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Assessing the severity of non-performing loans for residential and non-residential properties in Malaysia

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ABSTRACT

This study attempts to assess the macroeconomic factors impacting non-performing loans (NPLs) in both residential and non-residential properties held by commercial and Islamic banks in Malaysia between 2007 and 2021. The study will analyze quarterly NPL (non-performing loan) ratio data from reputable sources like Bank Negara, International Financial Statistics, and the Bank for International Settlements. It will focus on NPL trends across different property types in commercial and Islamic banks. Using the Autoregressive Distributed Lag (ARDL) technique, the study will evaluate the long-term relationship between NPLs and key macroeconomic factors. The results show a proven cointegrating link between determinants and NPLs. This provides crucial insights into fostering economic growth through macroeconomic factors while also bolstering the overall sustainability of the financial systems. The models are designed to anticipate non-performing loans based on data from Q12007- Q22021. Thus, the conclusions have practical limits, such as distortions in reflecting actual conditions or trends. Since then, the economy, society, and technology have all changed dramatically. Furthermore, human behaviors and preferences might change, making previous patterns less dependable for forecasting future actions. Key regulatory authorities, such as Bank Negara Malaysia, have developed measures to detect and address imbalances and vulnerabilities in the financial industry. Many of these measures have long lags; thus, it is important to identify macroeconomic and macro-financial factors that could act as leading indicators for future non-performing loan developments. The paper primarily contributes by estimating models to predict variables related to non-performing loans (NPLs). Its findings are valuable to regulatory agencies, as these agencies often rely on delayed indicators to identify key drivers of NPLs, including macroeconomic and bank-specific factors.

Contribution/ Originality: This study contributes by analyzing the impact of macroeconomic factors on non-performing loans (NPLs) in Malaysian commercial and Islamic banks from 2007 to 2021. Using ARDL techniques, it offers valuable insights for regulators and policymakers to enhance financial stability and anticipate NPL trends through early macroeconomic indicators.

1. INTRODUCTION

The global COVID pandemic caused a slowdown in economic activity, resulting in an increase in NPL ratios across practically all East Asia Pacific (EAP) countries in 2020 and early 2021. In light of the possible macroeconomic concerns posed by COVID-19, regulators in EAP countries pushed banks to give moratoriums and interim relief measures to borrowers; nonetheless, this approach further mitigated the negative impact on the deterioration of credit quality in banks' portfolios. This phenomenon creates significant vulnerabilities in credit markets [1] as well as serious consequences for the accumulation of non-performing loans. While Staehr and Uusküla [2] raise doubts about the ability of macroeconomic and financial indicators to reliably predict non-performing loan trends, the importance of these loans in shaping Malaysia's economic performance remains clear.

In particular, NPLs—whether in the residential or nonresidential sectors—directly influence the country's real GDP growth, underscoring their central role in the broader financial landscape [3]. NPLs for both residential and nonresidential properties constitute a severe concern since they can lead to more foreclosures and lower property prices in impacted areas, requiring banks to set aside more capital to cover potential losses. Furthermore, an oversupply of houses on the market lowers prices and slows the housing market [4] resulting in a credit crunch. The perceived risks associated with high levels of NPLs may discourage investors from investing in commercial real estate. Regulators monitor non-performing loans to prevent issues in the banking system. However, they must comprehend the non-diversifiable market risk that creates and contributes to this tendency. This question is clearly relevant in both academic and policymaking contexts because very few studies have explored the issue at the disaggregate level.

1.1. BNM's Data on Malaysian's Non-performing Loans

Bank Negara Malaysia [5] NPLs is defined as "*the outstanding amount of loans (principal and interest) classified as non-performing when principal or interest is six months or more in arrears. Interests on these loans are subsequently suspended.*"

The results from Bank Negara Malaysia data show that the total number of non-performing loans reached a nine-year high of RM28.4 billion in Q4 of 2020. Furthermore, by the second quarter of 2021, this figure had risen to RM29.9 billion, indicating a RM1.5 billion increase in just six months. Non-performing property loans, however, remained the primary driver of the rising NPL rates. NPLs for residential and non-residential properties have been consistently high for both commercial and Islamic banks. NPLs for residential properties involving commercial and Islamic banks totaled RM5.8 billion and RM2.5 billion, respectively, in the second quarter of 2021. Similarly, NPLs for non-residential properties of commercial and Islamic banks totaled RM2.4 billion and RM1.0 billion, respectively, during the same period. Figures 1 and 2 clearly highlight these patterns, as they exhibit NPLs for residential and non-residential properties in Malaysia's banking systems from 2013 to 2021.

In May 2024, Malaysia's non-performing loans (NPLs) stood at 1.62 percent, down from 1.78 percent in August 2023. This represents a 1.6 percent decrease from December 2005 to May 2024. Banks are likely to have written off impaired loans against excess provisions, leading to this significant drop [6]. However, while rising NPL ratios can threaten financial stability, writing off these loans can also hinder the flow of funds from savers to borrowers, potentially reducing long-term investment opportunities.

