

# **Study of the Impact of Macroeconomic Factors on the Capital Adequacy Ratio**

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## **Abstract**

The main aim is to find the influence of the three macroeconomic factors, including inflation, interest, broad money, and real growth rate, on the capital adequacy of the countries. Firstly, the Hausman test found the best fit analysis. The data was collected from Fred's database. A comparative study was conducted, and it found that the developed nations' capital adequacy level significantly influences macroeconomic factors. The overall data analysis of all the countries found that interest rates, inflation, broad money, and real growth determine the capital adequacy ratio. This study examines the influence of four macroeconomic factors-inflation, interest rate, broad money, and real growth rate investigates the influence of four macroeconomic factor -inflation, interest rate, broad money, and real growth rate -on the capital adequacy ratio (CAR) of six countries from 1998 to 2019. Using panel data regression with fixed effects selected via the Hausman test, the analysis compares developed nations (United States, United Kingdom, European Union) and emerging nations (China, Malaysia, Indonesia). The findings reveal that macroeconomic factors significantly determine the capital adequacy ratio in the full sample. However, a comparative analysis shows that developed nations' CAR is significantly influenced by inflation, interest rate, and broad money, while emerging nations' CAR is only affected by the real growth rate. These results highlight the differing sensitivity of capital regulation to macroeconomic conditions across development stages

## **Keywords**

**Capital Adequacy Ratio, Macroeconomic Factors, Panel Data, Developed Economies, Emerging Economie.**

## **1. Introduction**

Capital adequacy level is an important determinant of the banking sector of an economy (Vixes, X. ;2008). It states the resilience of the banks against the risk because it acts as a shield that protects against unpredictable fluctuations and bad investments. Then, Capital adequacy is the capital-to-risk-weighted-asset ratio that analyses a bank's financial strength using asset and capital information. The capital adequacy ratio is one of the main indicators used to measure the stability of commercial banks, thereby protecting depositors' rights and promoting stability and efficiency in the financial system. In addition, capital regulation is one of the important steps toward preventing banks from such risk (Slovik, P. 2012). Therefore, regulators and policymakers focus on maintaining a certain capital ratio (CR) level to minimise solvency and liquidation risks (Chalermchatvichien, et al., 2014). It will research the relationship between macroeconomic factors and difference counties that choose interest rates, inflation, broad money, and real. This study is mainly intended to focus on finding the external determinants of the capital regulation of the countries.

The capital adequacy level is a key determinant of a banking sector's resilience. It acts as a shield against unpredictable fluctuations and bad investments by measuring a bank's capital

relative to its risk-weighted assets. A higher capital adequacy ratio (CAR) protects depositors' rights and promotes financial system stability. Regulators and policymakers therefore focus on maintaining a minimum CAR to mitigate solvency and liquidity risks (Chalermchatvichien et al., 2014).

While existing literature has explored the relationship between macroeconomic variables and bank capital buffers, most studies focus on single countries or regions, and few have systematically compared developed and emerging economies using long-span panel data. Moreover, prior research rarely employs a unified cross-country, multi-decade framework to assess how inflation, interest rates, broad money, and real growth collectively affect CAR across different development stages.

This study addresses that gap by investigating the following research question: To what extent do inflation, interest rate, broad money, and real growth rate influence the capital adequacy ratio, and how do these influences differ between developed and emerging nations? By answering this question, the study aims to provide evidence-based insights for policymakers in designing macroprudential regulations.

## **2. Literature Review**

### **2.1. Capital Regulation and Macroeconomic Factors**

Kanngiesser, et al., (2019) studied the relationship between the macroeconomic variable and the capital buffers. A sample of four countries in the European Union includes Spain, Germany, Italy, and France. It shows that GDP growth has a significant influence on the capital buffer requirement of the banks. In another study by Syed and Aidyngul (2020), the impact of the unemployment rate, exchange rate, and GDP on the capital adequacy ratio is shown. It found that the capital adequacy ratio has a significant influence on macroeconomic variables in the findings. In addition, Eickmerier, et al., (2019) found the influence of the macroeconomic factors on the capital requirement of the banks. It found that the negative influence of the macroeconomic factors in the long run on the capital regulations of the banks. Therefore, the higher the level of growth, the lower the requirement for the capital adequacy ratio in the economy (Yüksel and Ozsari, 2017).

