Journal of Economics, Finance and Accounting Studies
ISSN: 2709-0809
DOI: 10.32996/jefas
Journal Homepage: www.al-kindipublisher.com/index.php/jefas

JEFAS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

The Impact of Money Supply, Interest Rate and Inflation Rate on Economic Growth: A Case of Morocco

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| ABSTRACT
The purpose of our study is to examine the impact of money supply, interest rate and inflation rate on the economic growth in Morocco from 1990 to 2020. This research empirically analyzes how the key monetary settings interact and influence Morocco's Gross Domestic Product, using annual data on money supply, interest rates, and inflation sourced from the Moroccan Central Bank and the World Bank development Indicators. To explore the complex interactions and causal effects of the selected macroeconomic indicator on economic growth, we have employed a quantitative analysis based on the Vector Autoregression (VAR) model and cointegration, implemented using the R programming language. The main findings reveal that money supply significantly boosts economic growth, while interest rates have negative effects. Moreover, inflation positively influences short-term economic growth. These insights enhance understanding of the role that monetary policy plays in promoting economic development. This research enriches the academic literature by addressing a gap concerning Morocco's economic dynamics and guiding policymakers to develop more effective monetary strategies.

| KEYWORDS

Money supply, interest rate, inflation rate, economic growth, R-language.

| ARTICLE INFORMATION

ACCEPTED: 01 April 2024 **PUBLISHED:** 17 April 2024 **DOI:** 10.32996/jefas.2024.6.2.10

1. Introduction

Nowadays, the natural and spontaneous functioning of the market no longer allows us to achieve a satisfactory equilibrium situation. State intervention, therefore, becomes necessary in order to regulate the economy and maintain a favorable situation; it develops economic policies for this purpose. The latter designates a set of coherent decisions taken by the economic and monetary authorities of a country with a view to achieving certain objectives, in particular, the achievement and maintenance of internal and external balances (Couppey-Soubeyran, 2012).

By monetary policy, we mean all the actions undertaken by the monetary authorities and the Central Bank with a view to modifying the monetary and financial conditions of the economy (Mourgues, 1988).

Today, the primary goal of central banks is to preserve stable prices(European Central Bank, 2024). But, economic growth and the fight against unemployment are considered secondary objectives. In order to achieve these objectives, most central banks are responsible for defining and conducting monetary policy as well as ensuring control of the money supply (Blanchard & Cohen, 2020).

Thus, the interest rate reflects the health of our economies; they intervene at all levels of economic life and concern all its actors: households, businesses and states. Today interest rates are monitored daily in the media. They are one of the economic variables most monitored by economic actors, each for their own interest, producers to make the right choice of financing their investments

since interest rates determine the cost of borrowed resources, and households in order to control their choices between immediate consumption and savings given that interest rates determine the price and income of certain investments.

In addition, inflation is an important economic problem of our time because it affects, to varying degrees, not only all the countries of the world but also the social and professional categories of a nation. It is also a complex phenomenon with varied aspects and omnipresent in contemporary economic life.

Furthermore, economic growth designates the sustained increase over one or more periods of a dimensional indicator, notably gross domestic product (Barro & Sala-i-Martin, 1997). Growth is a more restrictive concept than that of development which designates all the technical, social and cultural transformations accompanying the growth of production.

In the rapidly evolving economic landscape of the 21st century, Traditional market mechanisms often fail to achieve the desired states of equilibrium (Benkhaira & El Hassani, 2023), requiring proactive state intervention through well-designed economic policies. This intervention is crucial in emerging markets such as Morocco, where economic volatility and fluctuations can have an impact on growth and stability. This study seeks to explore the complex relationships between monetary policies - notably money supply and interest rate inflation - on economic growth in such a Moroccan emerging economy.

The governor of the Bank of Morocco, Jouahri (2018), admits that modern central banks, including Morocco's, are increasingly faced with the challenge of not only maintaining price stability but also promoting economic growth and reducing unemployment. This dual mission poses complex policy challenges that require a sensitive balancing of conflicting objectives. This research aims to contribute to the discourse on monetary policy in emerging markets by providing empirical evidence from Morocco. It will also analyze improvements to existing economic models and policies based on localized Moroccan insights, thus offering theoretical and practical contributions to the economic literature and policy-making.

2. Literature Review

2.1 Impact of Money Supply on Economic Growth

According to Friedman (1968), an increase in the quantity of money tends to lower the interest rate, thereby stimulating economic activity. This makes it possible to affect real quantities in the short term. This short-term effectiveness of expansionary monetary policy can be explained by a delay in expectations by agents because when the quantity of money increases, the cash held by agents' increases, which leads to an increase in demand. In this context, Bailly et al. (2006) emphasize that agents always have a time delay in their behavior -adaptive expectations hypothesis- which explains the impacts of variations in the money supply in the short term.