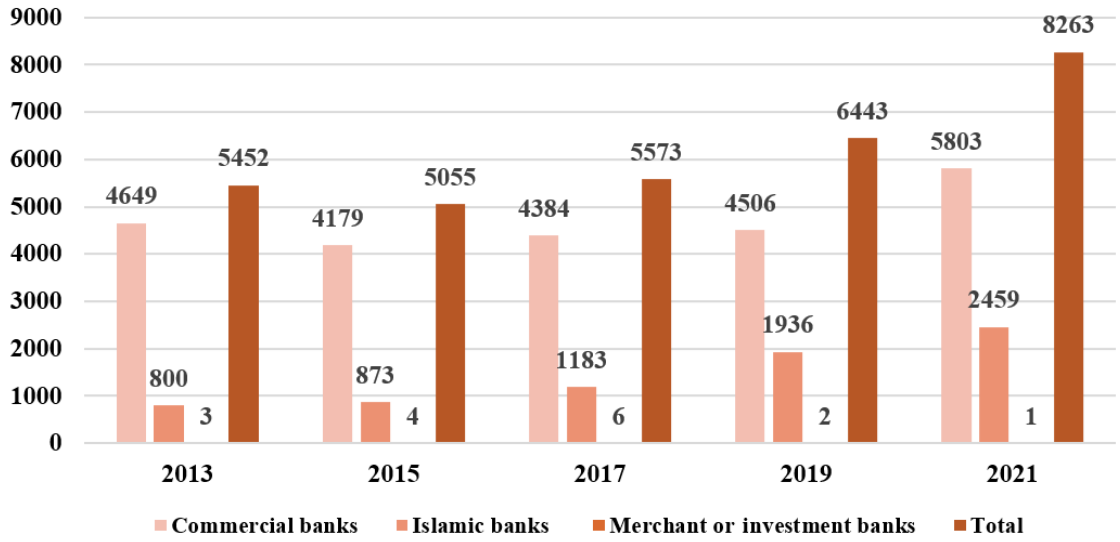

Figure 1. NPLs for residential property (In millions).

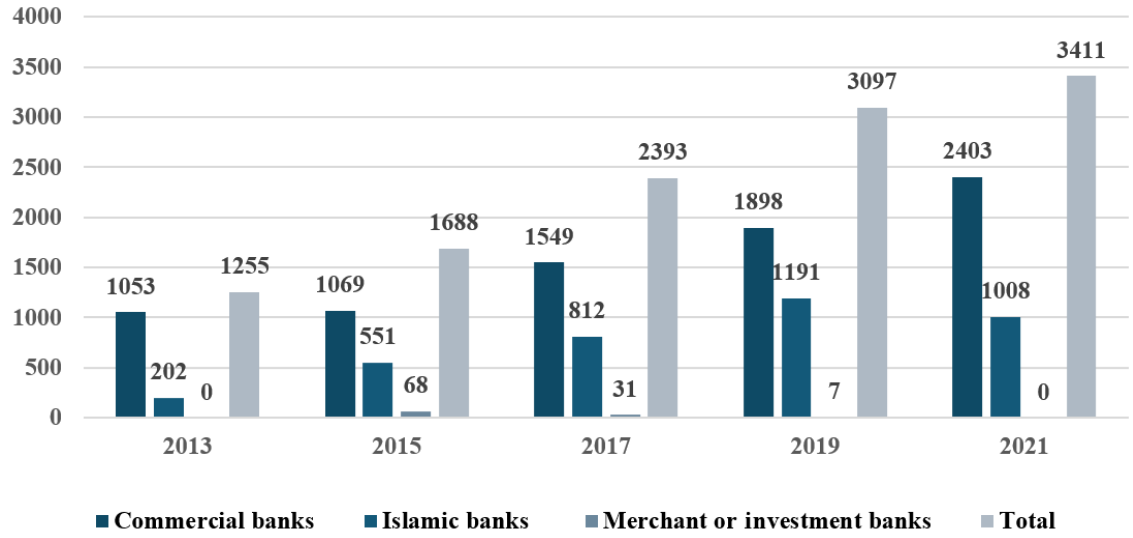

Figure 2. NPLs for non-residential property (In millions).

To monitor financial instability, authorities have implemented tools to detect imbalances and impending challenges in the economy. One of the primary components examined by BNM is household debts, such as mortgages, auto loans, and credit card debt, which frequently stimulates consumer spending, a major driver of economic growth. Household debt rose to RM1.53 trillion in December 2023, continuing its rising trend since 2018, with an annual growth rate of 5.1% [7]. Concurrently, the Malaysian banking industry has experienced a significant increase in non-performing loans (NPLs) over time. In Malaysia, 11% of family loans and 17% of total business loans have received repayment help, which has had a significant impact on pandemic-affected sectors such as the hotel and restaurant industry, where 52.8% of loans have been restructured.