Kanngiesser et al. (2019) studied the relationship between macroeconomic variables and capital buffers using a sample of four European Union countries (Spain, Germany, Italy, France) and found that GDP growth significantly influences capital buffer requirements. Similarly, Syed and Aidyngul (2020) reported that unemployment rate, exchange rate, and GDP significantly affect the CAR. Eickmeier et al. (2019) found a negative long-run influence of macroeconomic factors on bank capital regulations, suggesting that higher growth reduces the need for high capital adequacy (Yüksel and Ozsari, 2017).

For emerging nations, Anshu and Gakher (2019) investigated Indian banks using Johansen's cointegration and Granger causality tests, concluding that only GDP and CPI negatively influence CAR, while other variables showed no significant effect. Broad money, which reflects money circulating in the economy, has an inverse relationship with CAR, as it affects the supply and demand for loanable funds.

### **2.2. Capital Regulation and Regulation of Emerging Nations**

Capital adequacy ensures that there is enough liquidity in the banks so that the losses are absorbed before the banks become insolvent. Anshu and Gakher (2019) investigated the macroeconomic factors' influence on the CAR, taking a sample of Indian Banks. Johansen's cointegration and Granger causality test were used to analyse the results. It concluded that only GDP and CPI negatively influence the CAR. Meanwhile, other variables have found no significant influence on the capital adequacy ratio. Then, Broad money mainly refers to the money

circulating in the economy. There is an inverse relationship between the broad money and the banks' CAR. It further states that money supply impacts the supply and demand for the loanable funds in the banks, which is the primary driver of influencing the banks' capital adequacy ratio (Inoue, H. 2010).

### 2.3. Inflation Rate and Capital Adequacy Level

The inflation rate was found to have a positive influence on the CAR. Central banks in many advanced economies target low inflation to reduce economic volatility (Bagis; 2016). Since inflation is high, there is a need to have less lending from banks. Therefore, they can have a lower risk and need to have a low level of capital with them (Cecchetti and Kohler 2012). On the other hand, when the inflation rate is low, there is a need for high lending by the banks; therefore, the risk rises, and therefore it is required to hold a higher level of CAR (Badalashvili, 2016). The GDP growth rate will slow, and the economic recovery cycle will be long. From William R. White's observation, it is not enough to delve into the case of financial price stability (White, E.R.; 2008). Therefore, banks' stability is closely linked to macroeconomic factors.

### 2.4. Interest Rate and Capital Adequacy Level

Various researchers have studied the relationship between interest rate and capital adequacy level. Cecchetti and Kohlerb (2014) stated that the interest rate policy is the tool for bringing stability to the economy, wherever needed to stabilise inflation, growth, etc. For instance, the interest rate stabilises the economy, but the capital adequacy ratio stabilises the financial system at the financial system level (Eichengreen, B. 2009). Thus, it moves in the same direction and has a positive relationship. This study argued that the interest and capital adequacy rates are substitutes at the macroeconomic level.

### 2.5. Research Gap

Previous studies have examined macroeconomic influences on CAR, but few have simultaneously employed cross-country and long-span panel data to conduct a unified analysis of both developed and emerging economies. This study fills that gap by analysing six economies (USA, UK, EU, China, Malaysia, Indonesia) over 22 years (1998–2019), using four macroeconomic variables. The following hypotheses are tested:

H<sub>0</sub> (Developed economies): Macroeconomic factors do not impact developed countries' CAR.

H<sub>1</sub> (Emerging economies): Macroeconomic factors do not impact emerging countries' CAR.

