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ORIGINAL

Long and Short-Run Relationship Analysis of Monetary Policy On Economic Growth in Morocco: An ARDL Model Approach

Análisis de la Relación a Largo y Corto Plazo de la Política Monetaria sobre el Crecimiento Económico en Marruecos: Un Enfoque del Modelo ARDL

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ABSTRACT

Introduction: this study examines the relationship between Morocco's monetary policies from 1991 to 2022 and its economic progress. The analysis examines both short- and long-term dynamics using an AutoRegressive Distributed Lag (ARDL) model, taking into account the economic disturbances brought on by the COVID-19 pandemic.
Method: the research employs the ARDL model and the Granger causality test to assess the causal relationships and the influence of key monetary policy instruments on economic performance. The analysis leverages a robust dataset spanning three decades to ensure the validity and reliability of the results.
Results: the findings demonstrate a significant impact of monetary policy measures on Morocco's economic activity, both in the short term and the long term. The Granger causality test reveals a bidirectional relationship between the money supply and GDP, highlighting the mutual influence between these variables. Additionally, the analysis underscores the economic disruptions caused by the COVID-19 crisis, shedding light on vulnerabilities and areas requiring policy intervention.
Conclusions: this research contributes to the existing body of literature by providing an in-depth analysis of the interaction between monetary policy and economic growth in Morocco. Moreover, it offers timely insights into the implications of external shocks, such as the COVID-19 crisis, thereby equipping policymakers with actionable evidence to formulate resilient economic strategies.

Keywords: Monetary Policy; Economic Growth; Covid-19; ARDL; Granger Causality; Morocco.

RESUMEN

Introducción: este estudio examina la relación entre la política monetaria y el crecimiento económico en Marruecos durante el período 1991–2022. Utilizando un modelo AutoRegressive Distributed Lag (ARDL), el análisis investiga las dinámicas tanto a corto como a largo plazo, considerando también las disrupciones económicas provocadas por la crisis del COVID-19.
Método: la investigación emplea el modelo ARDL y la prueba de causalidad de Granger para evaluar las relaciones causales y la influencia de los principales instrumentos de política monetaria en el desempeño económico. El análisis se basa en un conjunto de datos sólido que abarca tres décadas, garantizando la validez y fiabilidad de los resultados.
Resultados: los hallazgos revelan un impacto significativo de las medidas de política monetaria en la actividad económica de Marruecos, tanto a corto como a largo plazo. La prueba de causalidad de Granger muestra una

relación bidireccional entre la oferta monetaria y el PIB, destacando la influencia mutua entre estas variables. Además, el análisis pone de manifiesto las disrupciones económicas causadas por la crisis del COVID-19, señalando vulnerabilidades y áreas que requieren intervención política.
Conclusiones: esta investigación contribuye al cuerpo existente de literatura al proporcionar un análisis profundo de la interacción entre la política monetaria y el crecimiento económico en Marruecos. Asimismo, ofrece perspectivas oportunas sobre las implicaciones de choques externos, como la crisis del COVID-19, proporcionando a los responsables políticos evidencias concretas para formular estrategias económicas resilientes.

Palabras clave: Política Monetaria; Crecimiento Económico; Impacto Económico del COVID-19; Modelo ARDL; Causalidad de Granger; Marruecos.

INTRODUCTION

As the world gradually recovers from the impact of the COVID-19 pandemic, central banks' monetary policy decisions are essential for maintaining economic stability and fostering recovery.[1] In Morocco, the effect of these monetary policies on economic growth holds significant importance.[2,3]

Historically, Morocco has faced various economic challenges, including growth disparities, persistent unemployment rates, and vulnerability to external turbulence.[4] However, the COVID-19 pandemic has introduced a new dimension to these challenges, posing unprecedented economic obstacles for the country.[2]

Travel restrictions and lockdown measures have led to a significant decrease in international tourism, which is a vital component of the Moroccan economy. The reduction in tourism has significantly influenced economic aspects like the trade balance and the overall economic expansion of the nation.[5] Furthermore, disturbances in worldwide supply networks have affected different segments of Morocco's economy, such as production and overseas sales.[6] Additionally, fluctuations in exchange rates have added to economic uncertainty, complicating long-term strategizing for businesses.[7]

To address these issues, monetary policy emerges as a crucial tool for boosting economic growth. Over the years, the effect of monetary policy on economic factors has consistently ignited continuous and complex discussions in academic research.[8] Nevertheless, with post-pandemic recovery efforts underway, it is imperative to reassess the effectiveness of these monetary measures to ensure a resilient and sustainable economic recovery.[9]

In this context, questions arise regarding the effectiveness of the monetary policy tools deployed by Bank Al-Maghrib, both during times of crisis and beyond.[10] This prompts reflection on the relevance of various monetary policy instruments for economic recovery. Hence, the following question arises: How effectively has Morocco's monetary policy supported economic recovery, particularly in handling the COVID-19 crisis's challenges?

