SHADOW ECONOMY NEXUS OF NON-PERFORMING LOANS IN EMERGING MARKETS[1]

GELİŞMEKTE OLAN PİYASALARDAKİ TAKİPTEKİ KREDİLERİN KAYIT DIŞI EKONOMİ İLİŞKİSİ

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ÖZ: Bu çalışma, 1998'den 2017'ye kadar olan dönemde 25 gelişmekte olan ülkede takipteki alacaklar (NPLs) ile kayıt dışı ekonomi arasındaki ilişkiyi, makroekonomik ve bankaya özgü değişkenleri ile birlikte incelemektedir. Driscoll-Kraay standart hataları ve sabit etki tahmincisi kullanılmış olup, sonuçlar takipteki alacakların kayıt dışı ekonomi, enflasyon ve ticari açıklık ile pozitif bir ilişkiye sahip olduğunu göstermektedir. Buna karşılık, GSYİH, işsizlik, hane halkı tüketimi, kredi/mevduat oranı, geniş para, banka öz sermaye getirisi ve genel ekonomik özgürlük endeksi, takipteki krediler üzerinde negatif bir etkiye sahiptir. Sonuçlarımız hem mikroekonomik hem de makroekonomik faktörlerden etkilenen takipteki kredilerin karmaşık yapısını göstermektedir.

Anahtar Kelimeler: Takipteki alacaklar, Kayıt dışı ekonomi, Makroekonomik faktörler, Ekonomik özgürlük endeksi, Gelişmekte olan piyasalar

ABSTRACT: This study examines the nexus between non-performing loans (NPLs) and the shadow economy, as well as macroeconomic and bank-specific variables, in 25 emerging countries from the period starting 1998 to 2017 period. The Driscoll-Kraay standard errors and a fixed effect estimator have been employed, and the results suggest that NPLs have a positive relationship with the shadow economy as well as inflation and trade openness. In contrast, GDP, unemployment, household consumption, credit to deposit ratio, broad money, bank return on equity, and overall economic freedom index have a negative effect on NPLs. Our results demonstrate the complex nature of non-performing loans, which are influenced by both microeconomic and macroeconomic factors.

Key Words: Non-performing loans, Shadow economy, Macroeconomic factors, Economic freedom index, Emerging markets

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EXTENDED ABSTRACT

Purpose: The purpose of this study is to explore the connection between non-performing loans (NPLs) and various macroeconomic and bank-specific factors in emerging markets from 1998 to 2017. A disruption in a bank's loan portfolio can have negative impacts on both the bank and the wider financial system, and the accumulation of NPLs is a key concern for academics and policymakers. By examining the relationship between NPLs and a range of macroeconomic and bank-specific factors, this study aims to shed light on the underlying causes of NPLs in emerging markets and inform policy decisions related to their management.

Importance: NPLs can have significant negative effects on both banks and the economy. They can reduce banks' ability to lend, impair their capital adequacy, and increase the risk of financial instability. It is therefore important to understand the factors that contribute to the accumulation of NPLs in order to develop effective policies for their management. Examining the relationship between NPLs and various macroeconomic and bank-specific factors can provide insight into the underlying causes of NPLs and inform the development of policies to mitigate their negative effects.

Method: The relationship between NPLs and various macroeconomic and bank-specific variables is examined using a panel data approach, employing the Driscoll-Kraay standard errors with a fixed effect estimator, using annual data for emerging markets from 1998 to 2017. The model includes country-specific variables such as GDP growth, inflation, and trade openness, as well as banking system-specific variables such as credit growth, return on equity, and economic freedom.