## 3. Methodology

### 3.1. Sample Selection and Data Analysis

**Table 1.** Data source

Variable	Countries Data
Capital Adequacy Ratio	FRED Database
Inflation Rate	FRED Database
Interest Rate	FRED Database
Real Growth Rate	FRED Database
Broad Money	FRED Database

The study covers six countries classified by the United Nations (2014): developed – European Union (aggregated), United States, United Kingdom; emerging – China, Malaysia, Indonesia (United Nation.;2014). The sample period runs from 1998 to 2019 with annual data, yielding 154 total observations (66 for developed, 88 for emerging). The dependent variable is the aggregate Capital Adequacy Ratio (CAR). Independent variables: inflation rate (%), central bank

interest rate (%), real growth rate (%), and broad money (logged). All data were sourced from the FRED Database.

The study conducts the regression analysis on the panel data using STATA software. It conducts the descriptive summary to understand the nature of the data and the presence of any extreme outliers in this data. The study collects the data from the FRED database, while for some nations, Thomson Reuters was used to collect macroeconomic variables. FRED databases provide information related to macroeconomic data, while Thomson Reuters provides macroeconomic and company-specific data. It will use statistical measures like descriptive summary, correlation analysis, and regression analysis to test the hypothesis. In the descriptive summary, the research will use the average, the number of observations, the standard deviation, the minimum and the maximum to understand the nature of the overall data (Eickmeier and Prieto 2018).

For The statistical methodology is to conduct three regressions by dividing the data into three sub-samples: a developed nation, a developing nation, and an entire sample (combined developed and developing). Firstly, as per the purpose of the research, the comparative study will be conducted where the developed nation and developing nation data will be divided, and two regressions will be conducted, one on a developed nation and another on a developing nation. However, before conducting the comparative study, the initial step is to run a regression on the entire sample to understand how globally the capital adequacy ratio gets impacted by this macroeconomic variable. Meanwhile, the Hausman test will be conducted to determine which type of regression will suit the research, whether fixed or random variable regression.

### **3.2. Selection of Pooled OLS and FE/RE Model**

The OLS is the common method for estimating the linear regression coefficients that can state the relationship between independent and dependent variables. The serial correlation of the error term is used for the RE-model to select a model. Generally, five conditions must be satisfied for selecting the linear regression model. With the aid of two of them, we can decide between Pooled OLS and FE/RE. These assumptions are as follows: 1) Linearity in parameters, 2) Exogeneity or zero conditional means, 3) Homoscedasticity, 4) Non-autocorrelation, and 5) No perfect multicollinearity.

FE or RE would be preferable if one or both of assumptions (2) or (3) (or both) are false. The formal test used for choosing the preferred model between the pooled OLS and the random effects model is the BP-LM test. The test has the following null and alternative hypotheses.

$H_0$ : No random effect (homoscedasticity)

$H_1$ : Pools in appropriate

The findings of the test are anticipated based on the p-value of the test statistics, where if the p-value is less than the confidence interval, which is 0.05, then we will reject the null hypothesis, and it will indicate there is no random effect. Whereas, if the p-value is higher than the significance level of 0.05, then we will fail to reject the null hypothesis. This shows that pooled OLS regression will be preferred.

### **3.3. Selection of Fixed Or Random Effect Model Regression**

The Hausman test will be conducted in order to determine which regression will be followed. The Hausman model test results will be conducted at a confidence interval of 5%, indicating if the p-value is lower than the significance level, then the null hypothesis will be rejected, whereas if the p-value is higher than the 0.05 level, then the model fails to reject the null hypothesis.

H<sub>0</sub>: Random effect model will be preferred

H<sub>1</sub>: Fixed effect model will be preferred

## 4. Data Analysis

This chapter provides the findings gathered from the data analysis process by reporting the results according to the research methodology. The study aimed to find the influence of the macroeconomic variables on the capital adequacy ratio for developed and advanced countries. The data collection and presentation have been discussed in this section. Then, the findings were reported in different departments, from descriptive summary to regression analysis.

