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The Impact of Macroeconomic Factors on Financial Stability: Evidence from OECD Countries

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ABSTRACT

Financial stability is an essential element for economic stability, especially in OECD member countries, which face ongoing macroeconomic challenges. This study aims to analyze the impact of macroeconomic factors on the financial stability of 27 OECD countries during the period 2008–2023. The data were obtained from the World Bank and include annual figures for indicators such as GDP, inflation, interest rates, exchange rates, unemployment, and non-performing loans (NPLs). Financial stability in this paper is measured through the banks' Z-score, while the econometric analyses applied include the Fixed Effects Model (FEM), Random Effects Model (REM), and Panel Corrected Standard Errors (PCSE) - with the latter identified as the most suitable for interpreting the results. The results reveal that Gross Domestic Product (GDP) has a positive effect on financial stability ($\beta = 0.256$); however, this relationship is not statistically significant ($p > 0.05$). The exchange rate demonstrates a positive and statistically significant effect ($\beta = 0.031$, $p < 0.05$), indicating that currency fluctuations are associated with improved financial stability. In contrast, inflation ($\beta = –0.073$, $p < 0.01$) and unemployment ($\beta = –0.242$, $p < 0.05$) exert negative and statistically significant effects, implying that worsening macroeconomic conditions substantially weaken financial stability. The non-performing loans (NPL) ratio also displays a negative effect ($\beta = –0.008$), though this result is not statistically significant ($p = 0.914$, $p > 0.05$). Lastly, the interest rate shows a positive and statistically significant coefficient ($\beta = 0.110$, $p < 0.05$), suggesting a counterintuitive relationship that deviates from theoretical expectations. The findings underscore the critical role of macroeconomic stability in ensuring financial stability. This study contributes to the existing literature by demonstrating that sound and prudent economic policies can substantially enhance financial stability in developed economies, particularly those within the OECD.

1. INTRODUCTION

Financial stability is a fundamental prerequisite for the proper functioning of any economy. The financial crises of recent years have shown that even advanced economies remain vulnerable to instability. Recent developments—marked by rising interest rates, persistent inflation, and escalating geopolitical tensions—have underscored the urgency of examining the key drivers of financial stability. In this context, analyzing the macroeconomic determinants of financial stability is not only timely but also essential for effective monetary policymaking.

Macroeconomic factors such as economic growth, inflation, interest rates, exchange rates, and non-performing loans represent key indicators that directly influence both banking stability and overall financial stability. These indicators reflect the economic situation of a country and exert constant pressure on financial and banking institutions. Continuous changes or deteriorations in these factors pose a risk by increasing uncertainties in financial and economic stability. Therefore, a deeper understanding of the relationship between these factors and financial stability is essential for designing sustainable economic policies.

This study focuses on the member countries of the Organization for Economic Co-operation and Development (OECD), which feature stable and internationally interconnected financial systems. Although these countries are characterized by dynamic and resilient banking sectors, they still face significant macroeconomic challenges that may threaten their financial stability. The selection of the 27 OECD member countries as the study sample aims to provide a comprehensive overview of the impact of macroeconomic factors on banking system stability in developed, stable, and globally connected economies.

However, existing literature has primarily focused on global or broad regional samples, largely overlooking specific and detailed analyses of OECD countries. The OECD member countries represent a unique group characterized by high institutional quality, developed financial markets, and coordinated monetary policies, which distinctly influence macro-financial dynamics. This study aims to fill this gap by providing an in-depth empirical analysis of the impact of

macroeconomic factors on financial stability within these countries, using quarterly data spanning the period 2008–2023. The selection of OECD countries as the study sample is further supported by relevant literature (OECD, 2020; IMF, 2021), which emphasizes the significance of these economies as developed and internationally interconnected systems.