Results: NPLs, as expected, affect one year before the level because the easing requirements may not be tightening as easy as loosening. Thus, bad loans continue to distribute for some time. The results of our analysis show that the GDP, shadow economy, trade openness, credit-to-deposit ratio, and the ratio of return on equity have a statistically significant relationship with NPLs. Specifically, the shadow economy and trade openness have a positive relationship with NPLs, though the other significant variables have a negative relationship. These findings are consistent with previous literature on the subject, which NPLs show a negative relationship between and GDP, and a negative relationship between return on equity and NPLs. Additionally, in line with literature, our study demonstrates a negative correlation between the credit-to-deposit ratio and non-performing loans. Unemployment, as expected, causes NPLs to increase, meaning that an increase in unemployment causes an increase in NPLs, as reported in the literature. Inflation and non-performing loans are found to be positively correlated, though the literature has reported negative relationships. The household consumption and NPLs relationship is negative but not statistically significant. Contrarily, trade openness is discovered to have a significant positive relationship with NPLs and is consistent with previous research and theoretical predictions. The overall economic freedom index, EFI, consists of 10 components, such as the rule of law, regulatory efficiency, open markets, etc., and has a negative sign and significant result, so according to results, if the "things" are going bad, it might cause NPLs to increase.

Conclusion: This study provides valuable insight into the complex relationship between NPLs and various macroeconomic and bank-specific factors in emerging markets. The results suggest that policies aimed at improving economic conditions and increasing

transparency and accountability within the banking sector may be effective at reducing NPLs. Future research should explore the mechanisms behind these relationships in more depth and identify additional ways to mitigate the negative effects of NPLs on banks and the wider economy.

One potential policy that may be effective at reducing NPLs is the implementation of stricter lending standards. By requiring banks to adhere to more stringent underwriting criteria, regulators can help ensure that only borrowers with a high likelihood of repaying their loans are approved for credit. This can reduce the risk of defaults and the accumulation of NPLs. Additionally, measures such as improved transparency and accountability within the banking sector can help reduce the risk of NPLs by increasing confidence in the financial system and encouraging banks to manage their loan portfolios more responsibly. Further research is needed to fully understand the complex relationship between NPLs and various macroeconomic and bank-specific factors, and to identify additional ways to mitigate the negative effects of NPLs on banks and the economy.

1.   PROLOGUE

A bank's loan portfolio plays a pivotal role in both its own stability and the broader financial ecosystem. Disruptions to this portfolio, especially in the form of non-performing loans (NPLs), can have multifaceted ramifications. These NPLs not only endanger the health of individual banks but can also destabilize the overarching financial system. The surge in NPLs often reveals a nuanced interplay between macroeconomic variables and bank-specific indicators. This intricate relationship has consistently drawn the attention of scholars and policymakers alike, culminating in a rich body of literature dedicated to NPLs.

The 2008 financial crisis spotlighted the fragility of the world's financial infrastructure. To counter the aftermath of the crisis, central banks in several developed nations initiated unconventional monetary policies. One major actor, The Federal Reserve System[1] (henceforth FED), took drastic measures. They reduced the policy rate from around 5.25% to a bracket of 0-0.25% by year's end. This was an attempt to alleviate the U.S. crisis that had global repercussions. Moreover, the FED's balance sheet, originally at $900 billion, ballooned to $4.5 trillion post major asset purchases, including QE1, QE2, and QE3.

Following in the FED, institutions like the Bank of England (BOE), the European Central Bank (ECB), Riksbank, and the Bank of Japan (BOJ) also lowered interest rates and implemented similar asset purchasing strategies (Gagnon, J. E., & Sack, B., 2018). These strategies aimed at infusing financial markets with increased reserves, making loans more accessible and affordable, particularly for developing nations.

However, in October 2014, while the FED halted major asset purchases, entities like Riksbank and BOE perpetuated the expansion of their balance sheets. In

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[1] United States of America' Central Bank.

2015, the ECB embarked on a significant asset purchasing journey, which spanned three years. It's worth noting that even as the BOJ maintains its asset purchase drive, its impact is arguably less profound than the FED's quantitative easing measures.

These quantitative easing initiatives inadvertently intensified the spending propensities of emerging economies, culminating in heightened foreign debt levels[2]. The resulting financial climate, characterized by excessive spending and an influx from QEs, potentially underestimated the gravity of credit risk management in Emerging Market Economies (EMEs). This could be a precursor to the NPL spike. Yet, it's crucial to remember that the economic climate often remains the most salient determinant of NPLs. In growth phases, banks exhibit a propensity to lend more, buoyed by positive expectations. Conversely, downturns compel banks to bolster loan provisions. Such economic cycles, compounded by fluctuating public expectations, can disrupt the financial equilibrium (Bikker, J. A., & Metzemakers, P. A. J., 2005).

