries were included in the sample and data for the years after 2018 was unavailable for some countries. The study can be developed in the future by increasing the number of sample countries and using up-to-date data.

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Appendix

Table A1 – *Matrix of correlations*

	NPLGL	INX	CON	DGDP	GDPG	UER	DUM	ROA
NPLGL	1.000							
INX	-0.196	1.000						
CON	0.194	0.158	1.000					
DGDP	0.090	0.329	0.098	1.000				
GDPG	-0.138	-0.206	-0.138	-0.155	1.000			
UER	0.231	0.147	0.295	-0.066	-0.277	1.000		
DUM	-0.105	-0.007	-0.006	-0.010	-0.293	-0.034	1.000	
ROA	-0.404	-0.067	-0.212	-0.304	0.334	-0.189	-0.041	1.000

Table A2 – *Assumption tests*

Heteroscedasticity		Autocorrelation		Cross-sectional dependence	
Breusch-Pagan/Cook Weisberg test		Wooldridge test for		Pesaran's test of cross-sectional	
Chi2(1)	Prob	*F*-value	Prob	Value	Prob
76.688	0.000	46.579	0.000	7.528	0.000

Table A3 – *Pesaran's CADF test*

	CADF value		Critical value table		
	Level	*I*(1)	%1	%5	%10
NPLGL	-5.134	-5.104	−4.96	−4.00	−3.55
INX	-1.570	-4.202	−4.96	−4.00	−3.55
CON	-2.840	-3.931	−4.96	−4.00	−3.55
DGDP	-1.659	-4.729	−4.96	−4.00	−3.55
GDPG	-1.710	-4.629	−4.96	−4.00	−3.55
UER	-1.812	-3.898	−4.96	−4.00	−3.55
DUM	-1.639	1.802	−4.96	−4.00	−3.55
ROA	-2.656	-4.050	−4.96	−4.00	−3.55
CIPS	-1.795	-3.187	-2.32	-2.15	-2.07

Table A4 – *Swamy S homogeneity test*

Swamy S
chi2(42) = 577.78   Prob > chi2 = 0.0000