The objective of this paper is to analyze the impact of macroeconomic factors on the financial stability of OECD countries during the period 2008 to 2023. Financial stability is measured using the Z-score, an indicator of banking stability that combines return on assets, average returns, and standard deviation to assess the risk within the banking system. The independent variables considered in the analysis include GDP, inflation, loan interest rates, exchange rate, unemployment rate, and the non-performing loan ratio. Data for these variables were obtained from the World Bank's official website for 27 OECD countries comprising the study sample. The analysis employs panel data techniques, namely the Fixed Effects Model, the Random Effects Model, and the Panel-Corrected Standard Errors (PCSE) method. Following a comparison of results and diagnostic tests, the PCSE method was identified as the most appropriate for interpreting the findings, and model validity tests were conducted accordingly.

The paper begins with a theoretical discussion of the topic, emphasizing the role of macroeconomic factors in financial stability. This theoretical framework highlights the significance of each macroeconomic factor mentioned above in ensuring the stable functioning of the financial system. The study then applies this theoretical foundation in an empirical context by analyzing and interpreting the impact of these factors on OECD countries during the period 2008–2023. This integration of theory and empirical analysis aims to provide a comprehensive understanding of the interaction between macroeconomic factors and financial stability.

2. LITERATURE REVIEW

The financial system is considered the main pillar of an economy's functioning. If the financial system faces risks or simply does not operate properly, the consequences can manifest as problems throughout the entire economy, potentially leading to financial crises and slowing economic growth. For this reason, researchers have consistently devoted special attention to the financial stability of countries [1]. For countries aiming to achieve sustainable economic development, promoting financial stability is one of the main priorities [2].

In most countries, the banking sector is a key component of the financial system and plays a crucial role in sustainable economic development. Therefore, financial stability depends largely on the stability of the banking system, which is often measured using sustainability indicators. Among these, the Bank Z-score is one of the most widely recognized measures for assessing financial stability. This indicator estimates the probability of a bank's bankruptcy and helps identify institutions facing financial difficulties [3]. Additionally, the Bank Z-score is used to evaluate banking efficiency: banks with lower Z-score values tend to be less efficient in managing and allocating their capital. Conversely, higher Z-score values indicate a lower risk of bankruptcy, reflecting a more stable banking system that is more resilient to financial shocks.

Given the great importance of this topic, numerous theoretical and practical studies have been conducted to analyze the relationship between macroeconomic factors and financial stability. According to the literature, some of the main factors that affect financial stability include inflation, interest rates, exchange rates, the non-performing loans ratio, and other economic factors. Although a significant number of studies exist on this topic, most have not focused comprehensively on OECD countries.

Diaconu and Oanea [4] studied the factors influencing the stability of the banking system in Romania during the period 2008–2012, using the Z-score index as an indicator of banking stability. The results indicated that GDP growth had a positive and statistically significant impact on banking system stability, suggesting that a growing economy fosters more favorable conditions for the financial system. Similarly, Abbas et al. [5] examined the relationship between GDP and financial stability in Pakistan during the period 2010–2016. Their findings also revealed a positive and significant relationship, indicating that increases in GDP contribute to improved financial stability within the banking sector.

A study conducted in India by Dhal et al. [6] analyzed the relationship between macroeconomic factors and financial stability. The findings indicate that high levels of inflation can negatively affect financial stability by creating uncertainty and impairing the performance of the banking sector. Similarly, Ullah et al. [7] argue that a stable financial system depends on a stable macroeconomic environment characterized by low and sustainable inflation rates, as large fluctuations can increase the risks faced by financial institutions. Another study examining the impact of inflation on financial stability is that of Bittencourt [8], conducted in Brazil, which found that high inflation rates had adverse effects on the country's financial development during the period 1985–2002. Likewise, Alsamara et al. [9] emphasized that high inflation poses a potential threat to the financial stability of banks, as it undermines their ability to manage assets and liabilities efficiently.

Another macroeconomic factor that significantly influences financial stability—particularly in the banking sector due to the nature of banks' operations—is the interest rate. A study conducted in Indonesia by Hudaya and Firmansyah [10] concluded that interest rates have a positive effect on financial stability. According to their findings, an increase in interest rates can enhance financial stability by boosting banks' profitability and reducing the risks they face. However, Apostolakis and Papadopoulos [11] found a negative correlation between interest rates and financial stability, suggesting that rising interest rates may lead to increased uncertainty within banking institutions. In line with this, Rajha [12] argues that high lending rates impair borrowers' ability to meet their financial obligations, resulting in a higher level of non-performing loans. This, in turn, poses a major threat to financial stability, as it adversely affects the liquidity and overall financial performance of banks.