The purpose of this study is to investigate in detail how Morocco's economic growth and monetary policy relate to one another from 1991 and 2022. Using the ARDL model, we will investigate the short and long-term impact of various monetary policy levers such as the benchmark interest rate, monetary reserves, money supply, interbank rate, and inflation rate, while also considering the impact of the COVID-19 crisis using a dummy variable. Additionally, this research aims to provide insights to policymakers, researchers, and economic actors on the best paths to foster strong and sustainable economic growth in the post-crisis context in Morocco.

In light of this, the article is organized as follows: We begin by reviewing pertinent research on monetary policy and economic growth. Subsequently, we present and interpret the empirical findings. Finally, we discuss the implications of the results.

Literature review

Monetary policy encompasses all decisions and actions undertaken by a government or monetary authority to influence economic activity through the circulation of money. While central banks typically prioritize maintaining price stability, they also play a crucial role in stabilizing the overall economy, as the effectiveness of achieving inflation targets hinges on how well monetary policy impacts economic activity.[11] In Morocco, monetary policy can be tailored to support growth during crises while still ensuring price stability. It's worth noting that the recession resulting from the 2007-2008 financial crisis prompted many central banks to implement expansionary monetary policies, a trend observed again during the current economic downturn.[12]

Monetary policy serves as a vital aspect of counter-cyclical measures aimed at stabilizing the economy by regulating the money supply using various tools. During times of crisis, adopting an accommodative stance in monetary policy is advisable. To promote economic activity by increasing investment and aggregate demand, this may entail cutting reserve requirements, lowering interest rates, and expanding the money supply.[10] Conversely, a restrictive monetary policy involves tightening the money supply and raising interest rates and

reserve requirements. This strategy aims to curb inflation by tempering aggregate demand and slowing down economic activity.[13]

Recalling the recent decisions made by Bank Al-Maghrib within the framework of its monetary policy, which has always focused on maintaining low and stable inflation. Between 2000 and 2003, Bank Al-Maghrib lowered its main interest rate from 5 % to 3,25 %, maintaining it at this level for an extended period before reducing it to 2,50 % at the end of 2014. Additionally, Bank Al-Maghrib reduced the reserve requirement ratio from 16,5 % to 2 % to address the decrease in bank liquidity. During this period, monetary aggregates continued to increase at a steady pace. Between 2014 and 2019, Bank Al-Maghrib again reduced its main interest rate three times, bringing it down from 3 % to 2,25 %.[14] Finally, following the COVID-19 pandemic, the magnitude of the economic shock caused by the COVID-19 pandemic necessitated an intensification of the expansionary nature of monetary policy. Thus, Bank Al-Maghrib did not hesitate to once again lower its main interest rate, bringing it to 2 %, and then to 1,5 %, while completely releasing required reserves for banks.[15]

In-depth empirical research on the connection between monetary policy and economic growth has been conducted both domestically and abroad. Numerous investigations have been carried out to evaluate the effects of different monetary policies in various regions of the world.[16]

In this context, Diebolt et al. (2011) using an SVAR model, questioned the thesis that accommodative monetary policy in America provided, during the period 1929-1933, an effective response to exit the crisis.[17] In another investigation, Ulke and Berument (2016) investigated how monetary policy shocks affected Turkey's inflation, output, and exchange rates between 1990 and 2014.[18] Using a vector autoregressive nonlinear model, they found that rising interest rates (indicative of a restrictive monetary policy) led to decreases in production and prices, while decreases (indicative of an expansive monetary policy) had contrasting effects, though relatively weaker. The work highlights the growing gap between results as the shock's strength increases and the reducing effect of expansive monetary policy shocks in comparison to restrictive ones.[18]

Additionally, According to Twinoburyo and Odhiambo (2017), policy coordination is advised since, between 1973 and 2013, changes in the money supply had little impact on Kenya's economic progress, either immediately or over time. Furthermore, The authors reviewed the literature on the relationship between monetary policy and economic growth and found that most of the results support the importance of monetary policy in promoting economic growth, especially in highly developed economies. Nonetheless, this association seems to be less pronounced in developing economies.[12]

Furthermore, the work conducted in Southern Africa by Dingela and Khobai (2017) utilizing the ARDL model, demonstrates the substantial short- and long-term impact of the money supply on economic growth from 1980 to 2016.[19] Similarly, the study by Blot and Hubert (2018) reveals, through an estimation of monetary multipliers, a significant effect of monetary policy on GDP. Their results demonstrate that expansive monetary policy instruments have contributed to supporting economic activity and mitigating the effects of the Great Recession, observed in the eurozone, the UK, and the US.[20]

Moreover, Shokr et al. (2019), through their non-recursive SVAR analysis, showed that from 1991 to 2011, changes in the money supply or interest rates, which are a manifestation of monetary policy shocks, had a major effect on Egypt's production, inflation, and exchange rate.[21]

In a separate study, Goshit et al. (2022) employed a structural VAR model with Bayesian techniques on quarterly data from 2001 to 2016. Their results indicated that base money shocks had a more pronounced impact on monetary stability than interest rate shocks. Additionally, monetary policy shocks did not influence economic growth.[22]

However, Tadadju and Essiane (2019) using an econometric approach based on dynamic panel data, challenged this hypothesis by demonstrating that monetary policy had a limited and non-significant effect on economic activity in Sub-Saharan Africa between 1980 and 2017. They deemed its transmission channels ineffective across their sample. [23]