People frequently cite and the issue of non-performing loans as a potential risk factor [8] which could potentially precipitate economic and financial instability in Malaysia. Following the lifting of the blanket loan moratorium on September 30, 2020, the number of NPLs began a gradual but consistent increase each month until the fourth quarter of that year, as reported by BNM. A closer examination of the distribution of these NPLs revealed discernible upward trends in the household sector, as well as in the wholesale and retail trade, and restaurants and hotels sectors, throughout the period from October to December 2020. A part of these NPLs was sold to and managed by Pengurusan Danaharta Nasional Berhad (Danaharta). Post-COVID, the finance companies experienced declines in total assets resulting mainly from a fall in loans and advances, due to the tight liquidity conditions.

Malaysia's government and regulatory authorities frequently monitor and respond to the challenge of NPLs by enacting measures targeted at assisting struggling borrowers and rejuvenating the economy. Many analysts and economists believe that the choices and policies that banks have implemented to reduce NPLs are, paradoxically, related to macroeconomic conditions and bank-specific factors, such as rapid credit growth, an increasing unemployment rate, central bank lending policies, and excessive bank lending [9]. Furthermore, greater NPL ratios are frequently connected with slower economic growth, severe currency depreciation, and increased volatility in international financial markets, whereas lower NPL ratios are associated with quicker growth and reduced global financial market volatility [10].

To address these mentioned gaps, the major goal of this research study is to assess the macroeconomic factors driving NPLs for residential and non-residential properties across both commercial and Islamic banks in Malaysia from 2007 to 2021.

2. LITERATURE REVIEW

The study conducted by Ahiase, et al. [11] encompassed 53 African nations, investigating the correlation between NPLs and macroeconomic factors, including GDP, gross external debt, unemployment, inflation, interest rates, and government effectiveness. While the research underscored the impact of macroeconomic factors and governance on NPLs, it did not account for macroeconomic shocks. This perspective resonates with Osunkoya, et al. [12] analysis, which focused on Nigerian data from 1981 to 2019, establishing a positive relationship between macroeconomic indicators and NPLs.

Similar trends are discernible across diverse regions. Gashi, et al. [13] examined countries in the Western Balkans, yielding comparable results. Golitsis, et al. [14] scrutinized North Macedonia, while Foglia [15] analyzed Italy, and Tham, et al. [16] along with Kepli, et al. [17] delved into Malaysia. Kjosevski and Petkovski [18] extended their analysis to the Baltic States, whereas Staehr and Uusküla [2] focused on EU countries, offering valuable insights into the correlation between macroeconomic indicators and NPLs.

Moreover, Osunkoya, et al. [12] highlighted inflation's minor short-term effects within Nigeria. This observation aligns with Küçük [19] and Özen, et al. [20] studies on Turkey, while Tham, et al. [16] and Kepli, et al. [17] explored Malaysia. In contrast, Kjosevski and Petkovski [18] provided divergent insights, suggesting that inflation's implications on NPLs span both positive and negative dimensions. Tham, et al. [16] introduced the housing price index, suggesting a positive correlation between rising property values, indicating a substantial short-term connection. Despite its significance, the impact of housing prices on real estate NPLs is relatively limited within the error correction model (ECM) model, mirroring Ahiase, et al. [11] findings, indicating that higher inflation rates correlate with increased NPLs. Conversely, Gashi, et al. [13] proposed an inverse relationship, suggesting that heightened inflation might reduce NPLs.

Regarding GDP, Staehr and Uusküla [2] emphasized its importance as a determinant of NPLs. Osunkoya, et al. [12] confirmed short-term GDP effects on Nigerian NPLs, with a stronger long-term impact, aligning with Tham, et al. [16] perspective, which contrasts with Foglia [15] finding of a negative GDP-NPL relationship. As for unemployment, Osunkoya, et al. [12] acknowledged its short-term impact on Nigerian NPLs, although insignificance emerged in the long term. Conversely, Golitsis, et al. [14] emphasized unemployment's substantial role in North Macedonia's NPL dynamics, complementing Ahiase, et al. [11] focus on NPLs and credit risk dynamics. Foglia [15] uncovered a positive correlation between unemployment rates and impaired loans.

Interest rates and NPLs are positively linked, as identified by Ahiase, et al. [11]. Osunkoya, et al. [12] supported this notion, observing a favorable impact of lending rates on NPLs. Golitsis, et al. [14] highlighted interest rates' robust long-term influence on NPLs. Tham, et al. [16] concurred, reporting extended causal effects and elasticity between interest rates and NPLs. Conversely, Ahmed, et al. [8] revealed that exchange rates constitute an external determinant alongside GDP, inflation, and government regulation. Osunkoya, et al. [12] noted exchange rates' short-term effect on Nigerian NPLs, evolving into a positive, significant influence over the long term. In a study on Romanian banks, Hada, et al. [21] highlighted exchange rates and unemployment as key determinants of non-performing loans (NPLs). Kepli, et al. [17] emphasized economic growth, money supply, and exchange rates for managing NPLs amidst volatile capital flows, stressing exchange rate flexibility and sufficient money supply's role in withstanding external shocks.