The exchange rate is another key macroeconomic factor that significantly influences financial stability, particularly within the banking sector. A study conducted in Indonesia by Winpor and Hidayet [13] confirmed a positive relationship between exchange rate stability and financial stability. A stable exchange rate supports effective risk management, preserves bank liquidity, and fosters a predictable environment for international transactions. Conversely, sharp fluctuations in the exchange rate can heighten uncertainty and increase risk exposure for banks holding foreign currency liabilities, thereby undermining their financial soundness.

Another important factor affecting financial stability is the unemployment rate. High levels of unemployment can undermine financial stability by reducing individuals' disposable income, which may, in turn, lead to higher levels of non-performing loans and lower consumer spending. A study by Elia et al. [14], which examined the impact of macroeconomic variables on the stability of the Lebanese banking system during the period 2009–2018, concluded that such macroeconomic indicators play a crucial role in determining financial stability. Among these factors, the unemployment rate has been found to be negatively associated with financial stability, as measured by the Z-score. This is primarily because rising unemployment reduces individuals' income streams, limiting their ability to repay loans. Consequently, the risk of default increases, leading to a higher level of non-performing loans, which in turn undermines the financial stability of banks. An increase in non-performing loans (NPLs) weakens the performance of financial institutions, thereby hindering economic growth. A rising level of NPLs can trigger instability in the banking sector and contribute to poor economic performance. It has been suggested that NPLs are among the primary causes of economic failure, as each non-performing loan represents a potential loss for the financial system [15]. Furthermore, an increase in NPLs may lead to higher interest rates on loans, which can reduce bank profitability and increase borrowing costs [16]. The effects of NPLs extend beyond the banking system, impacting the economy as a whole. If the initial adverse effects of these loans are not properly managed, they may escalate into full-blown financial crises. Additionally, NPL-induced increases in interest rates can reduce credit access, raise operational costs, and contribute to inflationary pressures.

3. METHODOLOGY

To analyze the impact of macroeconomic factors on the financial stability of OECD member countries, data have been collected for a 16-year period, specifically from 2008 to 2023. The data are obtained from the World Bank, an international financial institution that regularly publishes macroeconomic indicators. The dataset includes key financial and macroeconomic variables such as GDP, inflation, interest rates, unemployment rate, exchange rate, and non-performing loans (NPLs), all of which are available on an annual basis for the period 2008–2023.

The collected data are structured as panel data. This format, which combines time series and cross-sectional dimensions, offers a richer dataset by capturing both the variability between countries and the dynamics over time during the study period. To analyze the data, econometric models suitable for panel data were applied, including the Fixed Effects Model (FEM), the Random Effects Model (REM), and the Panel-Corrected Standard Errors (PCSE) Model. Based on the tests and diagnostic analyses conducted, the most appropriate model was selected for interpreting the results of the study.

3.1 Specification of the econometric model

The main role in conducting the research is the selection of appropriate variables for the study. In our study, the selection of variables was based both on their level of significance and the availability of data. Since our data is organized as panel data (covering 27 countries over a 16-year period), the general econometric model is specified as follows:

$$Y_{it} = \alpha + Bx_{it} + \varepsilon_{it}$$

- Y_{it} represents the dependent variable for unit i at time t.
- X_{it} are the independent variables for unit i at time t.
- α is the intercept (constant term).
- β is the regression coefficient for the variables X_{it}
- ε_{it} is the error term (random effect).

Indices:

- i represents the OECD countries (i = 1, 2,...,27)
- t represents the time period (2008 – 2023).

To measure the financial stability of OECD member countries, the Bank Z-score variable was used, obtained from World Bank data. GDP, inflation, interest rate, unemployment rate, and exchange rate were included as independent variables representing key macroeconomic factors. Additionally, due to its significant impact on financial stability, the non-performing loans (NPLs) ratio was incorporated as a control variable in the study.