Taking Turkey as a case study, it's evident that anticipated global economic downturns positioned it at a disadvantage compared to other emerging markets (World Bank, 2019). For instance, the global financial crisis resulted in a sharp decrease in foreign direct investment, affecting firms operating in different industries including the banking sector (Şenalp, 2022). This unfavorability was accentuated by escalating credit costs, which exerted pressure on businesses and potentially diminished the return rate of individual loans. Historically, credit has propelled economic growth[3], a phenomenon observable through its direct correlation with economic expansion[4] (Kara, M., Erçelik, G., 2018). This relationship, however, comes with inherent risks. As Turkey's banks bolstered the economic growth, the loan-to-deposit ratio surged[5], heightening the potential for liquidity risks. As Keeton W. R. (1999) specifies, when the supply of loans shifts to the right[6], banks' willingness to lend increases. Such a shift occurs; banks seek to increase their lending by loosening the requirements for credit and reducing the interest rates as much as possible. However, this increase in willingness to lend more loans by banks raises their riskiness (Foos, D., Norden, L., & Weber, M., 2010).

According to Grigoli F. et al. (2016), the accumulation of NPLs can be an expected occurrence across business cycles, even in robust economies. Hence,

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[2] See Figure 1.

[3] See for further details; Aghion, P. et al., (2005); Rahman, S. et al. (2014); Manaresi, F., & Pierri, M. N. (2019)

[4] See for further details; Franklin, J., Rostom, M., & Thwaites, G. (2015); Doerr, S., Raissi, M., & Weber, A. (2018)

[5] See Figure 2.

[6] See Figure 3.

formulating precise NPL policies for banks and their supervisors is pivotal, especially considering the extensive impacts on the real economy and banks' capital adequacy ratio (CAR). The effect has created worldwide regulations[7] to understand the riskiness of both bank and financial systems and the circuitously real economy.

In light of these considerations, this research delves into the intricate relationship between NPLs and a various bank-specific and macroeconomic factors, focusing on emerging markets from 1998 to 2017.

In the following sections, we review relevant literature on non-performing loans. We then present the data and econometric methodology used in our analysis. The empirical results are discussed in the subsequent section, followed by a conclusion in the final section.

2.   LITERATURE REVIEW

The literature suggests that NPLs are related to macroeconomic and bank-specific factors for developed and emerging market economies. The nature of this relationship is multifaceted, with some studies focusing on the macroeconomic perspective and others examining it from a microeconomic perspective. Regardless of the perspective taken, the literature suggests that a complex interplay of various economic factors influences non-performing loans.

Several studies have attempted to study the relationship between macroeconomic factors and non-performing loans. For instance, Mazreku et al. (2018) used panel data regression to explore this relationship in transition countries from 2006-2016. They suggest a negative correlation between GDP growth and inflation but a positive correlation with unemployment. Similarly, Jouini and Messai (2013) examined the non-performing loans relationship between various macroeconomic variables in Spain, Greece, and Italy between 2004-2008 and discovered a significant negative relationship between NPLs and GDP growth and return on assets. However, their results suggest that real interest rates and unemployment have a significant positive relationship. Erdinç and Abazi (2014) also examined the non-performing loans' relationship with macroeconomic variables, dividing the variables into two categories: macro-financial factors and bank-specific factors. They found that non-performing loans have a significant negative relationship with GDP growth and inflation but a positive relationship with credit growth and, as expected, a negative relationship with bank profitability.

Ghosh A. (2015) carried out detailed work on the determinants of NPLs during 1984-2013 for saving and commercial banks located in fifty US states. According to the results, having a high real personal income, real GDP, and housing price index causing to a reduction in NPLs, whereas public debt, unemployment, and inflation causing to an increase in NPLs. Following that, Ghosh A. (2017) argues that US

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[7] See IFRS 9 and IAS 39

housing prices, housing starts, and the growth rate of real GDP affects significantly total NPLs. Moreover, at the disaggregated level, NPLs in the sectors have an impact on the employment level and growth.