Instead, Goshit et al. (2024) used the nonlinear ARDL model to examine how monetary policy shocks affected Nigeria's economic growth between 1981 and 2018. Their findings showed that changes in the monetary policy rate, whether positive or negative, have statistically significant positive effects on long-term output growth. In the near term, adverse changes in the monetary policy rate exert greater influence than favorable ones, whereas positive changes in the money supply have more pronounced effects than negative ones. Consequently, this study advocates for an expansionary monetary policy to foster sustainable economic growth.[24]

A FAVAR model was used in another important study by Daoudi and Benyacoub (2021) to evaluate how monetary policy shocks affected Morocco's economic growth. Using a wide range of Moroccan macroeconomic time series data from 1985 to 2018, the results highlighted the negative impacts of these shocks.[25]

In a recent study, Sanya (2022) investigated how monetary policy and production growth in the Economic Community of West African States (ECOWAS) were related from 1980 to 2019. The ARDL model's long- and short-term results highlighted the significance of interest rates and the money supply as factors influencing economic growth in ECOWAS nations.[26]

The conclusions of the study conducted by Iorember et al. 2022, utilizing the ARDL model, also underscored the significant importance of money supply growth in Nigeria from 2004 to 2022, both in the short and long term. It was found that while interest rates and the money supply both have significant long-term effects, only the money supply is statistically significant in the short run.[27]

While these studies have provided valuable insights, it is still necessary to solve the gaps and constraints. For instance, a thorough examination that takes into account a greater variety of monetary policy instruments, including reserve requirements and interbank rates, as well as how they interact with other macroeconomic factors, is required. It's also critical to take into account the COVID-19 crisis's enormous influence.

Theoretically, the positive effects of accommodative monetary policy have been supported by the Keynesian approach but questioned by monetarists. This theoretical debate reveals divergences on how monetary policy should be conducted, a debate that has been reignited by the health crisis. [12]

Monetarists, represented by Milton Friedman, highlight the short and long-term effects of expansionary monetary policy. They argue that increasing the money supply can only lead to a proportional rise in the general price level in the long term, in line with the principle of monetary neutrality. Moreover, they emphasize the inflationary risks associated with expansionary monetary policy, particularly during crises, advocating instead for a monetary policy focused solely on inflation control.[28]

However, this perspective is challenged by John Maynard Keynes, who emphasizes the importance of nominal rigidities in the economy. Keynesians contend that an expansionary monetary policy, characterized by a boost in the money supply and a reduction in interest rates, can produce positive effects on the real economy. By encouraging economic agents to increase consumption and investment, such a policy can foster economic activity and mitigate the adverse impacts of crises.[28]

This ongoing debate highlights divergent perspectives on the role and effects of monetary policy, underscoring the importance of economic theories in shaping public policy decisions.

Based on this literature review, we formulated the following hypotheses:

- Hypothesis 1: monetary policy in Morocco could considerably influence economic growth.
- Hypothesis 2: inflation in Morocco could result from an increase in the money supply.
- Hypothesis 3: the enduring impacts of crises may persist long-term, significantly shaping GDP.

METHOD

To address our research inquiry, we chose to use an econometric methodology employing the ARDL (Autoregressive Distributed Lag) model, as introduced by.[29] This choice stems from the model's capacity to capture temporal dynamics and simultaneously evaluate short and long-term relationships, while also delivering precise estimations, even when dealing with small sample sizes.[30] Within this framework, we look into how Morocco's economic growth is affected by the main tools of monetary policy.

Description of data

In our variable selection process, we adhered to a meticulous approach, prioritizing variables based on their theoretical significance and data availability.

Money Supply to GDP Ratio (MS_GDP): this metric measures the volume of currency circulating within a country's economy at a given time, typically expressed in reference to the Gross Domestic Product (GDP). It serves as a crucial indicator for assessing economic activity and evaluating the effectiveness of monetary policies.

Policy Interest Rate (PIR): this rate, determined by central banks, governs the cost at which commercial banks borrow funds. It serves as a primary instrument for monetary policy, influencing borrowing expenses and overall expenditure and investment levels within the economy.

Interbank Interest Rate in the Money Market (IBIR): Reflecting lending rates among banks in the money market, this rate mirrors liquidity conditions within the financial sector. Its fluctuations impact the lending and investment decisions of banks, thereby shaping the availability of credit.

Reserve Requirement Ratio (RRR): set by central banks, this ratio dictates the portion of funds that banks must retain as reserves. Consequently, it influences the volume of currency in circulation and the accessibility of credit.

Dummy Variable for the COVID-19 Crisis (D_Crisis): this binary indicator assumes a value of 1 during the COVID-19 crisis period and 0 otherwise. It serves to capture the pandemic's repercussions on the Moroccan economy.

By incorporating these variables into our econometric model, we seek to determine how monetary policy affects economic growth and the effects of outside shocks, such the COVID-19 pandemic, on Morocco's economy.

It should be noted that the data used in this study came from a variety of sources, including the World Bank databases, Bank Al-Maghrib (BAM), and the national accounts supplied by the High Commission for Planning (HCP) and the Ministry of Economy and Finance (MEF) database. This dataset, spanning from 1991 to 2022, totaling 32 annual observations.