There seems to be a gap in the research because the scholars we looked at did not agree on what was being said. Our study aims to fill this gap by looking at the links between GDP, interests rates, unemployment rates, property prices/inflation, central bank policy rates, and exchange rates for both residential properties in Malaysia from 2007 to 2021. The investigation encompasses a majority of the macroeconomic factors that could potentially impact property NPLs among individuals in Malaysia. Given the limited body of literature concerning Malaysia (as highlighted by Kepli, et al. [17]) our study attempts to bridge this gap by exploring various determinants, particularly concentrating on property loans, an area that has received relatively little attention. Furthermore, the

significant role of property NPLs in numerous countries, as emphasized by Tham, et al. [22], motivated the deeper exploration of this subject.

3. CONCEPTUAL FRAMEWORK

This study validates its methodology by carefully selecting variables for inclusion and categorizing them into two distinct models, as illustrated in Figure 3. Model 1 centers on assessing the impact of NPL on residential properties (NPLR), while Model 2 directs its focus towards examining the effect of NPL on non-residential properties (NPLN).

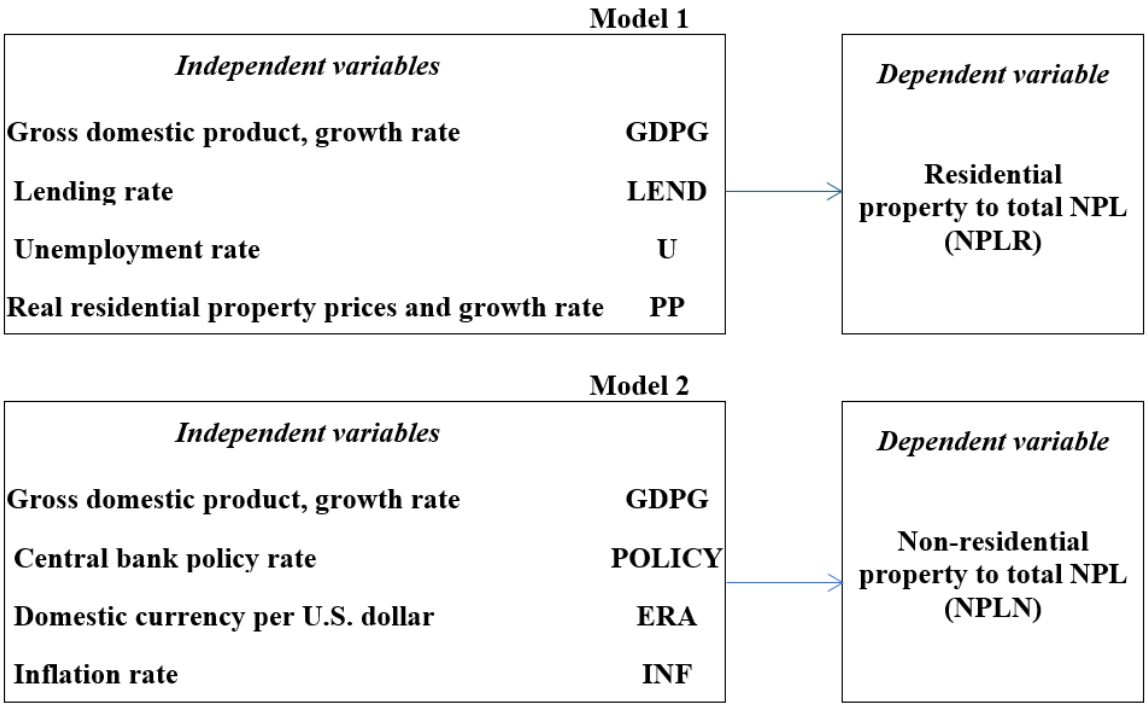

Figure 3. Conceptual framework.

4. RESEARCH METHODOLOGY

4.1. Research Design

This study is based on quantitative research, using secondary data from figures released by International Financial Statistics, Bank Negara Malaysia's Monthly Highlights and Statistics, and the Bank for International Settlements.

4.2. Data Collection

Bank Negara Malaysia's Monthly Highlights and Statistics provide the data for non-performing residential property loans, as Table 1 illustrates. The dependent variables include NPL ratios for both residential and non-residential properties owned by commercial and Islamic banks.

Table 1. Variable description.

Variable description	Measurement	Abbreviation	Source	Expected sign
NPLs from purchase of residential property to total NPLs	Percent	NPLR	BNM	NA
NPLs from purchase of non-residential property to total NPLs	Percent	NPLN	BNM	NA
Gross domestic product, growth rate	Percent	GDPG	BNM	-
Lending rate	Percent	LEND	IFS	+
Central bank policy rate	Percent	POLICY	IFS	+
Domestic currency per U.S. dollar (Period average)	Rate	ERA	IFS	+
Inflation (Consumer price index, 2010=100)	Percent	INF	IFS	+
Unemployment rate	Percent	U	BNM & IFS	+
Real residential property prices, growth rate	Percent	PP	BIS	+

Note: BNM-bank Negara Malaysia, IFS-International financial statistics, BIS-Bank for international settlements.