Considering the study's objective and the characteristics of the panel data, the following econometric model has been employed:

$$Z - score = \alpha + \beta 1 GDPGrowth_{it} + \beta 2 CPI_{it} + \beta 3 InterestRate_{it} + \beta 4 UnempRate_{it} + \beta 5 ExchRateChange_{it} + \beta 6 NPL_{it} + \varepsilon_{it}$$

Dependent variable:

• $Z - score_{it}$: Financial stability for country i in period t.

Independent variables:

• $GDPGrowth_{it}$: Gross Domestic Product for country i in period t (*AnnualGrowth %*)

• *CPI – Inflation (Consumer price index, %)* for country i in period t

• $InterestRate_{it}$: Interest rate for country i in period t.

• $UnemploymentRate_{it}$: Unemployment rate for country i in period t.

• $ExchangeRate_{it}$: Exchange rate for country i in period t.

• NPL_{it}: Non-performing loan (NPL) ratio for country i in period t.

Although lag structures of macroeconomic variables are often incorporated in financial stability models, they were excluded from this study for several reasons. First, the primary objective of this research is to assess the contemporaneous (same-period) effects of macroeconomic factors on financial stability, rather than their lagged effects. Second, the dataset comprises annual observations for 27 OECD countries over 16 years (2008–2023); including multiple lags would significantly reduce the degrees of freedom and could result in biased or inefficient estimates due to the limited time dimension. Third, preliminary diagnostic tests did not reveal significant improvements in explanatory power when lagged variables were introduced. For these reasons, the model specification focuses on contemporaneous relationships, which sufficiently address the study's objectives.

3.2 Description of variables

Based on the study's objective, the variables have been selected, and the econometric model has been developed accordingly (Table 1).

Table 1. Variables included in the study

Independent Variables	Dependent Variable
GDP Growth Rate (%) CPI Inflation (%) Interest Rate (%) Unemployment Rate (%) Exchange Rate Change (%) Non-performing Loans (%)	Banks' Financial Stability Bank Z-score

Source: Author

The dependent variable in this study is the Bank Z-score, a widely used indicator for measuring financial stability. The Bank Z-score estimates the probability of bankruptcy for commercial banks. The formula for calculating this variable is as follows:

$$Bank\ z-score = \frac{ROA + Eq\ /\ TA}{\sigma ROA}$$

According to the formula, this variable combines the Return on Assets (ROA), measured as a percentage (%), the average return, and the standard deviation of returns. The data for this variable were obtained from the World Bank for each OECD country included in the study.

GDP (Annual Growth %) is used to analyze the economic growth and stability of the economies included in the study. It is a key indicator that reflects the total value of goods and services produced over a specific period within a given economy. In this study, the annual real GDP growth rate, expressed as a percentage (%), is used to measure the economic performance of the countries. According to previous studies, the relationship between GDP growth and financial stability is positive, as GDP growth signals macroeconomic stability and promotes financial stability [2, 4, 17, 18]. The data for GDP were obtained from the World Bank website.

Inflation (measured by the Consumer Price Index, %) is another important macroeconomic variable that affects financial stability because it influences the financial sector's ability to allocate resources efficiently, thereby negatively impacting the development of the banking sector. Consequently, the relationship between inflation and banking stability is generally negative in most studies [9, 19]. High levels of inflation adversely affect banking performance [20]. Data for this macroeconomic variable were obtained from the World Bank website. In this study, the average annual inflation rate, expressed as a percentage (%), based on changes in the Consumer Price Index (CPI), is used.

The interest rate is a variable directly linked to economic conditions, as decisions regarding consumption, savings, and investment closely depend on it. Rising interest rates make it harder for borrowers to repay loans, which directly impacts the performance of the banking system. Numerous studies have found a negative relationship between interest rates and financial stability [12]. In this study, the average annual interest rate on bank loans, expressed as a percentage (%), is used to represent the cost of borrowing and its effect on economic activity. The data on interest rates for bank loans were sourced from the World Bank.