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Model specification

Economic modeling is the initial step in any empirical analysis.[31] It involves formalizing a phenomenon using equations where variables represent economic quantities. The aim is to simplify the essential characteristics of a given reality.[32] The model functions as a tool for the modeler to comprehend and elucidate phenomena by making assumptions and delineating relationships between variables.[33]

For a thorough understanding of the specific ARDL model utilized in our analysis, let's begin with an overview of its general form. The Autoregressive Distributed Lag (ARDL) model with lags p and q can thus be stated as follows:

$$\Delta Y_t = \beta_0 + \beta_1 \Delta Y_{t-1} + \cdots + \beta_p \Delta Y_{t-p} + \gamma_0 X_t + \delta 1 X_{t-1} + \cdots + \delta_q X_{t-q} + \mu_t \quad (1)$$

$$\Delta Y_t = \beta_0 + \beta_1 \Delta Y_{t-1} + \cdots + \beta_p \Delta Y_{t-p} + \gamma_0 X_t + \delta 1 X_{t-1} + \cdots + \delta_q X_{t-q} + \mu_t$$

Where:

- ΔY_t ΔY_t: differenced dependent variable at time t.
- ΔY_{t-i} ΔY_{t-i}: differenced dependent variable at lag i.
- X_t X_t: independent variable at time t.
- X_{t-i} X_{t-i}: independent variable at lag i.
- p: order of lags for the dependent variable.
- q: order of lags for the independent variables.
- β_0 β_0: intercept term.
- β_i β_i: coefficients of the dependent variable at lags i.
- γ_0 γ_0: coefficient of the independent variable at time t.
- δ_q δ_q: coefficients of the independent variable at lags i.
- μ_t μ_t: error term.

Following the overview of the ARDL model's general structure, we will proceed to outline the specific ARDL model utilized in our analysis.

To begin with, the initial mathematical formulation of our model is presented as follows:

$$GDP = f\ (\ MS\_GDP,\ PIR,\ RRR,\ IBIR,\ INF,\ D\text{-}CRISIS\ ) \quad (2)$$

Where:

- GDP: Gross Domestic Product (Current local currency units).
- MS_GDP: Money Supply per GDP (Annual percentage).
- PIR: Policy Interest Rate (Annual percentage).
- RRR: Reserve Requirement Ratio (Annual percentage).
- IBIR: Interbank Interest Rate (Annual percentage).
- INF: Inflation Rate (Annual percentage).
- D-Crisis: COVID-19 Crisis (Dummy variable).

The choice of variables is informed by economic theories, our research challenge, and the availability of data. After establishing the economic model, it is necessary to transform it into an econometric model. The following is an outline of the suggested econometric model:

$$LGDP_t = \beta_0 + \beta_1\, LGDP_t + \beta_2\, \mathrm{MS\_GDP_t} + \beta_3\, PIR_t + \beta_4\, RRR_t + \beta_5\, IBIR_t + \beta_6\, INF_t + \beta_7\, D\_CRISIS_t + \mu_t \quad (3)$$

$$LGDP_t = \beta_0 + \beta_1\, LGDP_t + \beta_2\, \mathrm{MS\_GDP_t} + \beta_3\, PIR_t + \beta_4\, RRR_t + \beta_5\, IBIR_t + \beta_6\, INF_t + \beta_7\, D\_CRISIS_t + \mu_t$$

Where:

- LGDP: logarithmic form of gross domestic product.
- MS_GDP: Money Supply per GDP.
- PIR : Policy Interest Rate.
- RRR: Reserve Requirement Ratio.
- IBIR: Interbank Interest Rate.

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- INF: Inflation Rate.
- D-Crisis: COVID-19 Crisis (Dummy variable).
- $\beta_0\beta_0$: Constant (a quantity whose value is fixed in a given problem).
- $\beta_i\beta_i$: Regression coefficients of the economic model.
- $\mu_t\mu_t$: Error term at year (t) or white noise are random variables that intervene temporarily to reflect unexpected events.
- *t*: the years from 1991 to 2022.

RESULTS AND DISCUSSION

Unit root test

Before applying the ARDL approach, we assessed the stationarity of the various series involved to confirm that none of them were integrated of order two I(2) or higher. We used the Augmented Dickey-Fuller (ADF) unit root test to check each chosen variable's stationarity. The results of this test, obtained using Eviews 10 software, are summarized in the table below:

Table 1. Unit root test results

Variables	Level			First Difference		
	ADF statistics	Probability	Result	ADF statistics	Probability	Result
LGDP	-0,6564	0,8432	Non-Stationary	-10,40275	0,0000	Stationary
MS_GDP	-1,1476	0,6843	Non-Stationary	-8,33173	0,0000	Stationary
PIR	-2,171625	0,0308	Stationary	_	_	_
RRR	-1,26767	0,6312	Non-Stationary	-2,600214	0,0112	Stationary
IBIR	-7,00879	0,0000	Stationary	_	_	_
INF	-2,00498	0,0446	Stationary	_	_	_

Note: *Results below or equal to 0,05 are considered statistically significant. LGDP: logarithmic form of gross domestic product, MS_GDP: Money Supply per GDP, PIR : Policy Interest Rate, RRR: Reserve Requirement Ratio, IBIR: Interbank Interest Rate, INF: Inflation Rate, D-Crisis: COVID-19 Crisis (Dummy variable)

It is observed that, on one hand, the policy interest rate, the interbank interest rate, and the inflation rate are stationary at level, while on the other hand, the other variables, notably the gross domestic product, the money supply, and the reserve requirement rate do not show stationarity. To render these variables stationary, we took their first difference.