Kumar, V., & Kishore, P. (2019) argues that there is no nexus between NPLs and macroeconomic variables as well as the CAR and return on assets (ROA) in the United Arab Emirates. In contrast, liquidity ratios indicate a significant negative relationship with NPLs. Klein N. (2013) concluded that NPLs affected by macro-economic factors more than bank-specific factors. Also, findings show that; NPLs affect the improvement of the economy negatively.

The relationship between non-performing loans and macroeconomic factors in the Eurozone has been the subject of several studies. Anastasiou et al. (2018) observed an upward trend in NPLs in the Eurozone between the first quarter of 2003 and the first quarter of 2016, which they attribute to deteriorating macroeconomic conditions. They also found that this trend was more pronounced in the periphery compared to the core areas. In a separate study, Gabriella et al. (2019) found that in case an increase occurs in NPLs in the Euro area, which leads to an increase in the cost of capital, a decrease in lending supply, and a reduction in liquidity creation. These effects were more significant for banks in periphery countries compared with the core countries. Cetin (2019) also found that non-performing loans negatively correlated with return on assets ratios in many EU member banks. Louzis et al. (2012) studied the role of macroeconomic variables and management quality in non-performing loans in Greece and found that both factors played a significant role.

Additionally, for the interest rate relationship, Jiménez G. et al. (2014) argues in their study that banks became more prone to risk-taking in the case of lower overnight interest rates. An increase in loans, as specified in the literature, usually causes future losses of loans (Jiménez, G., & Saurina, J. (2006); Karimiyan, A. et al., (2013)).

3. METHODOLOGY AND DATA

This study employs country-specific and banking system-specific variables affecting NPLs for Emerging Markets from 1998 to 2017 annually. The following model has been estimated to specify the nexus between NPLs, country-specific variables, and banking system variables.

$$NPL_{it} = \beta_0 + \beta_1 NPL_{it-1} + \beta_2 SDW_{it} + \beta_3 GDP_{it} + \beta_3 INF_{it} + \beta_4 UNP_{it-1} + \beta_5 HCS_{it-1} + \beta_6 TRD_{it-1} + \beta_7 CTD_{it-1} + \beta_8 M3G_{it} + \beta_9 ROE_{it} + \beta_{10} EFI_{it-1} + \varepsilon_{it}$$

Here, NPL represents "non-performing loans as a percent of all bank loans," SDW is "Shadow economy as a percent of GDP," GDP is "GDP growth rate," INF is "GDP deflator," UNP is "the unemployment rate," HCS is "household consumption as a percent of GDP," TRD is "Trade openness which is exports plus

imports as percent of GDP," CTD is bank "credit as percent of bank deposits," ROE "stands for bank return on equity in percent," M3G is "broad money growth," whereas economic freedom overall index denoted by EFI. Finally, UNP, HCS, TRD, CTD, and EFI are measured at t-1 to observe one-year-ahead results alongside the NPL.

The panel data approach has been chosen for this analysis due to its superior ability to handle variability and incorporate more information than time series or cross-sectional data. More comprehensive analysis of the statistical effects of variables can be done by using panel data analysis, and it allows also for the control of individual heterogeneity through panel data sets (Baltagi, 2005). Panel data usage allows for a more robust and detailed examination of the relationships under investigation, making it a valuable tool for empirical analysis.

3.1. Data

This paper investigates the macroeconomic variables nexus with the NPLs in emerging countries; Table 1 presents such variables to examine.

Table 1: Data Set

Variables	Symbol	Source
Non-performing loans as a percent of all bank loans	NPL	World Bank (2021a)
Shadow economy, percent of GDP	SDW	Medina & Schneider (2018)
GDP growth (annual %)	GDP	The World Bank (2018)
The unemployment	UNP	International Labour Organization (2021)
GDP deflator (Inflation)	GDF	World Bank (2021f)
Broad money growth (annual %)	M3G	International Monetary Fund (2021b)
Household consumption as a percent of GDP	HCS	World Bank (2021e)
Trade openness: exports plus imports as a percent of GDP	TRD	World Bank (2021g)
Bank credit as a percent of bank deposits	CTD	International Monetary Fund (2021c)
Bank return on equity, in percent	ROE	Bankscope (2021)
Economic freedom, overall index (0-100)	EFI	The Heritage Foundation (2021)

Shadow economy (SDW) data is taken from Medina & Schneider's (2018) work and represents all economic activities hidden from official authorities. Non-performing loans are expected to relate to the volume of the shadow economy, so if it increases, most likely, NPLs will increase.