The annual unemployment rate, measured as a percentage (%), indicates the proportion of the labor force that is unemployed. The data were obtained from the World Bank. The unemployment rate has a negative relationship with financial stability. Unemployment reduces the income of individuals and families, resulting in difficulties meeting financial obligations to banks. Non-payment of loans by individuals and households increases non-performing loans and negatively affects bank liquidity, contributing to the destabilization of the banking system [21]. The source of data for this variable used in the study is the World Bank website.

The exchange rate, **(***Annual Change %*) if it fluctuates constantly, can become a significant source of risk for banking institutions. Currency volatility negatively impacts banks' returns and exposes them to financial risks that affect their operations [22]. These fluctuations can create uncertainty in long-term planning, increase risk management costs, and limit banks' ability to support lending and economic development in a sustainable manner. As such, many studies have found a negative relationship between exchange rate and financial stability [22, 23]. In our study, we used the change in the exchange rate to represent the impact of this variable, with data obtained from the World Bank. In our study, the impact of this variable is measured through the year-on-year change in the exchange rate, calculated as follows:

$$\text{Change (\%)} = [(\text{ExchangeRate(t)} - \text{ExchangeRate(t-1)}) / \text{ExchangeRate(t-1)}] \times 100$$

A positive value indicates a depreciation of the domestic currency (a decrease in its value against the USD), while a negative value indicates an appreciation. The calculated value is expressed as a percentage (%). The data were obtained from the official website of the World Bank.

The ratio of non-performing loans (NPLs) to total loans is measured as a percentage (%) and indicates the quality of banks' loan portfolios. A higher percentage signifies greater risk to the banking system. Non-performing loans are one of the main causes of economic failure, with each non-performing loan considered a sign of loss for the financial system [15]. Additionally, non-performing loans contribute to higher interest rates on bank loans, which in turn reduce banks' profits and lead to increased costs and inflation [14]. The higher the NPL ratio, the greater the risk of bankruptcy for banks. Numerous studies have examined the relationship between NPLs and financial stability, with the vast majority finding a negative association between this variable and banks' financial stability [16, 24]. Data for this variable, as well as for all others, were obtained from the World Bank for all OECD countries.

4. ANALYSIS AND DISCUSSIONS

The paper examines the impact of several macroeconomic factors—namely Gross Domestic Product (GDP), inflation, interest rates, unemployment rate, and exchange rate—on the financial stability of the banking sector, measured using the Z-Score indicator. Additionally, the analysis includes the non-performing loan ratio, which is considered one of the key factors affecting banks' financial stability.

4.1 Descriptive statistics

The variables included in the study were analyzed over a 16-year period, from 2008 to 2023. The study sample comprised 27 OECD countries, resulting in a total of 432 observations.

Table 2 below presents descriptive statistics for the study variables, including the mean, minimum, maximum, and standard deviation values.

Table 2. Descriptive statistics for study variables

Variables	N	Mean	Min.	Max.	Std. Dev.
Bank Z-Score (%)	432	16.07407	-.3	57.4	9.890114
GDP Growth Rate (%)	432	1.865486	-10.94	24.62	3.697184
CPI Inflation (%)	432	3.129097	-4.45	72.31	5.206415
Interest Rate (%)	432	4.475093	-7.06	25.5	3.848697
Exchange Rate Change (%)	432	2.333641	-96.62	87.00	10.47194
Unemployment Rate (%)	432	7.633981	2.02	27.69	4.384327
Non-performing Loans (%)	432	3.908032	.1	46	5.548162

Source: Author's calculations

In this study, financial stability is measured through the Bank Z-score, which recorded an average value of 16.07 during the analyzed period. The lowest value observed was -0.3, while the maximum reached 57.4.

Economic growth, represented by GDP, averaged 1.87% during the study period. The GDP of the studied countries fluctuated between a minimum of -10.84% and a maximum of 24.62%.

Inflation averaged 3.13%, with a minimum value of -4.45% and a maximum value reaching as high as 72.31%.

The annual change in the exchange rate averaged 2.33%, with fluctuations ranging from a minimum decrease of -96.62% to a maximum increase of 87%.