Estimation of the ARDL model

Given that some series are stationary while others exhibit a unit root, it is possible to model them using an ARDL process. The table below presents the ARDL modeling estimation results, with our model's lag structure automatically selected by EViews 10 software based on Adjusted R-Squared.

Table 2. ARDL Model (1, 2, 2, 1, 1, 2, 0)

Variable	Coefficient	Std.error	P-value
GDP(-1)	0,713326	0,048246	0,0000
MS_GDP	-0,106146	0,052790	0,0695
MS_GDP(-1)	0,343281	0,039674	0,0000
MS_GDP(-2)	-0,146803	0,044744	0,0073
PIR	0,011100	0,016468	0,5142
PIR (-1)	0,000411	0,016546	0,9806
PIR (-2)	-0,043332	0,007348	0,0001
RRR	0,003669	0,001638	0,0467
RRR(-1)	-0,008073	0,001630	0,0004
INF	-0,005794	0,001574	0,0036
INF(-1)	0,005955	0,002608	0,0433
IBIR	-0,007549	0,007397	0,3294
IBIR(-1)	0,024178	0,006380	0,0030
IBIR(-2)	-0,015846	0,004855	0,0075

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D_CRISIS	-0,061729	0,012523	0,0005
C	7,642278	1,292740	0,0001
R-SQUARED	0,999461		

Note: *LGDP: logarithmic form of gross domestic product, MS_GDP: Money Supply per GDP, PIR : Policy Interest Rate, RRR: Reserve Requirement Ratio, IBIR: Interbank Interest Rate, INF: Inflation Rate, D-Crisis: COVID-19 Crisis (Dummy variable)

The ARDL model (1, 2, 2, 1, 1, 2, 0) demonstrates overall significance, as evidenced by the F-statistic probability shown in table 2. Moreover, the ARDL estimation reveals an adjusted R-squared of 0,9994, indicating 99,94 % significance, which confirms and enhances the estimated interpretation of the explanatory variables for the dependent variable.

Short-term estimation results

According to the results presented in table 3, we observe that the coefficient associated with the lagged error correction term (CointEq(-1)) displays a negative value, indicating a correction towards equilibrium, which is generally desirable in an error correction model. It is worth noting that this coefficient reflects the speed at which short-term deviations from equilibrium are rectified. With a value of -0,286674, it suggests a moderate and relatively slow correction of short-term deviations from equilibrium. This implies that imbalances are rectified at a gradual pace, with almost 28,67 % of the gap being corrected in the subsequent period for each unit of short-term deviation. This may suggest some inertia in the adjustment process or factors that impede the speed of re-equilibration.

Table 3. Short-Term Coefficient Estimation Results

Variable	Coefficient	Std.error	P-value
D(LMS_GDP)	-0,106146	0,039595	0,0214*
D(LMS_GDP(-1))	0,146803	0,036727	0,0021*
D(PIR)	0,011100	0,012129	0,3797
D(PIR(-1))	0,043332	0,006964	0,0001*
D(RRR)	0,003669	0,001212	0,0115*
D(INF)	-0,005794	0,001331	0,0012*
D(IBIR)	-0,007549	0,004327	0,1089
D(IBIR(-1))	0,015846	0,004094	0,0026*
COINTEQ(-1)	-0,286674	0,016879	0,0000*
R-SQUARED	0,957020		

Note: * Results below or equal to 0,05 are considered statistically significant.

In table 3, we observe that the coefficient associated with the lagged error correction term (CointEq(-1)) displays a negative value, indicating a correction towards equilibrium, which is generally desirable in an error correction model. It is worth noting that this coefficient reflects the speed at which short-term deviations from equilibrium are rectified. With a value of -0,286674, it suggests a moderate and relatively slow correction of short-term deviations from equilibrium. This implies that imbalances are rectified at a gradual pace, with almost 28,67 % of the gap being corrected in the subsequent period for each unit of short-term deviation. This may suggest some inertia in the adjustment process or factors that impede the speed of re-equilibration.

Additionally, we observe that the timing of the money supply's effect on short-term economic growth varies: an increase in the money supply during the previous period boosts present growth, whereas an increase during the current period has the opposite effect. This emphasizes the significance of timing when formulating monetary policies to support short-term economic growth.

This finding highlights the time-sensitive influence of changes in the money supply on short-term economic growth. When the money supply increases in the prior period, it appears to invigorate economic expansion in the current period by injecting more liquidity into the economy, thereby encouraging consumption and investment and consequently fostering short-term economic growth. Conversely, when the rise in the money supply occurs in the current period, it may signal a response to ongoing economic pressures or crises, which can adversely affect investor confidence and economic stability, leading to a downturn in economic growth. This emphasizes how crucial it is to take monetary policy timing into account when fostering short-term economic growth.