Furthermore, Friedman (1968) asserts that expansionary monetary policy -stimulus policy- is ineffective in the long term such that any increase in the money supply beyond what is necessary can result in inflation, i.e., say that agents are victims of a monetary illusion because this increase in demand, while the level of production remains stable, causes a rise in prices and the start of inflation (Batini & Nelson, 2001; Cozzi, 2007). In this sense, Friedman declared: "The cause of inflation is always the same everywhere, an abnormally high increase in the quantity of money in circulation in relation to the volume of production" (Nelson, 2007).

In Palestine, Razia & Omarya (2022) investigated the nexus between M2 and per capita economic growth based on time series analysis between 2000 and 2020. Their findings conclude that both M2 and total capital formation positively influence short-term economic growth. However, neither of these variables has an impact on long-term economic growth.

Buthelezi (2023) employed Markov-switching dynamic regression and time-varying parameter structural vector autoregression (SVAR) to examine the influence of money supply on economic growth in South Africa between 1990 and 2021. The results indicate a 0.70reduction in GDP for a 1 unit increase in money supply in the first state, whereas state 2 exhibited an insignificant effect.

In Azerbaijan, Zeynalova (2023) econometrics' analysis found a one-way causal connection between money supply and domestic credit volume, indicating a long-term link between money supply, credit volume, and economic expansion. On the other hand, in recent years, there has been growing interest in Nepal regarding the correlation between money supply and economic growth.

2.2 Impact of Interest Rates on Economic Growth

According to Montoussé (2007), economic policy has been inspired by Keynesian theory since the 1930s. According to this theory, monetary policy can be used as a tool with two main objectives: to stimulate or stabilize the economy. Thus, the ultimate objective of Keynesian monetary policy is expressed by the growth rate or the level of employment. The intermediate objective is represented by the level of interest rates.

Furthermore, Bénassy-Quéré et al. (2015) emphasized that interest rates play a very important role in the direction of the economy. If the central bank -monetary authority- increases the money supply, it is an expansionary monetary policy. On the other hand, in the case where this reduces the money supply, it is a restrictive monetary policy.

According to Mboweni (2000), monetary policy can only have an effect on the production process through interest rate variations. The functioning of both domestic and foreign markets for goods and services allows the author to demonstrate how changes in interest rates affect demand, which in turn affects economic activity and growth (Hameed & Ume, 2011).

Sultana (2023) finds that interest rate has a positive impact on economic growth in Bangladesh. An increase in interest rate in the period between 1990 and 2018positively affects the growth rate with stable inflation.

2.3 Inflation Impacts on the Economic Growth.

Several researchers have studied the impact of inflation on economic growth, led by Mundell (1963) and Tobin (1965) explained that the inflation rate have a negative effect on economic growth. In addition, Fischer (1993) found that inflation had a negative impact on economic growth through falling productivity and investment growth.

Barro (1995), in his study, reached a conclusion "that an increase in average inflation of 10 percent per annum reduces the growth rate of real GDP by 0.2 to 0.3 percent per annum and lowers the ratio of investment to GDP by 0.4 to 0.6 percent".

Paul et al. (1997) examine the nexus between the inflation rate and economic growth for 70 countries between 1960 and 1989. Their study shows» no causal relationship between inflation and economic growth in 40 percent of the countries. Consequently, in 20 percent of the countries, they reported bidirectional causality, and in the rest of the countries, they found a unidirectional relationship".

Along the same lines, Erbaykal & Okuyan (2008) found a significant long-term association but no statistical significance in the short term between inflation and economic growth.

However, Ghosh & Phillips (1998) discovered a strong and consistent negative correlation between inflation rates and economic growth. This relationship remains robust across all inflation rates except for the lowest ones.

Kunwar et al. (2023), in their studies from 1974/75 to 2020/21, found that the Consumer Price Index (CPI) is positively related to economic growth, indicating a strong impact on economic growth in developing countries like Nepal.

3. Materials and Methods

3.1 Data Sources

We selected money supply, interest rate and inflation rate as the three variables most representative of monetary policy instruments. In this empirical study, the data used over the period (1990-2020) are the annual time series collected from "World Bank Development Indicators" and "The Central Bank of Morocco".

To elucidate the research methods using time series modeling, we employed a computer-generated analysis for time series using the R programming language, adopting a quantitative approach for the data, as depicted in the figure below.