The data is collected in panel data, the longitudinal data in which cross-sectional observations across different times are collected. The two separate sheets had undertaken to present the data for the developed and emerging nations (appendix). For the developed nations, the countries selected were the United States, the European Union, and the United Kingdom, whereas the chosen emerging nations include China, Malaysia, and Indonesia. Since in this data set, the cross-sectional data of the six countries across the year 1998-2019 had been collected, panel data analysis was used to analyse the results.

The test has the following null and alternative hypotheses:

H<sub>0</sub>(developed economies): macroeconomic factor not impact developed countries CAR → reject

H<sub>1</sub>(emerging economies): macroeconomic factor not impact emerging countries CAR → only reject real growth rate

### 4.1. Descriptive Summary

**Table 2.** Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
CAR	154	.1482753	.0338363	.025	.233123
INFLATIONR~E	154	.0362886	.0544354	-.0140267	.6063047
INTERESTRATE	154	.047636	.0419481	0	.3844
BROADMONEY	154	30.02887	2.630588	25.54956	36.24678
REALGROWTH~E	154	.0450076	.0527735	-.1905809	.2117057

The table above shows the descriptive summary of the whole sample period, which states that the total observation undertaken in the analysis is 154, which includes six countries' data from 1998 to 2021. The first variable shows that the sample Average Capital Adequacy Ratio is 14.82%, with the highest of 23.33% and a minimum of 2.5% for all six nations. The mean value exceeding the median value of 14.82% > 13.55% represents the positively skewed distribution. The following variable is the inflation rate, with a mean value of 3.628%, representing the average inflation observed from 1998 to 2021. The highest inflation was 6.06%, and the lowest was -1.40%, representing deflation. Further, under the macroeconomic variables, the highest deviation was reported by the broad money category due to different huge volatility during the period of recessions as the overall period has multiple recession periods, and due to globalization, the supply of money has increased substantially. However, the real growth rate shown with the lowest standard deviation remains constant apart from some recessionary periods.

In addition, the average interest rate is 0.046, whereas the lowest value is 0, and the maximum value of the interest rate is 38.44%. The interest rate for the developed countries has been lower than that of the developing countries. The interest rate has been negative in the year of

crises, including the year of the global financial crisis. However, the impact of the financial crisis has been lower in emerging countries. In contrast, a larger impact has been observed on the inflation and interest rates of the developed countries. The last variable is the broad money, whose average value is 30.02, the maximum value is 36.24, and the minimum value is 25.54. The real growth rate has shown an average growth rate of 4.5%, whereas the maximum growth has been reported at 21.1% in a year. The growth rate has been higher in developed nations compared to emerging nations. The lowest real growth is estimated at -0.1905, which represents negative growth. The negative growth rate has been mainly associated with the year of crises that included the global financial crisis in 2008-2009 and the COVID-19 pandemic in 2019.

Furthermore, the broad money category under macroeconomic variables reported the largest bias. This is because the entire period has multiple recessionary periods, with different large volatilities during recessions. At the same time, under the influence of globalization, the money supply has increased substantially. However, the real growth rate was shown with the lowest standard deviation, which remains constant apart from some recessionary periods.

## 4.2. Correlation Analysis

**Table 3.** Correlation Analysis

	CAR	INFLATIONRATE	INTERESTRATE	BROADMONEY	REALGROWTHRATE
CAR	1.0000				
INFLATIONRATE	0.2674	1.0000			
INTERESTRATE	0.0862	0.8057	1.0000		
BROADMONEY	0.4130	0.3865	0.4026	1.0000	
REALGROWTHRATE	-0.1935	-0.1874	-0.0617	0.1451	1.0000

The correlation analysis was conducted to find the relationship between the different variables. The correlation finding shows that interest rate and inflation have the highest correlation, with a coefficient value of 0.8057. This strong relationship is because central banks aim to control inflation within a range by using an interest rate mechanism. Therefore, they are more aligned with each other than any other variables.