In our model, we also notice an interesting finding: an uptick in the policy interest rate from the previous period surprisingly correlates with short-term economic growth. This may appear paradoxical at first glance.

However, it could be attributed to heightened confidence among economic players in the overall economic stability, following proactive measures by the central bank. Additionally, delayed effects of the policy interest rate might contribute to this phenomenon, with initial positive reactions preceding the full manifestation of negative consequences.

Moreover, our analysis indicates that an increase in the reserve requirement ratio has a favorable impact on short-term economic growth. This could be attributed to the policy's role in encouraging banks to adopt more cautious lending practices, thereby reducing risks and fostering a stable financial landscape. Consequently, banks might become more judicious in their lending, facilitating productive investment and ultimately bolstering economic growth.

Additionally, we find that an increase in the inflation rate substantially diminishes short-term economic growth. This implies that heightened inflation levels lead to an immediate downturn in economic growth. This could be attributed to the uncertainty induced among economic agents by soaring inflation, leading to curtailed spending and investment, thereby impeding economic expansion. Furthermore, rising inflation could erode consumers' purchasing power, further stifling economic growth.

Lastly, we observe an intriguing trend where an increase in the interbank interest rate unexpectedly correlates with short-term economic growth. Typically, such an increase is associated with a slowdown in economic activity. However, one possibility is that under certain specific circumstances, a slight increase in the interbank interest rate may indicate a monetary policy favorable to economic stability or boost investor confidence, which can have a temporary positive impact on economic growth.

Cointegration bound test

We conducted a bounds cointegration test to determine the presence of long-term relationships among key economic variables. This approach, based on the Bounds method, allows us to evaluate cointegration by comparing the calculated test statistic (the Fisher F value) with critical values forming bounds. The outcomes of this test will enhance our understanding of the long-term connections among the studied variables and guide our subsequent analyses regarding the dynamics of these relationships within the Moroccan economic context. If the calculated statistic surpasses the upper critical value, we can reject the null hypothesis of no cointegration, regardless of the integration orders of the variables. In contrast, we might accept the null hypothesis if the computed F-statistic is less than the lower critical value. But if the computed statistic falls between the two crucial values, the outcome is considered inconclusive.[34]

Table 4. Bounds Test Results

Test statistic	Value	Signif.	I(0)	I(1)
F-statistic	22,03617	10 %	1,99	2,94
k	6	5 %	2,27	3,28
		2,5 %	2,55	3,61
		1 %	2,88	3,99

Table 4 indicates that the Fisher statistic (F=10,49) surpasses the upper critical values for all significance levels at 1 %, 5 %, 2,5 %, and 10 %. Consequently, we determine that the examined series have a cointegration relationship after rejecting the null hypothesis that there is no long-term link. This makes it possible to calculate how our explanatory factors will affect GDP over the long run.

Long term results

Following the bounds test, we proceeded to assess the long-term relationships between our variables.

Table 5. Long-run coefficient estimation results

Variable	Coefficient	Std.error	P-value
LMS_GDP	0,315108	0,118713	0,0224*
PIR	-0,111001	0,047334	0,0388*
RRR	-0,015361	0,002906	0,0003*
INF	0,000563	0,010440	0,9580
IBIR	0,002730	0,028463	0,9253
D_CRISIS	-0,215327	0,060375	0,0044*
C	26,65845	0,607804	0,0000

Note: *Results are statistically significant when they are less than or equal to 0,05.

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In table 5, it is observed that the money supply appears to have a significantly positive effect on GDP in the long term, as indicated by the positive coefficient of 0,315108. This could be explained by the fact that increasing the money supply injects more liquidity into the economy, stimulating consumption, investment, and production, thereby fostering long-term economic growth. Consequently, this result supports the notion that expansionary monetary policies can effectively promote long-term economic growth in Morocco.

It is also noteworthy that the coefficient of -0,111001 suggests a negative impact of the policy interest rate on long-term economic growth. This implies that, holding other factors constant, an increase in the policy interest rate is associated with a decrease in long-term economic growth. This phenomenon is in line with expectations, as higher interest rates typically discourage investment and consumption, leading to a reduction in long-term economic growth. Thus, this finding aligns with the results of[18], which demonstrates that a tightening of the interest rate results in a decline in output and prices.[18]

Similarly, an increase of one unit in the reserve requirement rate appears to result in a decrease of 0,015361 in long-term economic output. This observation could be explained by the fact that higher reserve requirements limit banks' ability to lend and stimulate economic activity, thereby leading to a reduction in production over the long term.

These findings align with the expectations of a restrictive monetary policy, both for the policy interest rate and the reserve requirement rate. However, given the inverse relationship between these rates and GDP, a decrease in these rates is expected to spur production expansion for several reasons. Firstly, lower rates make borrowing less costly, stimulating business spending and investment. Additionally, lower rates may encourage consumer demand, thus promoting production and economic growth.