Table 1 Data collection

Variable		**Definition**	**Measurement**	**Collected from**
GDP	Gross domestic product	"The total monetary value of all final goods and services produced within a country's borders in a specific time period"	Current US	World Bank Development Indicators
MS	Money supply	"The total amount of currency and other liquid assets circulating in an economy at a given time"	Current US	World Bank Development Indicators
IR	Interest rate	"The cost of borrowing money, expressed as a percentage of the principal amount borrowed."	percentage	World Bank Development Indicators
IFR	Inflation rate	"The annualized percentage change in the price of a basket of goods and services representing typical consumer purchases."	percentage	Central Bank of Morocco

3.2 Model Specification

Given the potential feedback loop between money supply, interest rate, inflation rate and economic growth, a VAR model was an appropriate approach. This model considers the causal relationships between variables in a comprehensive and interconnected

manner, enabling us to assess the influence of each factor on the others. Using a VAR model, we can analyze these dynamic relationships and explore the causal effect of the money supply, interest rate and inflation rate on economic growth; therefore, our model is written as follows:

$$GDP_t = \alpha + \sum_{i=1}^{k} \beta_i GDP_{t-i} + \sum_{i=1}^{k} \gamma_i M_{t-i} + \sum_{i=1}^{k} \Phi_i TIR_{t-i} + \sum_{i=1}^{k} \Theta_i TINF_{t-i} + v_t$$

4. Results

Correlation and stationarity are two essential tools in the time series analysis toolbox. Correlation, which measures the "strength and direction of linear relationships between variables"(Pearson & Henrici, (1997), provides an initial insight into potential linear relationships, while stationarity ensures that fluctuations of the time series remain stationary (mean, variance and autocorrelation) over time and provide a solid basis for reliable modeling as it sets the groundwork for precise modeling and uncovers important insights about the time series.

Table 2. Statistics and normality results

	DGP <dbl>	MS <dbl>	IR <dbl>	IFR <dbl>
nbr.val	3.100000e+01	3.100000e+01	3.100000e+01	3.100000e+01
nbr.null	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00
nbr.na	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00
min	3.018011e+10	1.150000e+11	1.500000e+00	3.034000e-01
max	1.200000e+11	1.490000e+12	8.500000e+00	7.986200e+00
range	8.981989e+10	1.375000e+12	7.000000e+00	7.682800e+00
sum	2.170371e+12	1.995300e+13	1.343800e+02	7.565940e+01
median	6.234302e+10	5.090000e+11	3.250000e+00	1.635300e+00
mean	7.001195e+10	6.436452e+11	4.334839e+00	2.440626e+00
SE.mean	5.778713e+09	7.938407e+10	3.772264e-01	3.734339e-01
CI.mean.0.95	1.180171e+10	1.621239e+11	7.703991e-01	7.626538e-01
var	1.035199e+21	1.953568e+23	4.411292e+00	4.323039e+00
std.dev	3.217451e+10	4.419918e+11	2.100308e+00	2.079192e+00
coef.var	4.595574e-01	6.867011e-01	4.845181e-01	8.519094e-01
skewness	1.691863e-01	3.693556e-01	7.422529e-01	1.149652e+00
skew.2SE	2.011553e-01	4.391481e-01	8.825072e-01	1.366887e+00
kurtosis	-1.722377e+00	-1.389584e+00	-8.719111e-01	1.427987e-01
kurt.2SE	-1.049203e+00	-8.464780e-01	-5.311329e-01	8.698720e-02
normtest.W	8.611892e-01	9.003560e-01	8.552302e-01	8.337555e-01
normtest.p	8.854317e-04	7.357190e-03	6.561397e-04	2.327539e-04

4.1 Descriptive Analysis

Table 2 reveals that the four variables exhibit distinct means, ranges, and standard deviations. For example, Gross Domestic Product (GDP) displays a notably high range, mean, and standard deviation, contrasting with the Interest Rate (IR) variable, which has a narrower range of 7, an average of 4.33, and a standard deviation of 2.1, primarily due to the differences in units between the variables. The test's p-value, or a test statistic (W) exceeding the previously established critical value in test theory, is determined by testing the null hypothesis that the time series are normally distributed, the hypothesis that is rejected in all variables.

4.2 Correlation Analysis

The figure below presents a correlation graph that illustrates the relationships between the variables. This visual depiction shows the direction and strength of correlations between pairs of variables, helping to identify potential linear dependencies and connections.