On the other hand, a negative correlation between the real growth rate and the capital adequacy ratio, with a coefficient value of -0.1935. This data indicates that the capital adequacy level is low. It is due to the real growth rate being higher. Then, the rise in the growth rate leads to an increase in loans, which increases the risk for financial companies. As we saw before the global financial crisis and now during the COVID-19 crisis, the banks expand their risk exponentially during the growth phase, eventually leading to a recession if not managed properly.

The correlation analysis has only stated the relationship between the variables and has not stated the cause-and-effect relationship. Broad money has shown the highest correlation with the capital adequacy ratio, with a coefficient value of 0.4130. The data shows that broad money has the highest relation with CAR. When broad money in the economy is higher, the CAR is higher. The inflation rate has also shown a positive relationship with the Capital adequacy ratio with a coefficient value of 0.2674. It shows that the inflation rises, and the CAR rises due to the uncertainty in the economy, rising with the high inflation. The banks hold a higher amount of capital to deal with uncertainties. Lastly, the interest rate has also shown a positive relationship with the capital adequacy ratio, with the coefficient value of 0.0862, representing a weak but positive relationship between the two variables. The data shows that as the interest rate rises, the capital adequacy level of the banks also rises.

### 4.3. Regression Analysis

#### 4.3.1. Impact of Macroeconomic Factors on Capital Adequacy Ratio of All Economies

The first regression model intends to find the macroeconomic factors' influence on the capital adequacy ratio of all the countries (advanced and emerging). The results of the same are stated below:

Hausman test results:

Firstly, the Hausman test was conducted to find the difference between the random and the fixed effect model. Using this test, which one between the random and fixed is selected efficiently under the null hypothesis that the random effect is better can be found.

**Table 4.** Hausman Test (All countries' data)

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
INFLATIONR-E	.1874074	.2062348	-.0188274	.0282424
INTERESTRATE	-.4246	-.3918414	-.0327586	.0956814
BROADMONEY	.0080459	.0068387	.0012072	.0044416
REALGROWTH-E	-.1637214	-.1498912	-.0138302	.0206205

b = consistent under Ho and Ha; obtained from xtreg  
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V\_b-V\_B)^(-1)](b-B)  
= 44.90  
Prob>chi2 = 0.0000

Based on the results of the Hausman test, the p-value is 0.000, which is less than the significance level of 0.05, which states that the null hypothesis has been rejected. Therefore, the random effect model is not efficient, and the fixed effect model is utilised in the analysis.

Fixed effect results

**Table 5.** Regression analysis (All countries data)

Fixed-effects (within) regression		Number of obs =	154		
Group variable: id		Number of groups =	7		
R-sq:		Obs per group:			
within =	0.3153	min =	22		
between =	0.2689	avg =	22.0		
overall =	0.2833	max =	22		
corr(u_i, Xb) =	-0.1732	F(4,143) =	16.46		
		Prob > F =	0.0000		
CAR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
INFLATIONRATE	.1874074	.0581185	3.22	0.002	.072525  .3022898
INTERESTRATE	-.4246	.1090402	-3.89	0.000	-.640139  -.2090611
BROADMONEY	.0080459	.003896	2.07	0.041	.0003448  .0157471
REALGROWTHRATE	-.1637214	.0378608	-4.32	0.000	-.2385605  -.0888822
_cons	-.0725401	.1201856	-0.60	0.547	-.31011  .1650299
sigma_u	.02359231				
sigma_e	.01948166				
rho	.59457098	(fraction of variance due to u_i)			
F test that all u_i=0: F(6, 143) =		29.83			Prob > F = 0.0000

The regression analysis results showed that all macroeconomic variables show significant results. Interest rate and natural growth rate show a significant negative relation, while inflation and broad money show a significant positive association.