The unemployment rate averaged 7.63%, ranging from a minimum of 2.02% to a maximum of 27.69%.

Non-performing loans averaged 3.90%, with values ranging from a minimum of 0.1% to a maximum of 46%.

4.2 Interpretation of the results of the econometric model

To assess the impact of macroeconomic variables on the financial stability of OECD member countries, this study used panel data and applied several econometric models, namely the Fixed Effects Model (FEM), the Random Effects Model (REM) and the Panel Corrected Standard Errors Model (PCSE). Initially, the FEM and REM models were implemented, the results of which are presented in Table 3. After performing diagnostic tests, the presence of autocorrelation and heteroscedasticity was identified, therefore, robust versions of these models were used in order to address these issues and increase the reliability of the results.

The following table (Table 3) presents the results of diagnostic tests, which reveal the presence of autocorrelation and heteroskedasticity in the model. This indicates that the model residuals are not independent and exhibit unstable variance, potentially compromising the accuracy and reliability of econometric estimates. Therefore, it is necessary to address these issues by applying more robust analytical methods.

Table 3. Diagnostic test results

Test	Test Statistics	P-Value	Conclusion
Wooldridge (Autocorrelation)	20.598	0.0001	There is autocorrelation.
Breusch and Pagan (Heteroskedasticity)	2257.21	0.0000	There is heteroscedasticity.
Hausman (FEM vs. REM)	7.60	0.2687	REM is more suitable.

Source: Author's calculations

The data obtained from these improved model versions, along with the comparison between them, are presented in the Table 4.

According to the results of the Fixed Effects Model, the R^2 value is 0.0248, indicating a low explanatory power of the independent variables on the dependent variable, i.e., a limited ability of the model to explain changes in financial stability. Although the R^2 values (~0.03) from the FEM and REM models are low, this may result from omitted relevant variables, measurement errors, or the indirect effects of macroeconomic factors on financial stability.

Despite the limited explanatory power, the analysis focuses on the statistical significance of the coefficients to capture meaningful relationships. However, the analysis of the variable coefficients provides valuable insights. Gross Domestic Product (GDP) shows a positive relationship with financial stability, consistent with existing literature, suggesting that economic growth strengthens the financial sector. Conversely, inflation, interest rates, and unemployment exhibit a negative impact, reflecting the destabilizing effects these variables may have on the banking system. Meanwhile, the exchange rate and the non-performing loan ratio are statistically insignificant in this model. The Random Effects Models confirm similar general directions of influence but differ in the statistical significance of some variables — specifically, the exchange rate shows a significant positive impact, while the negative effect of interest rates is not statistically significant. These differences emphasize the importance of careful model selection when interpreting the results.

Table 4. Summary of results from FEM and REM methods

	FEM	FEM - Robust	REM	REM - Robust
GDP Growth Rate (%)	.186781***	.186781***	.186391***	.186391****
	(0.000)	(0.001)	(0.000)	(0.000)
CPI Inflation (%)	-.117534***	-.117534***	-.118428***	-.118428***
	(0.004)	(0.000)	(0.004)	(0.000)
Interest Rate (%)	-.0106288	-.010628	-.020767	-.020767
	(0.888)	(0.864)	(0.782)	(0.734)
Exchange Rate Change (%)	-.297074***	.297074**	-.298555***	-.298555**
	(0.000)	(0.021)	(0.000)	(0.013)
Unemployment Rate (%)	.033484**	.033484***	.03298*	.03298***
	(0.049)	(0.000)	(0.052)	(0.000)
Non-performing Loans (%)	.093717*	.09371*	.087526*	.087526*
	(0.072)	(0.077)	(0.091)	(0.099)
R^2	**0.0248**	**0.0248**	**0.0304**	**0.0304**

Note: *p<0.1; **p<0.05; ***p<0.01. Source: Author's calculations in Stata program

