Recebido: 07-12-2023 | Aprovado: 18-12-2023 | DOI: https://doi.org/10.23882/rmd.24191

Monetary policy challenges in Morocco: exploring the possibility of reconciling price stability and economic growth.

Desafios da política monetária em Marrocos: explorar a possibilidade de conciliar a estabilidade dos preços e o crescimento económico

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Abstract: In this research paper, we used the VECM framework to assess Moroccan central bank's ability to target inflation. We also explored the possibility of reconciling between inflation control and growth stimulation through an impulse response analysis. Our empirical results showed that interest rate adjustments as monetary policy measure could be a relevant choice in a context of moderate and short-lived inflation since it provides a wide margin for reconciling price stability and economic growth. In times of high and persistent inflation, the central bank should prioritize inflation control through a permanent decrease in its money supply.

Keywords: Monetary Policy, inflation, economic growth, reconciliation.

JEL classification: E31, E52, F43

Resumo: Neste artigo de investigação, utilizámos o quadro VECM para avaliar a capacidade do banco central marroquino de atingir a inflação. Também explorámos a possibilidade de conciliação entre o controlo da inflação e a estimulação do crescimento através de uma análise de resposta ao impulso. Os nossos resultados empíricos mostraram que os ajustamentos das taxas de juro como medida de política monetária podem ser uma escolha relevante num contexto de inflação moderada e de curta duração, uma vez que proporcionam uma ampla margem para conciliar a estabilidade de preços e o crescimento económico. Em tempos de inflação elevada e persistente, o banco central deve dar prioridade ao controlo da inflação através de uma diminuição permanente da sua oferta monetária.

Palavras-chave: Política Monetária, inflação, crescimento económico, reconciliação.

1. Introduction

The trade-off between price stability and economic growth is one of the major concerns of monetary policies. Central banks tend to prioritize the stimulation of economic activity in times of crises and focus their efforts on reducing inflationary pressures in a context of overheating economy or commodity price shocks. The trade-off between targeting inflation and boosting growth is also a matter of monetary authorities' strategic choices. For example, the growth dimension is covered by the functions of the Federal Reserve, which set a goal of promoting maximum employment and stable prices. Conversely, the European Central Bank adopts a more restrictive stance by focusing its policy on price stability. Taking into account these two benchmark cases as well as the available theoretical and empirical literature, the present research paper proposes an empirical assessment of the monetary policy stance in Morocco.

A large strand of empirical literature on monetary policy in developing economies remains strictly focused on one goal (i.e. price stability or growth stimulation). Our research paper goes beyond this scope by exploring the possibility of reconciling the two objectives. Indeed, the estimation of a VECM (i.e. Vector Error Correction Model) and the interpretation of its coefficients will provide an assessment of Moroccan central bank's ability to target inflation. In addition, the analysis of impulse response functions will allow us to draw some interesting conclusions about the possibility of reconciling between targeting inflation and supporting economic growth in Morocco.

2. Literature review

The general theory (Keynes, 1936) supports the use of monetary policy (i.e. in combination with fiscal policy) as an effective growth stimulation tool in times of downturn. This theory emphasizes the key role of monetary expansion (i.e. increase in money supply) in boosting economic activity. The contributions of (Harrod, 1937; Hicks, 1937; Meade, 1937) provide a mathematical structure to the Keynesian approach. The positive effect of expansionary monetary policy on growth is also backed up by the graphical analysis proposed by (Hansen, 1949,

1951, 1953) in his IS-LM model. Other contributions draw the same conclusions in a context of small open economy with flexible exchange rates (Fleming, 1962; Mundell, 1960, 1963). In addition, the aggregate aggregate demand / aggregate supply framework simplify the analysis of monetary policy effects on economic activity under the hypothesis of flexible price level (e.g. (Baumol & Blinder, 1985; Stiglitz, 1993)). In contrast with the Keynesian approach, (Sargent & Wallace, 1981) focus on the creation of a sound macroeconomic environment through the adoption of a monetary dominance scheme in which independent central banks direct their efforts towards inflation control rather than supporting government's growth stimulation policies. Indeed, inflation must be the central bank's primary concern according to (Rogoff, 1985). The author states that the ideal central banker places a large, but finite, weight on price stabilization.