The result is evident in the substantial depth of the regression, as the adjusted R-squared is around 31.53%, indicating 31.53% of the variables are explained by the independent variable. The inflation rate has shown a positive and significant influence on the capital adequacy ratio

with a coefficient value of 0.187 and a p-value of 0.002, which is less than 0.05. Similarly, the impact of broad money on the capital adequacy ratio is positive and significant, with a coefficient value of 0.0080 representing a weak relationship. However, the p-value of 0.000 is less than the significance level. It shows that the relationship between broad money and the capital adequacy ratio is significant and positive. Meanwhile, inflation increases the economy's uncertainty, which influences the banks to hold more of their capital to deal with the uncertain environment. Therefore, the inflation rate's positive influence on the capital adequacy ratio was found.

In addition, a negative relationship between the capital adequacy ratio and interest rate, with the coefficient value of -0.4246, which represents a strong relationship between the variables. The p-value is 0.000, showing a negative and significant relationship. The rising interest rate decreases the demand for loans and advances as borrowers are less willing to take loans at high-interest rates. On the other hand, the rising interest rate increases the deposits in the banks. Therefore, there is a lower risk for the banks to have liquidity crises or situations of bank runs. There is less capital adequacy required in the banks.

Lastly, real growth negatively impacts the capital adequacy ratio with a coefficient value of -0.163. The p-value is 0.000, which is less than the significance level of 0.05 and therefore states a negative and significant relationship between the capital adequacy ratio and natural growth. The reason behind the negative relation is that when the actual growth rate in the economy is higher, there is a lower risk of uncertainties prevailing in the economy. When the real growth is higher, the capital level requirement will be lower, lowering the capital adequacy ratio and vice versa. Therefore, banks are required to hold a lower level of capital.

#### 4.3.2. Impact of Macroeconomic Factors on Capital Adequacy Ratio of Developed Nations

The first regression model intends to find the macroeconomic factors' influence on the capital adequacy ratio of developed nations. The results of the same are stated below:

Hausman test results:

Firstly, the Hausman test was conducted to find the difference between the random and the fixed effect model. Using this test, which one between the random and fixed is selected efficiently under the null hypothesis that the random effect is better can be found.

**Table 6.** Hausman Test (Developed nations data)

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
INFLATIONR-E	-.4980587	-.3179666	-.180092	.0683406
INTERESTRATE	-.403266	-1.023919	.6206534	.1483424
BROADMONEY	.0287297	-.0120254	.0407551	.0097539
REALGROWTH-E	.0258114	.0026031	.0232083	.0055361

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\text{chi2}(2) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

= 17.58  
 Prob>chi2 = 0.0002

Based on the results of the Hausman test, the p-value is 0.002, which is less than the significance level of 0.05. It states that the null hypothesis has been rejected. Therefore, the random effect model is not efficient, and the fixed effect model is utilised in the analysis.

Fixed effect results

**Table 7.** Impact of the macroeconomic variable on developed nations' CAR

Fixed-effects (within) regression		Number of obs =	66
Group variable: id		Number of groups =	3
R-sq:		Obs per group:	
within = 0.6000		min =	22
between = 0.8584		avg =	22.0
overall = 0.0475		max =	22
corr(u_i, Xb) = -0.7640		F(4,59) =	22.13
		Prob > F =	0.0000

  

CAR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
INFLATIONRATE	-.4980587	.2243809	-2.22	0.030	-.9470438	-.0490735
INTERESTRATE	-.403266	.1757969	-2.29	0.025	-.7550348	-.0514972
BROADMONEY	.0287297	.0088261	3.26	0.002	.0110686	.0463908
REALGROWTHRATE	.0258114	.0856202	0.30	0.764	-.1455141	.197137
_cons	-.6754664	.26022	-2.60	0.012	-1.196165	-.1547674

  

sigma_u	.03812155
sigma_e	.01626016
rho	.84607255 (fraction of variance due to u_i)

  

F test that all u_i=0: F(2, 59) = 11.94	Prob > F = 0.0000
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The regression analysis results showed that all macroeconomic variables except the real growth rate had a significant impact on the capital adequacy ratio. Wherein interest rate and inflation show a significant negative relation, while broad money shows a significant positive relation.