4.3. Sample Size

This study's sample consisted of 27 commercial banks and 17 Islamic banks listed on the Main Board of Bursa Malaysia. This investigation will use quarterly data ranging from the first quarter (Q1) of 2007 to the second quarter (Q2) of 2021.

4.4. Autoregressive Distributed Lag (ARDL) Approach

This study used the Autoregressive Distributed Lag (ARDL) technique [23] to investigate the long-term relationship between NPLs and their drivers. This study prioritizes econometric models that describe the four pillars of NPLs' four pillars: base lending rate, inflation rate, GDP, and income distribution. Zainol, et al. [24] conducted a similar analysis that only included the four pillars. The ARDL approach is particularly useful when the stationarity properties of the underlying regressors are uncertain, whether they are trend-stationary or first-difference stationary. It entails testing for a long-term relationship between a dependent variable and a set of regressors. The standard F-test is employed to assess the significance of the lagged levels of the variables within a univariate equilibrium correction mechanism. Under the null hypothesis of no long-run relationship, the asymptotic distributions of these statistics deviate from standard distributions, regardless of whether the regressors are integrated of order 0 (I(0)) or order 1 (I(1)) [25]. This is a suitable method for analyzing the impact of macroeconomic factors on non-performing property loans. Following previous empirical studies by Fell, et al. [10]; Golitsis, et al. [14] and Foglia [15] the long-run model can be written as follows:

$$NPLR_t = \beta_0 + \beta_1 GDPG_t + \beta_2 LEND_t + \beta_3 U_t + \beta_4 PP_t + e_t \quad (1)$$

$$NPLN_t = \beta_0 + \beta_1 GDPG_t + \beta_2 POLICY_t + \beta_3 ERA_t + \beta_4 INF_t + e_t \quad (2)$$

The ratio of NPLs for residential property to total NPLs is known as NPLR, while the ratio of NPLS for non-residential property to total NPLs is known as NPLN. For the macroeconomic variables of interest, GDPG is the growth rate of GDP, LEND is the lending rate, U is the unemployment rate, PP is the growth rate of real residential property prices, POLICY is the Central Bank policy rate, ERA is the domestic currency against USD, and INF is the inflation rate. β_1, β_2, β_3, and β_4 represent the coefficients of the independent variables, and e is the error term.

Specifically, it is anticipated that the GDP growth rate will exert a negative influence on NPLs. As GDP rises, per capita income is expected to increase, potentially facilitating consumers' ability to meet their monthly installment payments. Conversely, both the lending rate and the central bank policy rate are expected to positively impact NPLs. An increase in borrowing costs may make it difficult for consumers to meet their loan obligations.

Regarding currency, this study posits that a depreciation of the Ringgit Malaysia (RM) will likely lead to an increase in NPLs. A depreciation of the RM may indirectly elevate the cost of living, as the prices of imported goods rise, potentially exacerbating financial strains. This effect is anticipated to be mirrored by changes in the inflation rate. Additionally, the unemployment rate is anticipated to positively correlate with NPLs, as higher levels of unemployment may hinder individuals' ability to repay loans. Concerning residential property prices, it is hypothesized that higher prices will correspond to a greater propensity for NPLs. Table 1 outlines the expected signs for these relationships.

There are several steps that need to be taken before conducting the ARDL test. The first step is to lag length using information criteria. The selection of lag lengths can be guided by using Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and Hannan and Quinn's information criterion (HQIC) [26]. This study uses AIC for the optimal lag orders. The elimination of the endogeneity problem through ARDL eliminates residual correlation [25].

The second step is the unit root test. ARDL allows the variables to be stationary at level I (0) or at first difference I(1) but not at second difference I(2). The existence of I(2) variables in the model will cause the computed F-statistics to be invalid. Subsequently, the Augmented Dickey-Fuller (ADF) test is used to check whether variables in the model are free from I(2).

Step 3 involves the ARDL estimation after all variables are stationary at I(0) or I(1). This study yields the following equations:

$$\Delta NPLR_t = \alpha_0 + \alpha_1 GDPG_{t-1} + \alpha_2 LEND_{t-1} + \alpha_3 U_{t-1} + \alpha_4 PP_{t-1} + \sum_{i=1}^{p} \tau_i \Delta NPLR_{t-i} + \sum_{i=0}^{p} \delta_{1i} \Delta GDPG_{t-i} + \sum_{i=0}^{p} \delta_{2i} \Delta LEND_{t-i} + \sum_{i=0}^{p} \delta_{3i} \Delta U_{t-i} + \sum_{i=0}^{p} \delta_{4i} \Delta PP_{t-i} + \varepsilon_t \quad (3)$$

$$\Delta NPLN_t = \alpha_0 + \alpha_1 GDPG_{t-1} + \alpha_2 POLICY_{t-1} + \alpha_3 ERA_{t-1} + \alpha_4 INF_{t-1} + \sum_{i=1}^{p} \tau_i \Delta NPLN_{t-i} + \sum_{i=0}^{p} \delta_{1i} \Delta GDPG_{t-i} + \sum_{i=0}^{p} \delta_{2i} \Delta POLICY_{t-i} + \sum_{i=0}^{p} \delta_{3i} \Delta ERA_{t-i} + \sum_{i=0}^{p} \delta_{4i} \Delta INF_{t-i} + \varepsilon_t \quad (4)$$

Where the Δ is the first difference operator, α_0 is the drift component, and the ε is the white noise residuals.