We also observe that the period of the COVID-19 crisis, represented by the dummy variable „D_CRISIS," has a significant and negative impact on long-term economic growth. Specifically, this means that during an economic crisis resulting from the COVID-19 pandemic, GDP tends to decrease, which is consistent with theoretical and empirical expectations that negative economic shocks generally lead to a contraction in economic activity. This finding confirms hypothesis 3, suggesting that the repercussions of the crisis could extend over the long term, exerting a persistent influence on GDP. This underscores the importance of including the impact of economic crises, especially the COVID-19 crisis, in our study.

Finally, our results suggest that the stimulative effects of monetary policy on economic activity are not only evident in the short term but also in the long term, contributing to sustained economic growth. This observation appears to confirm hypothesis 1, indicating that monetary policy in Morocco could have a significant impact on economic growth.

Our conclusions are consistent with the findings of the study conducted Dingela and Khobai (2017) in Southern Africa, confirming the significant impact of the money supply on economic growth both in the short and long term.[19] Similarly, the work of Iorember et al. (2022) in Nigeria has shown that the interest rate and money supply have significant long-term effects.[27]

Additionally, research conducted by Sanya and Tosin (2022) has underscored the significance of interest rates and money supply as factors influencing economic growth in ECOWAS countries, both in the short and long run.[26]

Furthermore, the findings of Blot and Hubert (2018) have strengthened our conclusions by illustrating a notable impact of monetary policy on GDP. Their results emphasized the crucial role played by expansive monetary policy measures in bolstering economic activity and mitigating the effects of the Great Recession observed in the eurozone, the UK, and the US.[20] Similarly, the analysis conducted by Shoker et al. (2019) revealed that monetary policy shocks, manifested through fluctuations in interest rates or money supply, significantly influenced production, inflation, and exchange rates in Egypt.[21]

Conversely, other studies present findings that contradict ours. Tadadjeu and Essiane (2019) disputed the significant influence of monetary policy on economic activity,[17] whereas Diebolt et al. (2019) cast doubt on the US's ability to navigate through the crisis with supportive monetary policy.[23] Additionally, the conclusions drawn by Daoui and Benyacoub (2021) suggest a negative effect of monetary policy shocks on economic growth in Morocco.[25] Finally, Twinoburyo and Odhiambo (2017) found that variations in the money supply do not influence economic growth in Kenya, whether in the short or long term.[12]

Our conclusions are further reinforced by their alignment with the principles of Keynesian theory, which advocate for the notion that an expansionary monetary policy, characterized by an increase in the money supply, can foster economic growth.

However, these findings appear to contradict monetarist theory, which suggests that the impact of increasing the money supply on economic growth diminishes over the long run. Monetarists argue that an excessive increase in the money supply can lead to inflation, thereby ultimately impeding economic growth.

Thus, with the exception of the inflation rate and the interbank interest rate, all our explanatory variables are significant and contribute to long-term economic growth. These findings suggest that an expansionary monetary policy aimed at supporting banks in their intermediation role could reignite economic activity in Morocco.

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Causality test

A bidirectional causal relationship between the money supply and the gross domestic product is revealed by the Granger causality test results. Firstly, we note that variations in the money supply cause changes in GDP, indicating a significant impact of monetary policies on economic activity by stimulating production and economic growth. Conversely, we also find that GDP influences the money supply, potentially driven by increased demand for money in commercial transactions, monetary policy measures aimed at supporting economic growth, and heightened credit creation by banks during economic expansion.

Table 6. Granger causality test

Null Hypothesis	F-Statistic	*p*-value
LMS_GDP does not Granger Cause LGDP	6,84597	0,0041*
LGDP does not Granger Cause LMS_GDP	5,80919	0,0082*
INF does not Granger Cause LGDP	4,29977	0,0244*
LGDP does not Granger Cause INF	0,14177	0,8685
PIR does not Granger Cause MS_GDP	2,79951	0,0800**
MS_GDP does not Granger Cause PIR	0,16211	0,8512
IBIR does not Granger Cause MS_GDP	4,48698	0,0232*
MS_GDP does not Granger Cause IBIR	0,61411	0,5501
INF does not Granger Cause PIR	4,43938	0,0224*
PIR does not Granger Cause INF	1,52702	0,2368
IBIR does not Granger Cause PIR	0,63429	0,5397
PIR does not Granger Cause IBIR	6,31938	0,0068*
D_CRISIS does not Granger Cause INF	11,8465	0,0002*
INF does not Granger Cause D_CRISIS	0,71526	0,4984

Note: ** and * denote significance levels of 1 % and 5 %, correspondingly.

The money supply and the gross domestic product have a bidirectional causal relationship, according to the Granger causality test results. Firstly, we note that variations in the money supply cause changes in GDP, indicating a significant impact of monetary policies on economic activity by stimulating production and economic growth. Conversely, we also find that GDP influences the money supply, potentially driven by increased demand for money in commercial transactions, monetary policy measures aimed at supporting economic growth, and heightened credit creation by banks during economic expansion.

Furthermore, we observe that fluctuations in inflation precede and influence changes in GDP. This relationship can be interpreted in several ways. For instance, price hikes may erode consumers' purchasing power, leading to reduced demand and production. Additionally, inflation could escalate production costs for businesses, prompting them to cut production to maintain profit margins. Moreover, monetary authorities may raise interest rates to combat inflation, curbing investment and consumer spending, thus dampening economic growth and GDP. In summary, inflation's adverse effects on GDP are manifested through its impacts on demand, production costs, and investment decisions.