The regression results show that interest rate and inflation rate significantly negatively influence the capital adequacy ratio of the developed nations' banks. The result is evident in the substantial depth of the regression, as the adjusted R-squared is around 60%, indicating 60% of the variables are explained by the independent variable. The inflation rate has shown a significant negative influence on the capital adequacy ratio with a coefficient value of -0.498 and a p-value of 0.030. The result showed that the p-value was less than 0.05, stating that the relationship is significant. Similarly, the influence of the interest rate on the capital adequacy ratio is negative and significant, with a coefficient value of -0.4032 with a p-value of 0.025, which is less than the significance level. It shows that the relationship between interest rate and capital adequacy ratio is significant and negative. This shows that capital adequacy declines when the interest rate increases. This is because the banks are stable, and when the interest rates increase, the borrowing declines in emerging countries. Therefore, the banks have lower chances of facing the situation of high loan demand or a bank run. The capital adequacy ratio is increased.

The monetary authority often increases the interest rate to decrease the money supply in the economy. Banks dealing with a lower money supply also decline their CAR levels. Similarly, when inflation increases and the Capital Adequacy Ratio decreases, the CAR level reduces as the banks in the developed nations have lower chances for bank run situations. At the same time, the increased ability to advance loans increases the money supply to cope with the growing inflation.

On the other hand, a positive relationship has been found between the capital adequacy ratio and broad money, with a coefficient value of 0.0287, representing a strong relationship between the variables. The p-value is 0.002, showing a positive and significant relationship. Similarly, real growth was found to have a positive relationship with the capital adequacy ratio, with a coefficient value of 0.0258. The p-value is 0.764, more than the significance level of 0.05. Therefore states a positive but insignificant relationship between the capital adequacy ratio and real growth. Overall, the Hausman test showed that macroeconomic factors influence the CAR of developed countries.

#### 4.3.3. Impact of Macroeconomic Factors on Capital Adequacy Ratio of Emerging Nations

The third regression model intends to find the macroeconomic factors' influence on the capital adequacy ratio of emerging nations. The results of the same are stated below:

Hausman test results

**Table 8.** Hausman Test (Emerging nation data)

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
INFLATIONR~E	.1199529	.3032979	-.183345	.0541403
INTERESTRATE	-.2799718	-.5541048	.274133	.1570535
BROADMONEY	.0057873	.0065769	-.0007896	.0066188
REALGROWTH~E	-.1530411	-.2277844	.0746633	.0303375

b = consistent under Ho and Ha; obtained from xtreg  
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V\_b-V\_B)^(-1)](b-B)  
= 50.24  
Prob>chi2 = 0.0000

Firstly, the Hausman test was used to find the difference between the random and the fixed effect model. Using this test, it would be found which one between the random and fixed is selected efficiently under the null hypothesis that the random effect is better.

Based on the results of the Hausman test, the p-value is 0.000, which is less than the significance level of 0.05, which states that the null hypothesis is rejected. Therefore, the random effect model is not efficient, and consequently, the fixed effect model is utilised in the analysis.

Fixed effect results

**Table 9.** Impact of macroeconomic variables on emerging nations' CAR

Fixed-effects (within) regression		Number of obs = 88	
Group variable: id		Number of groups = 4	
R-sq:		Obs per group:	
within = 0.2358		min = 22	
between = 0.4499		avg = 22.0	
overall = 0.3768		max = 22	
corr(u_i, Xb) = 0.1966		F(4, 80)	= 6.17
		Prob > F	= 0.0002

  