Economic growth is expected to negatively affect the NPL because an expanding economy increases agents' expectations and spending and vice versa. In

contrast, unemployment is expected to positively affect NPL since income loss causes loans to turn non-performing.

Inflation is rather complex comparing the other variables since it has two effects if the wages are sticky; if inflation increases, that will follow by a decrease in the obligations in real values; thus, repayment becomes more manageable than before, which leads to a reduction in NPLs, yet another aspect of inflation is reals incomes, if the wages are sticky real incomes will decrease by inflation; therefore, it can cause to NPLs due to the increase in other expenses. Therefore, if we observe inflation to increase, in the case of sticky wages, NPLs would most like will increase as well (Louzis et al., 2012; Baselga-Pascual et al., 2015; Ghosh, 2015).

Household final consumption expenditure (HCS) is considered one-factor affecting non-performing loans, and a positive relationship is expected (Park, 2012). Trade openness may provide banks with a larger pool to invest in while performing lending activities so that banks can decrease their risk; in other words, higher trade openness causes risk-taking to reduce in bank credits (Alamgir Hossain et al., 2020; Ashraf et al., 2016; Yanıkkaya, 2003).

Banks may attempt to increase their market share and improve short-term profitability by rapidly expanding their loan volume and lowering credit requirements. However, such measures could raise NPLs due to the potential for adverse selection. As banks with modest profitability have additional motivations to participate in higher risk activities, which can contribute to higher levels of NPLs; therefore, profitability, as measured by return on equity, is also a determinant of NPLs. The credit-to-deposit ratio (CTD), calculated as the total loans of a bank divided by the total deposits of the same bank for a given period, is used to assess its liquidity. Banks with lower liquidity may be more prone to NPLs as they may be more likely to engage in aggressive lending practices, attracting less qualified borrowers.

Finally, institutional development represented by the economic freedom index (EFI) can negatively affect NPL since it is a pooled index that is based on the general situation for the market side and government side, which indirectly prevents bad loans.

Before conducting the empirical analysis, the relationship between the independent and control variables was analyzed. The findings of this study suggest that each independent variable has a unique explanatory value in terms of its influence on bank lending behavior (as shown in Table 3).

Table 3: Pairwise correlation results

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) NPL	1.000											
(2) D.NPL	0.115 (0.012)											
(3) SDW	0.222 (0.000)	-0.060 (0.194)	1.000									
(4) GDP	-0.225 (0.000)	-0.319 (0.000)	-0.084 (0.059)	1.000								
(5) INF	0.085 (0.059)	0.032 (0.480)	-0.012 (0.785)	-0.064 (0.151)	1.000							
(6) D.UNP	0.112 (0.015)	0.222 (0.000)	0.024 (0.596)	-0.418 (0.000)	0.000 (0.994)	1.000						
(7) D.HCS	-0.040 (0.380)	-0.055 (0.234)	0.030 (0.518)	-0.192 (0.000)	-0.246 (0.000)	0.032 (0.487)	1.000					
(8) D.TRD	0.040 (0.379)	0.016 (0.733)	-0.036 (0.432)	0.128 (0.005)	0.096 (0.037)	-0.061 (0.185)	-0.250 (0.000)	1.000				
(9) D.CTD	-0.314 (0.000)	0.152 (0.001)	-0.052 (0.255)	0.059 (0.202)	-0.012 (0.798)	-0.045 (0.325)	0.004 (0.927)	0.084 (0.066)	1.000			
(10) M3G	-0.023 (0.605)	0.038 (0.409)	0.010 (0.831)	0.070 (0.120)	0.540 (0.000)	-0.097 (0.035)	-0.018 (0.691)	0.069 (0.131)	-0.045 (0.323)	1.000		
(11) ROE	-0.472 (0.000)	-0.088 (0.056)	-0.108 (0.016)	0.324 (0.000)	0.074 (0.100)	-0.178 (0.000)	-0.104 (0.023)	0.131 (0.004)	0.275 (0.000)	0.187 (0.000)	1.000	
(12) D.EFI	-0.160 (0.000)	0.059 (0.203)	-0.037 (0.422)	-0.001 (0.979)	-0.108 (0.018)	-0.041 (0.372)	-0.024 (0.608)	0.042 (0.365)	0.052 (0.258)	-0.102 (0.027)	0.103 (0.025)	1.000

Table 2 presents descriptive statistics of the variables under consideration in this study.