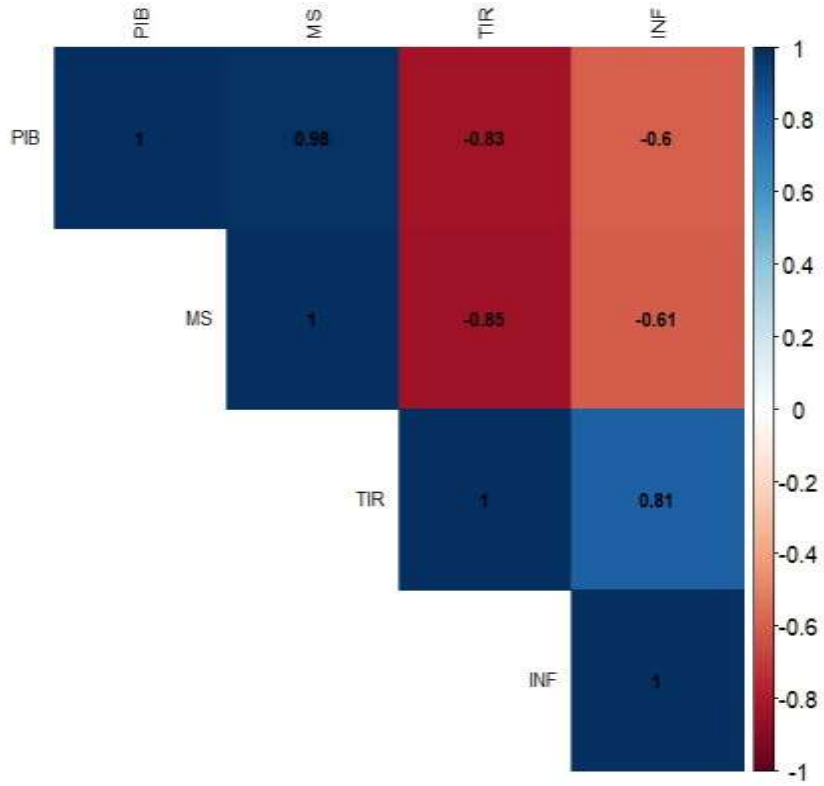

Fig. 1. Correlation results

Firstly, gross domestic product (GDP) has a strong positive correlation with the Money Supply (MS) and a strong negative correlation with the Interest Rate (IR) with values of 0.98 and 0.83, while the Inflation Rate (IFR) has a more moderate positive correlation. We can also see that Money Supply has the same correlation with the Interest Rate and the Inflation Rate as gross domestic product.

Secondly, the Inflation Rate (IFR) has a strong positive correlation with the Interest Rate (IR), with a value of 0.81, in contrast to the Gross Domestic Product (GDP) and the Money Supply (MS), which have a negative correlation of around 0.6.

4.3 Stationarity

A large number of unit root tests exist. The pioneering works in this field are those of Fuller (1976) and Dickey and Fuller (1979, 1980). Dickey-Fuller tests are parametric tests that can be used to determine whether a chronicle is stationary or not by determining a deterministic or stochastic trend. These tests are based on the estimation of an autoregressive process.

In our study, we will apply the ADF test, which is based on the following hypotheses:

$$\begin{cases} H_0 : non - stationarity \\ H_1 : stationarity \end{cases}$$

The results of the ADF test on the different series studied are summarized in the table below:

Table 3. The ADF test

	Value of test statistic	Critical values for test statistics		
	1pct	5pct	10pct	
GDP	Tau3 : -1.66	-4.15	-3.50	-3.18
	Phi2 : 2.46	7.02	5.13	4.31
	Phi3 : 1.50	9.31	6.73	5.61
MS	Tau3 : -0.94	-4.15	-3.50	-3.18
	Phi2 : 2.22	7.02	5.13	4.31
	Phi3 : 1.14	9.31	6.73	5.61
IR	Tau3 : -2.17	-4.15	-3.50	-3.18
	Phi2 : 6.60	7.02	5.13	4.31
	Phi3 : 4.90	9.31	6.73	5.61
IFR	Tau3 : -2.57	-4.15	-3.50	-3.18
	Phi2 : 3.49	7.02	5.13	4.31
	Phi3 : 4.18	9.31	6.73	5.61

In the comparison between the statistical test (−1.66 2.46 1.5) and critical value at 5% as (−3.50 5.13 6.73), the following results can be observed and interpreted

tau3: Because there is a unit root, the first null hypothesis is not rejected.

phi3: There is a unit root, and there is no trend; thus, this hypothesis is not refuted.

phi2: we have a unit root but no trend no drift; therefore, this hypothesis is not refuted.

According to table 3, all variables, with the exception of the interest rate, which has a drift, have a unit root and are not stationary.