At a significance level of 10 %, the Granger causality test likewise shows a causal relationship between the money supply and the policy interest rate. This suggests that changes in the money supply can be explained in part by variations in the policy rate. It implies that monetary policy choices, including central banks' changes to the policy rate, have a big influence on the amount of money in the economy. While policy rate hikes may have the opposite impact, policy rate decreases may promote borrowing and expenditure, increasing the money supply. In conclusion, the money supply is mostly determined by the policy rate, which can have a big impact on the state of the economy as a whole.

Similarly, the test indicates that variations in the interbank interest rate can also influence changes in the money supply. This is because the interbank interest rate affects the money supply by influencing banks' financing costs and overall interest rates. Lower interbank rates tend to encourage lending and result in an increase in the money supply, whereas higher rates may restrict credit availability, leading to a decrease in the money supply.

Moreover, the analysis also reveals that inflation causes the policy interest rate, suggesting that variations in inflation precede and impact observed changes in the policy interest rate. This relationship can be explained by the central bank's role in regulating inflation. Indeed, high inflation may prompt the central bank to raise the policy interest rate to dampen demand and contain inflationary pressures. Thus, the policy interest rate

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acts as a tool of monetary policy in response to fluctuations in inflation, aligning with the common practice of monetary policy aimed at maintaining price stability.

Furthermore, it seems that interbank rates are significantly influenced by the policy interest rate. The reason for this outcome is that the central bank's monetary policy decisions, like changing the policy interest rate, can affect the amount of liquidity in the banking system, which in turn can change the supply and demand for money in the interbank market and, ultimately, interbank rates.

A unidirectional causality relationship is observed between the variable representing the COVID-19 crisis and inflation. This suggests that events associated with the pandemic, such as supply and demand disruptions, economic stimulus policies, and monetary measures, explain observed variations in consumer prices. Lockdown measures disrupted supply chains, leading to temporary shortages and price increases, while stimulus policies injected liquidity into the economy, thereby boosting demand and potentially inflation. In summary, policy and economic responses to the COVID-19 crisis have had significant implications for inflation dynamics.

Finally, hypothesis 2, stating that an increase in the money supply could lead to higher inflation in Morocco, appears to be refuted, given the absence of a causality relationship between monetary policy instruments and the inflation rate, as revealed by the causality test.

Validation tests of the ARDL model

It is crucial to evaluate the ARDL model and determine whether it adequately depicts the dynamics of the modeled variables after determining its coefficients. To ascertain whether the model is acceptable, tests on the residuals are essential (table 7). First, we used the ARCH test to check that there was no heteroscedasticity in the errors before assessing the stability of our model. We next performed the Jarque-Bera and Breusch-Godfrey serial correlation tests, which confirmed the normality of the residuals from the computed VAR and showed no autocorrelation in the errors with the chosen lag. Finally, our results confirmed that our model passed the post-estimation tests and showed its overall relevance.

Table 7. ARDL model residual tests

Validation tests	p-value
Heteroscedasticity test ARCH	0,7252*
Autocorrelation LM Test	0,0840*
Normality test Jarque-Bera	0,8471*
Stability test CUSUM	ARDL satisfies the stability condition (The blue line remains within the red dashed bounds)

Note: *P-value above 0,05 indicates statistical significance.

CONCLUSIONS

The economic crisis brought on by the Covid-19 outbreak has reignited discussions about how important monetary policy is for controlling economic crises and promoting economic recovery. In this context, our study focused on examining the impact of key monetary policy tools on economic growth in Morocco.

Covering the period from 1991 to 2022, our analysis considered several macroeconomic variables, including money supply, central and interbank interest rates, reserve requirement ratio, inflation, and a dummy variable representing the COVID-19 crisis.

Our empirical findings reveal a significant influence of monetary policy instruments on Moroccan economic activity, helping to mitigate the effects of recessions. This confirms the lasting impact of monetary policy implemented since the 1990s on the country's GDP. However, despite its crucial role in crisis management and supporting activity, this monetary policy alone proves insufficient to fully stimulate economic growth, as evidenced by the relatively weak coefficients of the explanatory variables.

Thus, it is evident that monetary policy alone cannot bear full responsibility for economic recovery. Effective monetary and fiscal policy coordination is crucial for maintaining economic growth, as Keynes argued in 1936.

In summary, our empirical analysis, based on the ARDL model, has revealed several significant relationships among our key economic variables, providing precise recommendations to economic policymakers. It is crucial to adopt a balanced monetary policy, maintaining prudent expansionary measures, such as keeping interest rates low, to foster sustainable growth. Similarly, particular attention to price stability is necessary, given the negative effect of inflation on short-term GDP. Targeted stimulus measures are crucial to combating the detrimental impacts on GDP in response to the COVID-19 crisis's economic issues. Long-term growth and financial stability are ensured by constant monitoring of economic indicators.

Therefore, these recommendations provide practical guidance for policymakers in their economic actions, reinforcing the prospects for a robust and sustainable economic recovery.

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CONFLICT OF INTEREST

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