Table 2: Summary Statistics

VARIABLES	N	Mean	Std. Dev.	Min.	Max.
NPL	500	7.462	7.360	0.350	48.60
SDW	500	27.42	9.798	9.412	59.94
GDP	500	3.840	3.674	-13.13	17.33
INF	500	6.700	9.433	-25.96	75.68
UNP	500	7.333	5.943	0.210	33.29
M3G	500	13.07	11.62	-19.44	102.0
HCS	500	58.25	12.04	23.65	88.12
TRD	500	71.98	41.12	16.44	220.4
CTD	500	103.0	47.67	37.12	331.0
ROE	500	14.81	18.37	-199.9	44.93
EFI	500	61.97	7.017	44	79

3.2. Cross-section dependency, Stationarity, and Slope Homogeneity

Nowadays, countries have more comprehensive linkages than they used to have financially and commercially. Therefore, any shock to one country on the net will affect the other countries involved. This possible effect does not necessarily require direct nexus among the counterparts. If CD exists among the variables, the results will be biased and inconsistent[8].

Table 4: Cross-Sectional Dependence Tests

Pesaran CD	Friedman		Frees		
Abs: 0.378		Test	1%	5%	10%
5.652 (0.0000)	44.198 (0.0072)	3.27	0.2468	0.1695	0.1294

Besides that, the panel models include the time dimension and cross-section; therefore, we carry out tests for time series properties in the variables. Pesaran's (2004) CD test has been used for the cross-sectional dependence test. As Pesaran et al. (2008) and Güloğlu et al. (2020) stated, the CD test, in the panel models, is more appropriate in case N is greater than T; besides that, the test is robust to structural breaks and non-normality of errors.

Due to the issue of cross-section dependency, the first-generation panel unit root tests have been prone to over-rejecting the null hypothesis. Second-generation panel unit root tests have been employed to address this limitation and avoid spurious results in the study. These tests were created as a solution to the first-generation

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[8] See for further detail (Baltagi, 2005, 10.5)

panel unit root tests' issues and a more reliable way to test for panel data unit root tests.

Table 5: Pesaran panel unit-root test results

	Level	Order 1
NPL	-2.509***	-3.754***
SDW	-2.487***	-4.384***
GDP	-3.397***	-5.316***
INF	-3.947***	-5.442***
CAB	-1.952	-4.247***
UNP	-1.489	-3.466***
M3G	-3.233***	-5.04***
HCS	-1.678	-3.854***
TRD	-1.668	-3.665***
CTD	-1.709	-2.436***
ROE	-2.631***	-4.713***
EFI	-2.3**	-4.451***

∗, ∗∗, and ∗∗∗ indicate that statistics are significant at the 10%, 5%, and 1% levels of significance, respectively.

Table 5 presents the findings of the stationarity tests conducted using the Pesaran (2007) method. The findings show that while some of the variables are integrated at order 1, others are stationary at a level. These findings have important implications for the analysis, as variables that are stationary at a level can be modeled directly, while those that are integrated of order one must be differenced before they can be used in the model. It is important to correctly identify the integration order of the variables to obtain reliable results from the analysis. It is also important to keep in mind that the order of integration may change for various data subsets, so it is necessary to carefully consider the implications of this for the analysis.

Table 6: Slope homogeneity tests results

$\widetilde{\Delta}$	4.433***
$\widetilde{\Delta}_{adj.}$	7.889***

∗,∗∗,∗∗∗ indicates that statistics are significant at the 10%, 5%, and 1% significance levels.