4.4 Data Transformation

Logarithmic transformations are a common technique in economics to address skewed data and unequal variance. By transforming variables, economists achieve normality in error terms, which is crucial for statistical tests. Additionally, this transformation stabilizes variance in time series analysis and allows interpreting coefficients as elasticities, which represent proportional changes due to a 1% shift in another variable.

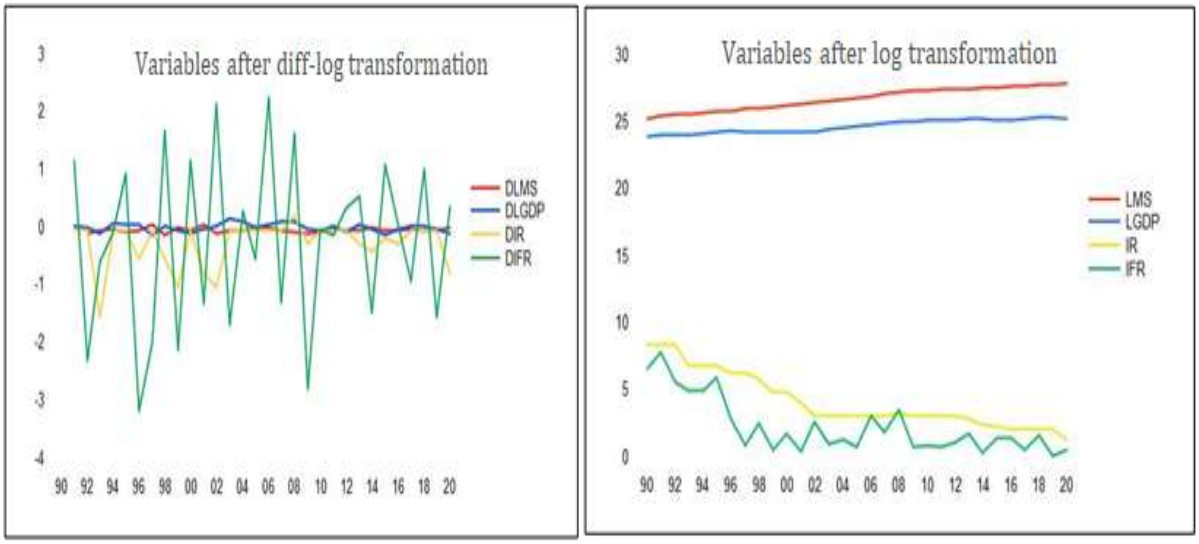

Fig. 2. Times series after log transformation and differentiation

The difference test determines the number of times the time series needs to be differenced to achieve stationarity using a unit root test, specifically the ADF in this instance. Table 4 shows that we need to apply a first-order difference to our data to make the all-time series stationary, as the logarithmic transformation does not achieve this.

Table 4. n-differences needed to achieve stationarity

Variables	ndiffs
Gross domestic product	1
Money Supply	1
Interest Rate	1
Inflation Rate	1

4.5 VAR and Cointegration

The optimal delay is determined using the information criteria (Akaike (AIC), Schwars (SC), Hannan-Quinn (HQ), and Final Predictor Error (FPE)). To do this, we will choose the number MAX(p) = 4, as shown in the figure below:

```
VARselect(cbind(DLGDP,DLMS,DIR,DIFR),type="non" ,lag.max =15)

$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     4      4      4      3
```

```
        Phillips-Ouliaris Cointegration Test

data:  cbind(dLPIB, ddLM3, dTIR, dTXINF)
Phillips-Ouliaris demeaned = -25.398, Truncation lag parameter = 0, p-value = 0.1426
```