CAR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
INFLATIONRATE	.1199529	.0712587	1.68	0.096	-.0218564	.2617623
INTERESTRATE	-.2799718	.145359	-1.93	0.058	-.5692454	.0093018
BROADMONEY	.0057873	.0042967	1.35	0.182	-.0027634	.014338
REALGROWTHRATE	-.1530411	.04407	-3.47	0.001	-.2407431	-.0653391
_cons	-.0046431	.1375665	-0.03	0.973	-.2784091	.2691229
sigma_u	.0281586					
sigma_e	.01961304					
rho	.67333685	(fraction of variance due to u_i)				

F test that all u\_i=0: F(3, 80) = 40.89 Prob > F = 0.0000

The regression analysis showed that all macroeconomic variables except the real growth rate are insignificant. It means that the capital adequacy ratio for developing nations is only influenced by the level of real growth rate and not by any other macroeconomic variables.

The adjusted R-squared is around 23.58%, indicating that the independent variable explains 23.58% of the variance. The inflation rate has shown a positive influence on the capital adequacy ratio with a coefficient value of 0.119; however, the p-value of 0.096 is more than 0.05, showing that the relationship is insignificant. Similarly, the influence of broad money on the capital adequacy ratio is positive, with a coefficient value of 0.0057, representing a weak relationship. Then, the p-value is 0.182, which is more than the significance level, which shows the relationship between broad money and capital adequacy ratio is insignificant.

On the other hand, a negative relationship between the capital adequacy ratio and interest rate, with a coefficient value of -0.2799. The p-value is 0.058, which shows that the relationship is negative but insignificant since the p-value is more than the significance level. Similarly, real growth negatively impacts the capital adequacy ratio with a coefficient value of -0.153. The p-value is 0.001, which is less than the significance level of 0.05. The study states a negative and significant relationship between the capital adequacy ratio and real growth. Therefore, the

Hausman test showed that the macroeconomic factor only impacts the real growth rate in emerging countries, CAR.

## 5. Conclusion

This study examined how inflation, interest rate, broad money, and real growth affect capital adequacy ratios in six countries over 1998–2019. The key findings are:

For the full sample, all four macroeconomic variables significantly influence CAR, confirming that capital regulation is not isolated from macroeconomic conditions.

For developed nations, inflation, interest rate, and broad money are significant predictors, with high explanatory power ( $R^2=60\%$ ). The negative effect of inflation and interest rates suggests that developed banks reduce capital buffers when these variables rise, possibly due to countercyclical regulatory frameworks or greater market discipline.

For emerging nations, only real growth rate significantly affects CAR. The insignificance of other variables may reflect weaker transmission channels, less responsive monetary policy, or the predominance of micro-prudential factors over macro variables.

These results have important policy implications. In developed economies, macroprudential authorities should monitor inflation and interest rate movements as they directly affect bank capital adequacy. In emerging economies, real growth fluctuations require attention, but other macro variables may have limited direct impact, suggesting that bank-level characteristics or regulatory enforcement play a larger role.

Limitations of this study include the aggregation of EU countries as a single entity and the exclusion of bank-specific variables. Future research could incorporate micro-level bank data and extend the country sample.

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## **Appendix**

Capital Adequacy ratio

<https://data.worldbank.org/indicator/FB.BNK.CAPA.ZS>

Bank Regulatory capital to Risk Weighted Assets for the United States

<https://fred.stlouisfed.org/>

Bank Regulatory capital to Risk Weighted Assets for INDONESIA

<https://fred.stlouisfed.org/>

Inflation Rate for Indonesia

<https://fred.stlouisfed.org/>

Inflation Rate for United States

<https://fred.stlouisfed.org/>

Interest rate in Indonesia

<https://fred.stlouisfed.org/>

Interest rate in United States

<https://fred.stlouisfed.org/series/DFP>

Real Effective Exchange Rate for United States

<https://fred.stlouisfed.org/series/RBUSBIS>

Real Effective Exchange Rate Indonesia

<https://fred.stlouisfed.org/series/RBIDBIS>

Broad Money Supply for United States

<https://fred.stlouisfed.org/>

Broad Money Supply for Indonesia

<https://fred.stlouisfed.org/>