Equation 3 and Equation 4 (without summation sign) signifies the long-run relationships. Critical values tabulated are applicable to small sample sizes [27]. The null hypothesis is rejected if the calculated F-statistic value is greater than the upper bound of critical values. This implies that there exists a long-run relationship between NPLs and their determinants.

5. HYPOTHESIS STATEMENTS

5.1. Model 1

H_1: There is a long-run relationship between non-performing loan (residential property) and gross domestic product growth rate.

H_2: There is a long-run relationship between non-performing loan (residential property) and lending rate.

H_3: There is a long-run relationship between non-performing loan (residential property) and unemployment rates.

H_4: There is a long-run relationship between non-performing loan (residential property) and real residential property prices and growth rates.

5.2. Model 2

H_1: There is a long-run relationship between non-performing loan (Non-residential property) and gross domestic product growth rate.

H_2: There is a long-run relationship between non-performing loan (Non-residential property) and central bank policy rate.

H_3: There is a long-run relationship between non-performing loan (Non-residential property) and domestic currency.

H_4: There is a long-run relationship between non-performing loan (Non-residential property) and inflation.

Table 2. Summary statistics key variables.

Model 1					
Statistics	**NPLR**	**GDPG**	**LEND**	**U**	**PP**
Mean	25.6060	4.2445	4.8754	3.3904	4.0674
Maximum	33.1747	16.1375	6.5500	5.1000	12.8291
Minimum	21.5611	-17.2195	3.4492	2.7000	-3.2588
Std. dev.	3.1793	4.3906	0.6739	0.5040	3.6288
n	58	58	58	58	58
Model 2					
Statistics	NPLN	GDPG	POLICY	ERA	INF
Mean	8.1820	4.2445	2.9052	3.6462	2.0321
Maximum	12.2381	16.1375	3.5000	4.4500	8.4068
Minimum	4.9904	-17.2195	1.7500	3.0200	-2.5556
Std. dev.	2.3010	4.3906	0.5062	0.4669	1.8455
n	58	58	58	58	58

6. RESULTS AND DISCUSSIONS

Table 2 presents the summary statistics for the key variables. In comparison, the non-performing loans for residential property as a percentage of the total non-performing loans stood at 25.6%, compared to 8.2% of the non-performing loans for non-residential property ratio. This implies that the average NPL ratio for residential property is three times larger than for non-residential property in Malaysian commercial and Islamic banks. The quarterly GDP growth rate averaged 4.2%, ranging from the lowest growth rate of -17.2% to the highest growth rate of 16.1%. The lending rate and policy rate in Malaysia were recorded at 4.9% and 2.9%, respectively, between 2007 and 2021. The lending rate reached an all-time high of 6.6%, and the lowest recorded lending rate was 3.4%. Meanwhile, the policy rate hit a record high of 3.5% and a record low of 1.8% over the period of study. Malaysia's unemployment rate, real residential property price index growth rate, and inflation rate for 2007-2021 were at approximately 3.4%, 4.1%, and 2.0%, respectively. Lastly, the exchange rate of RM against the USD was recorded at an average of 3.64 over the period 2007-2021.

Table 3. Correlation matrix.

Model 1					
Variables	**NPLR**	**GDPG**	**LEND**	**U**	**PP**
NPLR	1.0000				
GDPG	-0.1986	1.0000			
LEND	0.5395	0.1873	1.0000		
U	0.2262	-0.4813	-0.4258	1.0000	
PP	-0.4114	0.1344	-0.2070	-0.4540	1.0000
Model 2					
Variables	NPLN	GDPG	POLICY	ERA	INF
NPLN	1.0000				
GDPG	-0.2579	1.0000			
POLICY	-0.1985	0.4468	1.0000		
ERA	0.8097	-0.2551	-0.1665	1.0000	
INF	-0.3467	0.4471	0.4572	-0.2246	1.0000

Table 3 lists the correlation coefficients among the regressors during the sample period. The correlations between two independent variables are relatively low for the two models, suggesting that there is no serious multicollinearity in this study. Table 4 reports the results from augmented Dickey-Fuller (ADF) test for stationarity of the variables. The null hypothesis of a unit root can be rejected at first differences, showing that all the variables

can be characterized as I(1). Subsequently, the ARDL bound test is used to examine the cointegrating relationships between the variables.

Table 4. Augmented dickey-fuller test results.