Fig. 3. VAR lag determination and cointegration

The Phillips-Ouliaris cointegration test returned a p-value of 0.14. This suggests that we fail to reject the hypothesis of no cointegration, indicating that there is no long-term equilibrium relationship between the financial settings and GDP.

```
VAR Estimation Results:
=======================

Estimated coefficients for equation DLGDP:
==========================================
Call:
DLGDP = DLGDP.l1 + DLMS.l1 + DIR.l1 + DIFR.l1 + DLGDP.l2 + DLMS.l2 + DIR.l2 + DIFR.l2 + DLGDP.l3 + DLMS.l3 +
DIR.l3 + DIFR.l3 + DLGDP.l4 + DLMS.l4 + DIR.l4 + DIFR.l4 + const

   DLGDP.l1     DLMS.l1      DIR.l1     DIFR.l1    DLGDP.l2     DLMS.l2      DIR.l2     DIFR.l2    DLGDP.l3
-0.20636088 -0.74172026  0.07687102  0.01363835  0.09852611  0.57954975 -0.15299434  0.01975521 -0.18778198
    DLMS.l3      DIR.l3     DIFR.l3    DLGDP.l4     DLMS.l4      DIR.l4     DIFR.l4       const
 0.39241359 -0.05632583  0.04600763  0.79948005 -0.98815992 -0.08748214  0.02298353 -0.01656957


Estimated coefficients for equation DLMS:
=========================================
Call:
DLMS = DLGDP.l1 + DLMS.l1 + DIR.l1 + DIFR.l1 + DLGDP.l2 + DLMS.l2 + DIR.l2 + DIFR.l2 + DLGDP.l3 + DLMS.l3 + DIR.l3
+ DIFR.l3 + DLGDP.l4 + DLMS.l4 + DIR.l4 + DIFR.l4 + const

     DLGDP.l1       DLMS.l1        DIR.l1       DIFR.l1      DLGDP.l2       DLMS.l2        DIR.l2       DIFR.l2
 0.1220943265 -0.0017956993  0.0015076645 -0.0004404549 -0.2379769763 -0.1556960243  0.0331474763  0.0104883857
     DLGDP.l3       DLMS.l3        DIR.l3       DIFR.l3      DLGDP.l4       DLMS.l4        DIR.l4       DIFR.l4
 0.4305239534 -0.4709454895 -0.0112483367 -0.0152413740 -0.3240673332  0.3866373310 -0.0120144306 -0.0219625367
        const
-0.0050266845


Estimated coefficients for equation DIR:
========================================
Call:
DIR = DLGDP.l1 + DLMS.l1 + DIR.l1 + DIFR.l1 + DLGDP.l2 + DLMS.l2 + DIR.l2 + DIFR.l2 + DLGDP.l3 + DLMS.l3 + DIR.l3
+ DIFR.l3 + DLGDP.l4 + DLMS.l4 + DIR.l4 + DIFR.l4 + const

   DLGDP.l1     DLMS.l1      DIR.l1     DIFR.l1    DLGDP.l2     DLMS.l2      DIR.l2     DIFR.l2    DLGDP.l3
-0.06367888 -2.48014310  0.32088712  0.10779647  1.35900307 -3.30902483 -0.28959588  0.11032797 -1.71207136
    DLMS.l3      DIR.l3     DIFR.l3    DLGDP.l4     DLMS.l4      DIR.l4     DIFR.l4       const
-0.88965095  0.32488372  0.07716757  2.33144787 -0.50067443 -0.44311213  0.08299842 -0.28366379

Estimated coefficients for equation DIFR:
=========================================
Call:
DIFR = DLGDP.l1 + DLMS.l1 + DIR.l1 + DIFR.l1 + DLGDP.l2 + DLMS.l2 + DIR.l2 + DIFR.l2 + DLGDP.l3 + DLMS.l3 +
DIR.l3 + DIFR.l3 + DLGDP.l4 + DLMS.l4 + DIR.l4 + DIFR.l4 + const

   DLGDP.l1     DLMS.l1      DIR.l1     DIFR.l1    DLGDP.l2     DLMS.l2      DIR.l2     DIFR.l2    DLGDP.l3
-7.15709776 11.13584414  0.83016883 -0.16263407  2.29885971  1.27596134 -1.19514761  0.24837502 -5.35821503
    DLMS.l3      DIR.l3     DIFR.l3    DLGDP.l4     DLMS.l4      DIR.l4     DIFR.l4       const
-0.80545828  0.52429739  0.11916090  6.52199700 -3.51463560 -0.69402919  0.38873261 -0.03082386
```

Fig. 4. VAR estimation

4.6 Analysis of Findings

4.6.1 Gross Domestic Product

The parameter for the lagged GDP values is negative for lags 1 and 3 and positive for lags 2 and 4. This suggests that previous GDP values positively influence themselves after 4 lags. A one-unit rise in the GDP from the previous period (DLGDP.l4) results in a 0.799-unit increase in the GDP for the current period. This could be due to factors such as increased investment (higher current GDP allows for more investment in capital and infrastructure, boosting future production capacity) or innovation(increased economic activity can stimulate innovation and technological progress, leading to long-term productivity gains and higher GDP).

4.6.2 Money Supply

The parameter for lagged money supply values is negative for lags 1 and 4 and positive for lags 2 and 3. This indicates that a decline in the money supply from the previous period corresponds to an increase in the change in gross domestic product for the current period, which does not confirm our hypothesis of the positive impact of the MS on GDP, given that this impact is still very small. However, further research with a larger sample is recommended to confirm or refute this finding.