A large array of research papers have examined the implications of monetary policy on inflation and economic activity. Other studies have restricted the analysis to one monetary policy goal (i.e. price stability or growth stimulation). The following table presents a brief review of the empirical literature.

Table 1. A brief empirical literature review

Authors	Model	Period, frequency and country	Variables	Main results
(Sims, 1992)	SVAR	1957-1991 Monthly France, Germany, Japan, U.K. and U.S.	Short term interest rate, monetary, aggregate (M1), consumer price index, industrial production index, index of the foreign exchange value of domestic currency and commodity price index.	There is a persistent negative response of money stock and output to interest rate shocks in the five sample countries. Prices show a temporary positive reaction. Taking into account monetary shocks, the reaction of prices is positive whereas the response of economic activity is small or predominantly negative.
(Starr, 2005)	SVAR	1995-2003 quarterly Russia, Ukraine, Belarus, and Kazakhstan	Money supply (M1 or M2), central bank's refinancing rate, real effective exchange rate, real GDP and consumer price index.	There is mixed evidence that monetary policy variables (i.e. money supply, policy rate and exchange rate) have a significant effect on real output. However, these variables provide an explanation for price fluctuations in the four sample countries.

(Uhlig, 2005)	SVAR	1965-2003 Monthly United States	Real GDP, GDP deflator, commodity price index, total reserves, non-borrowed reserves and federal funds rate.	Shocks to monetary policy variables (i.e. restrictive stance) have an ambiguous effect on real GDP and lead to a slow decrease in GDP price deflator.
(Sousa & Zaghini, 2008)	SVAR	1980-2001 Quarterly Euro area	GDP deflator, consumer price index, real GDP, monetary aggregate (M3), short term interest rate, exchange rate, and global liquidity aggregate	Money supply and price level show a permanent positive reaction to shocks in global liquidity. The response of output is temporary and positive. In addition, global liquidity shocks result in a temporary appreciation of real effective exchange rate.
(Chiaraah & Nkegbe, 2014)	ECM	1980-2010 Annual Ghana	GDP, money supply, exchange rate, domestic price level and United states' price level (i.e. proxy of foreign price level).	Reflecting the monetary policy stance, money supply has a significant positive effect on inflation rate in the long term. Its impact is not significant in the short-term according to the error correction model.
(Ahmad et al., 2016)	ARDL	1973-2014 Annual Pakistan	GDP, money supply, inflation, interest rate and exchange rate	According to the long-term equation, monetary policy stimulate economic activity through money supply and exchange rate, which have a significant positive effect on GDP. The impact of exchange rate and interest rate is positive and significant in the short-term.
(Wauk & Adjorlolo, 2019)	ARDL	1982-2017 Annual Ghana	GDP, inflation, exchange rate, money supply (M2) and interest rate.	Interest rate exhibits a significant negative impact on economic activity in the long term. The effects of the other monetary policy variables (i.e. exchange rate and money supply) are insignificant in the long and short terms.
(Gillani & Abdin, 2021)	ARDL	1981-2014 Annual Pakistan	Consumer price index, liquidity ratio, reserve ratio and money supply (M2).	Money supply shows a positive and significant effect on price level according to the long-term equation. Pakistani central bank can control inflation through an effective management of money supply.

Source: author

3. Methodology

Our empirical study assesses Moroccan central bank's ability to control inflation and explores the possibility of reconciling between the two major challenges of monetary policy (i.e. maintaining price stability and boosting economic growth). We test two major hypotheses:

- Hypothesis I: Moroccan central bank manages to control inflation effectively.
- Hypothesis II: Moroccan central bank manages to reconcile between targeting inflation and supporting economic growth.

The sources of data are Bank Al-Maghrib (i.e. the Moroccan central bank), the Ministry of Economy and Finance as well as the High Commission for planning. We use annual time series from 1980 to 2020. Inflation rate *(if)* and natural logarithm of gross domestic product *(lgdp)* are the ultimate goals of monetary policy. Interbank rate *(r)* and money supply *(m)* (i.e. aggregate M3 as percentage of GDP) react immediately to central bank's decisions and hence reflect the orientation of its policy. Government expenditure *(ex)* and current account balance *(ca)*, (expressed as percentage of GDP), reflect respectively the potential impact of fiscal policy measures and foreign trade dynamics on price level.