Variables	Level		First differences			
	Constant	Constant, trend	Constant		Constant, trend	
	t-stat	t-stat	t-stat		t-stat	
Model 1						
NPLR	-1.5378	-0.9517	-7.5617	***	-3.5889	**
GDPG	-2.4791	-2.5254	-6.3064	***	-6.1438	***
LEND	-1.7770	-2.4654	-4.4082	***	-4.3754	***
U	-1.3070	-1.9177	-8.2917	***	-8.3660	***
PP	-1.3763	-1.4555	-7.2617	***	-4.5511	***
Model 2						
NPLN	-0.1218	-1.7355	-7.6414	***	-8.1676	***
GDPG	-2.4791	-2.5254	-6.3064	***	-6.1438	***
POLICY	-1.9486	-2.0337	-5.4646	***	-5.4370	***
ERA	-1.1644	-2.2679	-5.4353	***	-5.4021	***
INF	-1.5193	-1.7589	-4.9929	***	-4.9106	***

Note: *** and **, denote statistical significance at the 5%, and 10% levels, respectively. The optimal lag length is selected using the Akaike information criteria.

Table 5. ARDL bounds cointegration test results.

Model		K	F-statistic	Significance	I(0)	I(1)
1	NPLR=f(GDPG, LEND,U, PP)	4	8.1382	10%	2.3450	3.2800
2	NPLN=f(GDPG, POLICY, ERA, INF)	4	4.6413	5%	2.7630	3.8130

Note: Critical value bounds are based on Narayan [27]. The lag selection is selected using Akaike information criterion.

The result for ARDL cointegration bound test is presented in Table 5. For Model 1, the calculated F-statistic (8.1382) exceeds the upper bound critical values at the 1% level of significance. While for Model 2, the computed F-statistic (4.6413) is greater than the upper bound critical values at the 5% significance level. Overall, therefore, we can conclude there exists a co-integrating relationship between variables examined in this study.

For Model 2, only Central Bank policy rate and currency are statistically significant at the 10% and 1% significance levels. For instance, a one percentage point increase in policy rate raises NPL for non-residential property to total NPLs by about 2.8 percentage points. This is because the non-residential property includes the purchase of industrial buildings and factories, land, commercial buildings, and shophouses, which have been relatively less influenced by the healthy economic environment. A positive value of the exchange rate implies a depreciation of the exchange rate. In this study, a rise in currency depreciation leads to an increase in the NPL for non-residential property to total NPLs by about 4.34 percentage points.

Table 6. Long-run estimates.

Model 1				Model 2			
ARDL (1, 2, 1, 3, 0)				ARDL (2, 0, 1, 0, 0)			
Variable	Coefficient	t-statistic		Variable	Coefficient	t-statistic	
C	-6.2617	-0.9731		C	-23.4582	-2.7261	***
GDPG	-0.5694	-3.9902	***	GDPG	-0.1219	-0.7536	
LEND	4.6228	7.2772	***	POLICY	2.7804	1.7605	*
U	3.3533	2.7353	***	ERA	7.0496	4.3350	***
PP	0.0616	0.5947		INF	-0.4975	-1.4733	

Note: *** and * denote statistical significance at the 1% and 10% levels.

As argued by Fell, et al. [10] a substantial currency depreciation is predicted to raise the amount of NPLs in nations that largely rely on external debt. Overall, favorable macroeconomic conditions can cause business and household sectors to benefit from higher income, which could reduce the risk of loan default, reduce credit risk, and result in a lower quantum of NPLs.

Furthermore, the long-run relationship between NPLs and their macroeconomic factors can be seen in Table 6. For Model 1, the study finds that three out of four explanatory variables are statistically significant at 1% levels. All the long-run parameter estimates follow the expected signs. For GDP growth rate, a one percentage point increase in GDP growth leads non-performing residential property loans to drop by about 0.57 percentage points of total NPLs. Conversely, the estimated coefficients for lending rate and unemployment rate are positive. This suggests that lower unemployment and lending rates are linked to decrease in the NPL for residential property for both commercial and Islamic banks in Malaysia.

For Model 2, only central bank policy rate and currency were found to be statistically significant factors that affect NPLs for non-residential property with expected movements. The other two variables, GDP, and inflation, are not significant. From our observation, non-residential property, which includes buying of industrial buildings, and factories, land, commercial buildings and shophouses, is not really affected by GDP as the ownership of these properties is mostly held by private firms. Since private firms primarily view these properties as investments, their profitability serves as a more accurate indicator. For inflation, these properties naturally will have an increase in terms of values; thus, whether there is inflation or not, is irrelevant.

Table 7. Error correction regression results.