4.6.3 Interest Rate

For the interest rate, the result indicates that an increase in the interest rate from the preceding period corresponds to a decrease in the change in gross domestic product for the current period, affirming the hypothesis of an inverse relationship between the interest rate and GDP.

4.6.4 Inflation Rate

The parameter for the preceding inflation rate is positive, suggesting that a rise in inflation corresponds to an increase in gross domestic product, supporting the hypothesis of a short-term positive impact of inflation on GDP.

4.6.5 Forecasting

Researchers are able to predict the future behavior of economic variables by utilizing econometric models to analyze historical data and identify relationships. This process allows economists to make well-informed decisions based on the data, as demonstrated in the figure below, which shows the future of the financial settings and the GDP.

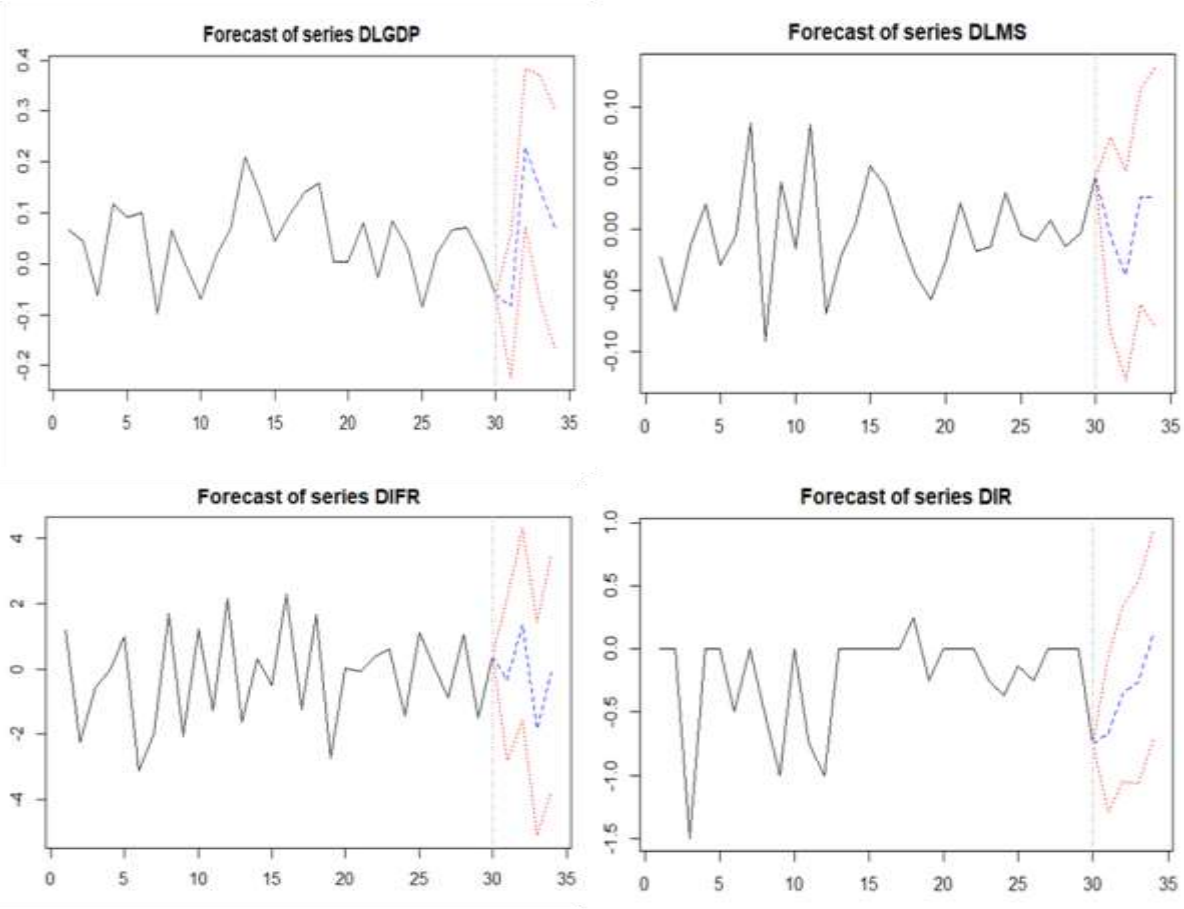

Fig. 5. Future forecast of model's variables

According to our model, gross domestic product is expected to fall initially and then rise, which may be due, in general, to the expected reduction in the money supply, which will result in lower consumer spending, lower business investment and, ultimately, lower production of goods and services. This may also be due to the long-term effects of past increases in the inflation rate. Subsequently, GDP rises sharply after initially falling, which is associated with higher money supply. Generally, this rise can be caused by the expected fall in the inflation rate, which may have a positive effect on GDP in the long term.