Table 5. PCSE model results

Variable	Coef.	Std. Err	P-Value	Relationship with Z-score
GDP Growth Rate (%)	.025658	.033945	0.450	Positive but insignificant
CPI Inflation (%)	-.078133**	.0358299	0.029	***Negative and significant***
Interest Rate (%)	-.110021**	.0505961	0.030	***Negative and significant***
Exchange Rate Change (%)	-.242635***	.0883844	0.006	***Negative and significant***
Unemployment Rate (%)	.030108**	.0122395	0.014	***Positive and significant***
Non-performing Loans (%)	-.008329	.0773512	0.914	Negative but insignificant

Note: *p<0.1; **p<0.05; ***p<0.01.
Source: Author's calculations in Stata program

In both the Fixed Effects and Random Effects models, the low R^2 values did not indicate a strong fit for the econometric specification. Moreover, diagnostic tests revealed the presence of heteroskedasticity across panels and first-order autocorrelation within panels. While the Random Effects Model (REM) assumes homoskedasticity and no autocorrelation, the Panel-Corrected Standard Errors (PCSE) approach is specifically designed to address such violations by producing unbiased coefficient estimates and robust standard errors. PCSE is particularly well-suited for panels where the cross-sectional dimension (N) exceeds the time dimension (T), as is the case with our dataset (27 countries over 16 years). By correcting for both heteroskedasticity and autocorrelation, PCSE improves the efficiency and reliability of the estimates, thereby enabling a clearer and more accurate interpretation of the relationship between macroeconomic variables and financial stability. The results obtained using PCSE are presented separately in Table 5, and the study's conclusions are based on these results due to their greater methodological robustness.

Based on the results of this method, the econometric model presented at the beginning looks as follows:

$$Z - score = \alpha + .025658GDPGrowth_{it} - 0781337CPI_{it} - .1100211InterestRate_{it} - .2426356ExchRateChange_{it} + .0301087UnempRate_{it} - .0083296NPL_{it} + \varepsilon_{it}$$

The results show a positive relationship between GDP and financial stability, indicating that an increase in GDP tends to improve financial stability. However, according to our study, this relationship is not statistically significant, meaning that GDP cannot be considered a key variable in our analysis.

The results of the analysis show a significant negative relationship between inflation and financial stability. This means that rising inflation is associated with a deterioration in financial stability, implying that high inflation levels can destabilize the banking system. This can be explained by the fact that increasing inflation raises the cost of financing, leading to higher loan defaults and harming the financial performance of banks. These findings are consistent with the majority of studies conducted on this topic [7, 9, 19, 20, 25].

Interest rates also show a negative relationship with financial stability, meaning that an increase in interest rates is associated with a decrease in financial stability. Higher interest rates impose a greater financial burden on borrowers, thereby increasing the likelihood of loan defaults. This negatively impacts the financial performance of banks by increasing the volume of non-performing loans and contributing to the destabilization of the banking system. This finding, which highlights a negative relationship between interest rates and financial stability, is widely supported in the existing literature and by most studies in the field [11, 12]. However, some studies have found this relationship to be positive [10].

Another macroeconomic variable, the unemployment rate, has also shown a negative relationship with financial stability, which is expected since unemployment reduces individuals' ability to repay loans. This situation adversely affects the financial performance of banks and contributes to the destabilization of the banking system [21].

The exchange rate has shown a positive relationship with the financial stability of banks, indicating that favorable changes in the exchange rate help banks better manage currency risks. This reduces the costs associated with volatility and creates a more stable financial environment, thereby increasing investor and depositor confidence, which in turn enhances banks' financial performance. This positive relationship is supported by a growing body of literature [13].

Non-performing loans, as one of the most important specific factors affecting the financial stability of commercial banks, have resulted in our study to have a negative relationship with financial stability, although this relationship is not statistically significant. This result may be related to the characteristics of the study sample, as in the countries included, the ratio of non-performing loans has generally been low, which suggests that commercial banks have adopted effective credit risk management policies. However, such a negative relationship between non-performing loans and bank financial stability has broad support in the existing literature [14-16].

After interpreting the analysis results, the model's suitability is evaluated through diagnostic tests.