In our study, we employed the Pesaran and Yamagata (2008) slope homogeneity test in order to examine the robustness of the results obtained from the panel data regression model. The test results indicated that the null hypothesis of slope homogeneity was rejected, implying that the coefficients of the model are not constant across all units in the panel. This finding has important implications for the analysis, as it suggests that how the model's variables are related to one another may

vary depending on the specific unit being considered. Consequently, we proceeded to estimate the model while considering the potential heterogeneity in the coefficients. The slope homogeneity test is a useful technique in regression with panel data, identifying potential issues with the assumptions of the model and ensuring the reliability of the results.

4. RESULTS

Table 7 presents the analysis results of panel data regression using the Driscoll-Kraay standard errors. The use of the Driscoll-Kraay estimator and the fixed-effects model allows us to control for various sources of unobserved heterogeneity and obtain reliable estimates of the parameters of interest. The Driscoll-Kraay estimator was selected for its robustness to cross-sectional dependence, autocorrelation, and heteroskedasticity. In addition, the fixed effects is used in the model as it is well-suited for analyzing data from a specific set of countries, firms, etc. We also applied the Hausman test[9] to the data, which confirmed the appropriateness of the fixed-effects specification.

Table 7: Panel FE Results

VARIABLES	FE Model	
D.NPL	0.350**	(0.1340)
SDW	0.659***	(0.0614)
GDP	-0.119	(0.1130)
INF	0.0177	(0.0178)
D.UNP	-0.541*	(0.3040)
D.HCS	-0.203	(0.1550)
D.TRD	0.105**	(0.0382)
D.CTD	-0.197***	(0.0572)
M3G	-0.0427**	(0.0186)
ROE	-0.109***	(0.0183)
D.EFI	-0.337**	(0.1430)
Constant	-8.182***	(1.8170)
within R-squared	0.4426	
Observations	475	
Number of groups	25	

Standard errors in parentheses,   *** $p<0.01$, ** $p<0.05$, * $p<0.1$

NPLs, as expected, affect one year before the level because the easing requirements may not be tightening as easy as loosening. Thus, bad loans continue to distribute for some time.

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[9] The results of the test not reported here but available upon request.

The results of our analysis show that the GDP, shadow economy, trade openness, credit-to-deposit ratio, and the ratio of return on equity have a statistically significant relationship with NPLs. Specifically, the shadow economy and trade openness have a positive relationship with NPLs, though the other significant variables have a negative relationship.

These findings are consistent with previous literature on the subject, which NPLs show a negative relationship between and GDP (Louzis et al., 2012; Ćurak et al., 2013; Ghosh, 2015; Koju et al., 2018), and a negative relationship between return on equity and NPLs (Klein, 2013; Makri et al., 2014).

Additionally, in line with Swamy's (2012) findings, our study demonstrates a negative correlation between the credit-to-deposit ratio and non-performing loans. Unemployment, as expected, causes NPLs to increase, meaning that an increase in unemployment causes an increase in NPLs, as reported in the literature (Louzis et al., 2012; Klein, 2013; Makri et al., 2014; Skarica, 2014, Ghosh, 2015).

Inflation and non-performing loans are found to be positively correlated, though the literature has reported negative relationships (Ćurak et al., 2013; Klein, 2013; Skarica, 2014; Ghosh, 2015; Roman & Bilan, 2015).

The household consumption and NPLs relationship is negative but not statistically significant. Contrarily, trade openness is discovered to have a significant positive relationship with NPLs, and is consistent with previous research and theoretical predictions. The overall economic freedom index, EFI, consists of 10 components, such as the rule of law, regulatory efficiency, open markets, etc., and has a negative sign and significant result, so according to results, if the "things" are going bad, it might cause NPLs to increase.

5. CONCLUSION

In this study, we examined NPLs' relationship with the shadow economy, as well as bank-specific and macroeconomic variables, in 25 emerging countries starting from 1998 up until 2017. In order to do it, the Driscoll-Kraay standard errors are employed with a fixed effect estimator. Our results show that the shadow economy has a positive effect on NPLs, as well as one lagged value of NPLs, inflation, and trade openness. In contrast, GDP, unemployment, household consumption, credit to deposit ratio, broad money (m3), bank return on equity, and overall economic freedom index had a negative impact on NPLs.