Model 1				Model 2			
Variable	**Coefficient**	**t-statistic**	**Sig**	**Variable**	**Coefficient**	**t-statistic**	**Sig**
D(GDPG)	-0.0742	-2.4999	**	D (NPLN(-1))	-0.2702	-2.3173	**
D (GDPG(-1))	0.2086	4.4531	***	D (POLICY)	0.7763	3.184	***
D(LEND)	-2.8951	-3.2589	***	ECM (-1)	-0.1115	-5.5451	***
D(U)	-1.036	-2.2043	**				
D(U(-1))	-2.2664	-4.193	***				
D(U(-2))	-2.1109	-4.4653	***				
ECM(-1)	-0.4165	-7.3829	***				
Adjusted R2	0.5665			Adjusted R2	0.3484		
SER	0.7142			SER	0.3699		
AIC	2.2832			AIC	0.901		
SC	2.5387			SC	1.0095		
Diagnostic tests				Diagnostic tests			
	Statistic	Prob.			Statistic	Prob.	
BGLM	0.7361	0.6921		BGLM	0.8202	0.6636	
ARCH	1.2204	0.5432		ARCH	0.3634	0.8338	
RESET	0.0253	0.975		RESET	0.6484	0.5276	
JARQUE-BERA	2.0772	0.3539		JARQUE-BERA	1.7019	0.127	

Note: *** and **, and denote statistical significance at the 1% and 5%, levels, respectively. BGLM-Breusch-Godfrey serial correlation LM test, ARCH-Autoregressive conditional heteroskedasticity test, RESET-Ramsey RESET test, SER-S.E. of regression. AIC-Akaike info criterion, and SC-Schwarz criterion.

Table 7 presents the results for error correction regression. Interestingly, the error correction terms (ECT) are negative and statistically significant at the 1 percent levels for Models 1 and 2. This indicates that about 42% (11%) of the discrepancy between the long-run and short-run is corrected within a quarter for Model 1 (Model 2). As a result, the adjustment is a faster for the NPL residential property than the NPL non-residential property. This scenario could be reasonable where the investment in non-residential property usually takes a longer time period as the value of the properties is higher. Lastly, for diagnostic tests, both models pass the assumptions of normality, serial correlation, heteroskedasticity, and specification bias, thus the models are overall fit for purpose.

Among the key factors in determining credit risk are non-performing loans, where the greater the credit risk, the higher the probability of default [15]. Frequently, bank disruption is often caused by a high amount of NPLs

[28]. Malaysia's economy continued to maintain positive performance, with GDP growing at a pace of 3.3% in 2021 and 8.7% in 2022 [5]. Nevertheless, the Malaysian banking system has recorded a significant rise in NPLs over the years. More importantly, the NPLs for purchases of residential property remained high for commercial banks and Islamic banks. People frequently cite a sluggish global economy, weak economic growth, rising interest rates, war, and pandemic aftershocks as the most significant determinants of the NPLs. Accordingly, the objective of this study is to explore macroeconomic determinants that may influence the extent of non-performing property loans in Malaysia. Specifically, this study focuses on commercial and Islamic banks in Malaysia over the period 2007 to 2021.

Using the ARDL approach, the results confirm that there exists a cointegrating relationship among non-performing residential property loans and its determinants. The macroeconomic factors considered in this study are GDP growth, lending rate, unemployment rate, and real residential property price index growth. First, the results show that the behaviour of the NPLs in Malaysia's commercial and Islamic banks is affected by different macroeconomic factors over the study period. Second, it is evident that the decrease in NPLs for residential property is affected by a robust economic growth, coupled with reduced lending and unemployment rates. Finally, these findings highlight the critical need for stable macroeconomic environments not only to curb NPLs within Malaysia's banking systems but also to enhance the overall sustainability of the financial sector. Macroeconomic conditions heavily influence the results of examining the relationship between the number of NPLs in Malaysia using the ARDL approach, despite prior literature focusing on various types of non-performing loans [24, 29].

7. CONCLUSION

7.1. Implications

A strong macroeconomic surveillance system is critical for closely monitoring economic dynamics, discerning interconnections between various economic variables, and prioritizing housing price stability to reduce speculation and the impact of housing prices on non-performing loans [30]. Commercial banks must strictly follow regulatory regulations, maintain adequate capital reserves, and avoid imprudent lending practices that may result in unsecured credits in their portfolios [31].

In essence, effective macroeconomic stability can be used to reduce non-performing loans (NPLs), as long as banks take steps to limit property financing risks through efficient NPL management. This means implementing responsible lending standards as well as effective credit risk management procedures designed specifically for property investment. Banks must also face and handle the problems of guaranteeing long-term financial viability, all while carefully examining the whole market landscape, which includes macroeconomic indicators, market mechanisms, and swings in property prices. Banks are well-positioned to allocate resources towards funding sustainable development projects, resulting in a more resilient and sustainable economic trajectory.

7.2. Limitations

One of the disadvantages of using the ARDL model is the necessity to choose an appropriate lag length. Inaccurate lag duration can cause model misspecification, leading to biased estimates and incorrect conclusions. However, when dealing with macroeconomic models, there may be simultaneous variables, resulting in endogeneity difficulties that can bias the estimations. Thus, addressing endogeneity may necessitate the incorporation of instrumental variables, complicating both the model and the estimating procedure.

7.3. Future Research

This study concludes that more research into the reasons for property NPLs in Malaysia is required so that the causes can be effectively monitored as part of the country's strategic monetary policy to manage and minimize the amount of property NPLs in the country. Finally, this study will add to Malaysia's sound, resilient, and sustainable real estate financing system.

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