5. Discussion

The results of this study provide valuable information on the effect of money supply, interest rates, and inflation rates on Moroccan economic growth. The results showed an absence of a significant long-term impact of the money supply on economic growth

despite positive short-term effects; in addition, our analysis highlighted a negative impact of the interest rate on economic growth. For the inflation rate, the results confirmed a positive impact on short-term economic growth.

First, our finding that money supply has a significant effect on economic growth in the short run but not in the long run, is consistent with the findings of Friedman (1968) that an increase in the quantity of money tends to lower the interest rate, thereby stimulating economic activity. This makes it possible to affect real quantities in the short term. However, our finding is in contrast with Razia & Omarya (2022), who find a positive impact in the short run but not relationship between the variables in the long term.

Furthermore, our observation of the negative impact of the interest rate on economic growth is consistent with the work of Montousssé (2007) and Mboweni (2000), which highlighted the opposite effect of the interest rate on economic growth. However, Sultana (2023) finds that interest rate has a positive impact on economic growth. The increase in interest rate in this time period, 1990-2018 positively affects the growth rate with stable inflation. But Bosworth, (2014) there is only a weak relationship between real interest rates and economic growth.

Finally, our finding of a positive impact of the inflation rate on short-term economic growth is consistent with the conclusions of Mundell (1963) and Tobin (1965); an increase in the nominal interest rate caused by inflation makes an investment more preferable than consumption. This, in turn, will cause an increase in the accumulation of capital, which will lead to economic growth. Umaru et al. (2012) the results revealed that inflation had a positive impact on economic growth by boosting productivity and output levels, and on trends in total factor productivity. But, Fischer (1993), Barro (1995), Barro (1996), and Espinoza et al. (2010) found a negative relationship between the inflation rate and economic growth.

By integrating these consistent and inconsistent results with previous research, our study contributes to enriching the debate on the impact of monetary variables on economic growth. This study highlights the diversity of effects of monetary variables on economic growth and underlines the importance of considering local specificities and economic dynamics specific to Morocco.

6. Conclusion

Through a quantitative methodology and empirical investigation, the study aims to analyze the relationships between money supply, interest rates, inflation rates, and gross domestic product (GDP). The findings reveal nuanced relationships, such as the negative impact of interest rates on GDP, the mixed impact of money supply on GDP, and the positive short-term effect of inflation on economic growth.

Furthermore, this study emphasizes the importance of econometric modeling and historical data analysis in forecasting future economic variables. By utilizing VAR models and examining causal relationships between key economic indicators, economists can gain insights into the potential behavior of economic variables and make informed decisions based on data-driven projections.

The study underscores the significance of monetary policy in shaping economic outcomes and highlights the complexities involved in managing economic variables to achieve sustainable growth. By considering the interplay between monetary instruments and economic indicators, policymakers can navigate trade-offs, address challenges, and strive towards fostering a conductive economic environment in Morocco.

In conclusion, the analysis presented in this study provides valuable insights into the impact of monetary policy on economic growth, emphasizing the need for evidence-based decision-making and proactive policy measures to steer the economy towards stability and prosperity. By continuing to explore these relationships and refine economic models, stakeholders can enhance their understanding of the economic landscape and implement strategies that promote long-term growth and development in Morocco.

This research has a few limitations. First off, the study's scope is restricted to the years 1990–2020, which could cause it to miss significant structural changes that occurred after COVID-19 and could have an impact on the correlations between the variables it looked at. Second, the conclusions may not be as broadly applicable to other nations with various economic systems and policies due to the Moroccan focus. Furthermore, even though cointegration analysis and the usage of a VAR model are crucial, they can overlook possible non-linear relationships or dynamic impacts between variables. Finally, the study particularly examines how Morocco's economic growth is impacted by the money supply, interest rates, and inflation. But additional elements, including fiscal policy, political stability, shocks from the outside world, and structural reforms, could all have a big impact.

Future research could examine external factors like regional trade dynamics or global economic conditions that may have an impact on Morocco's interactions between monetary policy and economic growth. It could also look at a longer time span to better understand the long-term trends and dynamics of the Moroccan economy. More detailed knowledge of the intricate relationships between monetary variables and economic growth may also be possible through comparative analysis with other nations, which could aid in determining the conclusions' relevance as well as the effects of various policies and settings.

Funding: This research received no external funding.
Conflicts of Interest: The authors declare no conflict of interest.
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