These findings suggest that the factors contributing to NPLs are complex and not limited to the bank itself or macroeconomic factors. Rather, NPLs are influenced by the wider economic context in which banks operate. For example, a low return on equity may lead banks to loosen credit requirements, which could result in an increase in NPLs. Similarly, higher levels of NPLs could be a result of a growing shadow economy. This highlights the interconnectedness of the banking sector and the economy and the need for a healthy economy to sustain a properly functioning

banking sector and vice versa. Therefore, the solution to NPLs requires a multifaceted approach that addresses the problem's microeconomic and macroeconomic drivers of the problem.

Ethical Declaration

In this study, all the rules stated in the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed.

Ethics Committee Approval

The authors declare that the research is one of the studies that does not require ethical committee approval.

Conflict of Interest and Funding

No conflict of interest and funding has been declared by the authors.

Authorship Contribution Declaration

All stages of the study were designed and prepared by the authors.

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APPENDIX

Table 1: List of Countries Included in The Study

Argentina	Mexico
Brazil	Pakistan
Chile	Peru
China	Philippines
Colombia	Poland
Czechia	Russia
Egypt	Saudi Arabia
Greece	South Africa
Hungary	South Korea
India	Thailand
Indonesia	Turkey
Kuwait	United Arab Emirates
Malaysia	

FIGURES

Figure 1: Foreign Debt Stock of Selected Emerging Markets
Source: Respective Central Banks
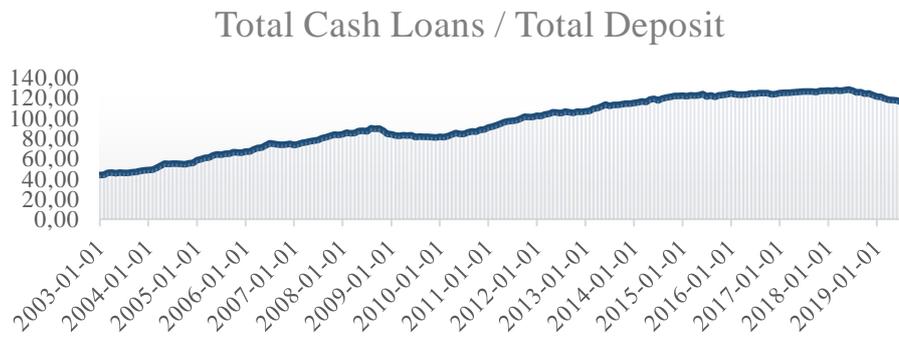
SOURCE: BRSA

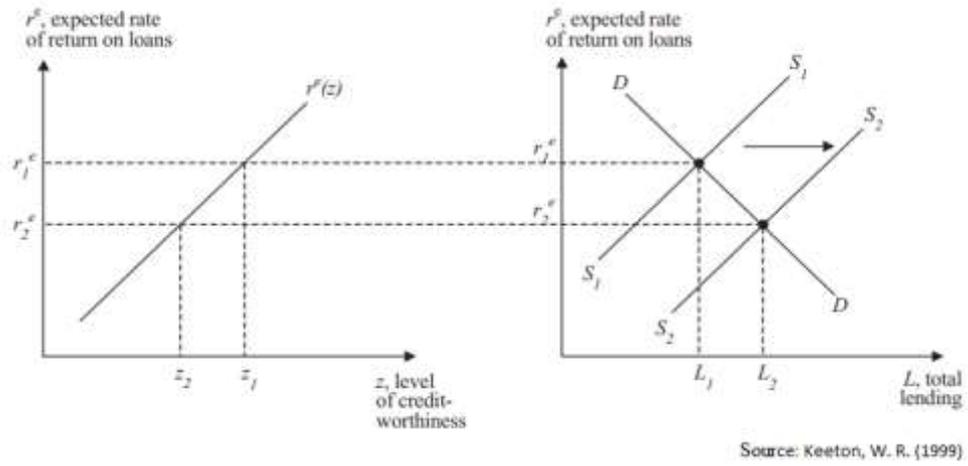**Figure 2:** Loan to Deposit ratio of Turkey

Figure 3: Supply Shift