To assess the overall goodness of fit of the model, a joint significance test (Wald test) was conducted. This test evaluates whether a set of coefficients are equal to zero. The hypotheses tested are as follows:

Null hypothesis (H_0): All coefficients of the variables selected in the study are equal to zero, meaning they have no significant impact on the model.

Alternative hypothesis (H_1): At least one of the coefficients is different from zero, indicating a significant impact on the model.

According to the table below, which presents the test results, the $Chi^2(6)$ value of 130.59 demonstrates strong evidence to reject the null hypothesis. Furthermore, the p-value less than 0.05 confirms that the null hypothesis can be rejected with a high level of confidence.

Table 6. Model fit test

$Chi^2(6) = 130.59$
$Prob > chi = 0.0000$

Source: Author's calculations in Stata program

The results of this test, presented in Table 6, show that the variables collectively have a significant impact on the dependent variable. According to the results shown in Table 5, four out of the six study variables have a statistically significant impact on the model. Therefore, the model is valid

and appropriate for analyzing the impact of macroeconomic variables on the financial stability of OECD countries.

After conducting the Wald test, which confirmed that the coefficients of the independent variables were significant and different from zero, a multicollinearity test among the independent variables was also performed. This test was carried out using Variance Inflation Factors (VIF) to ensure that there was no high correlation between the independent variables that could compromise the accuracy of the model.

The results of this test, presented in Table 7, indicate that there is no presence of multicollinearity among the independent variables. All VIF values are below 10, which means that each independent variable can contribute independently to explaining the dependent variable.

Table 7. Multicollinearity test

Variable	VIF	1/VIF
Unemployment Rate	1.59	0.627909
Non-performing Loans	1.59	0.629199
CPI Inflation	1.51	0.660182
Interest Rate	1.27	0.789664
Exchange Rate Change	1.26	0.795198
GDP Growth Rate	1.06	0.943014
Mean VIF	1.38	

Source: Author's calculations in Stata program

The summary of the Wald test and multicollinearity test results confirms that the PCSE method is appropriate for our study's data, ensuring accurate and reliable modeling, with analysis results that are valid and supported by the literature.

5. CONCLUSION

The paper aims to analyze the impact of macroeconomic factors on the financial stability of OECD member countries during the period 2008–2023. The empirical analysis is conducted using panel data and econometric methods such as FEM, REM, and PCSE. Financial stability is measured through the Z-score of commercial banks, which serves both as an indicator of financial soundness and as a proxy for the risk of bank insolvency. Regarding macroeconomic factors, the analysis includes GDP, inflation, interest rate, exchange rate, unemployment rate, and non-performing loans.

The empirical results show that GDP has a positive but statistically insignificant relationship with financial stability. Although, from a theoretical standpoint, GDP is expected to support financial sustainability, in this study, the variable did not prove to be statistically significant. This may be attributed to the specific characteristics of the sample, the time period under analysis, and the influence of intervening factors that may have weakened its impact. In contrast, the exchange rate demonstrates a positive and statistically significant relationship with financial stability, reinforcing its role in maintaining financial balance and enhancing stability in foreign exchange markets. This, in turn, strengthens the financial position of commercial banks that are exposed to foreign currency fluctuations.

Other macroeconomic variables—such as inflation, interest rates, unemployment rates, and non-performing loans—were found to have a negative relationship with financial stability, suggesting that the deterioration of these factors increases financial risk and undermines the stability of commercial banks. Among these variables, only non-performing loans did not show a statistically significant relationship.

An increase in inflation negatively affects purchasing power and creates uncertainty within the banking sector. High interest rates can raise the cost of borrowing and increase the financial burden on both businesses and individuals, which may lead to a rise in non-performing loans and pose a threat to the banking system. Unemployment was also found to be negatively associated with financial stability, as it reduces individuals' ability to repay loans, thereby impacting the performance of commercial banks.

This study offers a valuable foundation for further research in different geographical contexts, particularly in countries with varying levels of economic development. Such studies would enable a more comprehensive approach and allow for more meaningful cross-country comparisons regarding the impact of macroeconomic factors on financial stability. In this context, future research could be extended by incorporating additional variables and by focusing on countries at different stages of development.

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