The estimation of a VECM that includes the above-mentioned variables and the interpretation of its coefficients will provide an assessment of Moroccan central bank's ability to target inflation. In addition, the analysis of impulse response functions will allow us to draw some interesting conclusions about the possibility of reconciling between targeting inflation and supporting economic growth in Morocco.

In the presence of a cointegrating relationship, a VECM can be formulated as follow:

$$\Delta Y_t = A_0 - \alpha\beta' Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta Y_{t-i} + \mu_t \qquad (1)$$

Where:

- Y_t: $(k \times 1)$ vector of I(1) variables.
- A_0: $(k \times 1)$ vector of constant terms.
- α: $(k \times 1)$ vector of adjustment coefficients.
- $\beta' Y_{t-1}$: error correction term.
- Γ_i: matrix of coefficients.
- μ_t: $(k \times 1)$ vector of white noise terms.

4. Result and discussion

Since all the variables are integrated of order one, we use Johansen methodology to test for cointegration. According to the Akaike Information Criterion, the optimal lag length is ($p = 3$), (table A1).

Table 2. Unit root test results

Variable	ADF Level	ADF First difference	Conclusion
if	-3.303088 (-3.533083)	-9.861962 (-1.949609)	I(1)
lgdp	-2.472942 (-2.943427)	-7.815392 (-3.529758)	I(1)
ca	-2.234832 (-2.936942)	-6.695907 (-1.949609)	I(1)
ex	-2.023406 (-2.936942)	-6.753428 (-1.949609)	I(1)
r	-2.638866 (-3.526609)	-6.519686 (-1.949609)	I(1)
m	-2.046247 (-3.526609)	-4.780857 (-2.938987)	I(1)

( ): critical values for the 5% significance level.

Table 3. Cointegration test results

(a)

Unrestricted Cointegration Rank Test (Trace)		
Hypothesized No. of CE(s)	Trace statistic	0.05 critical value
None *	140.1288	95.75366
At most 1 *	91.24448	69.81889
At most 2 *	52.10655	47.85613
At most 3	**27.08643**	**29.79707**

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level.
* Denotes rejection of the hypothesis at the 0.05 level.

(b)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
Hypothesized No. of CE(s)	Max-Eigen statistic	0.05 critical value
None *	48.88435	40.07757
At most 1 *	39.13792	33.87687
At most 2	**25.02012**	**27.58434**

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level.
* Denotes rejection of the hypothesis at the 0.05 level.

The Johansen test (i.e. trace statistic) indicates the existence of three cointegrating equations, which justifies the estimation of a VECM with ($p - 1 = 2$) lags. We are interested in analysing the cointegrating equation as well as the short-term dynamics of inflation.

Table 4. Long-term relationship (i.e. cointegrating equation)

if	*lgdp*	*ca*	*ex*	*r*	*m*	*c*
1	0.095693* [3.98086]	-0.073590 [-0.53949]	-0.038589 [-0.17508]	- 0.626209* [-3.35873]	- 0.173186** [-2.70415]	-1.093110

[ ] t-statistic.
* Significance at the 1% level. ** Significance at the 5% level.

Table 5. VECM: short-term dynamics of inflation

D(if)			
CointEq1	-0.899804 [-4.66138]*		
D(if(-1))	0.443527 [2.08075]**	*D(ex(-1))*	-0.247709 [-1.23112]
D(if(-2))	0.310543 [2.00879]**	*D(ex(-2))*	-0.764502 [-4.25020]*
D(lgdp(-1))	-0.127935 [-1.75101]***	*D(r(-1))*	-1.132347 [-4.49963]*
D(lgdp(-2))	-0.100794 [-1.25549]	*D(r(-2))*	0.099657 [0.46483]
D(ca(-1))	0.001938 [0.01339]	*D(m(-1))*	0.147200 [1.26580]
D(ca(-2))	-0.439624 [-3.34892]*	*D(m(-2))*	-0.144601 [-1.27579]
c	0.012461 [1.82313]***		
R-squared: 0.777962			

[ ] t-statistic.
* Significance at the 1% level. ** Significance at the 5% level. *** Significance at the 10% level.

The negative sign and significance of the adjustment coefficient (i.e. estimated at -0.89) as well as the results of residual tests (i.e. normality, autocorrelation and heteroskedasticity) confirm that our VECM is valid, (table A2).

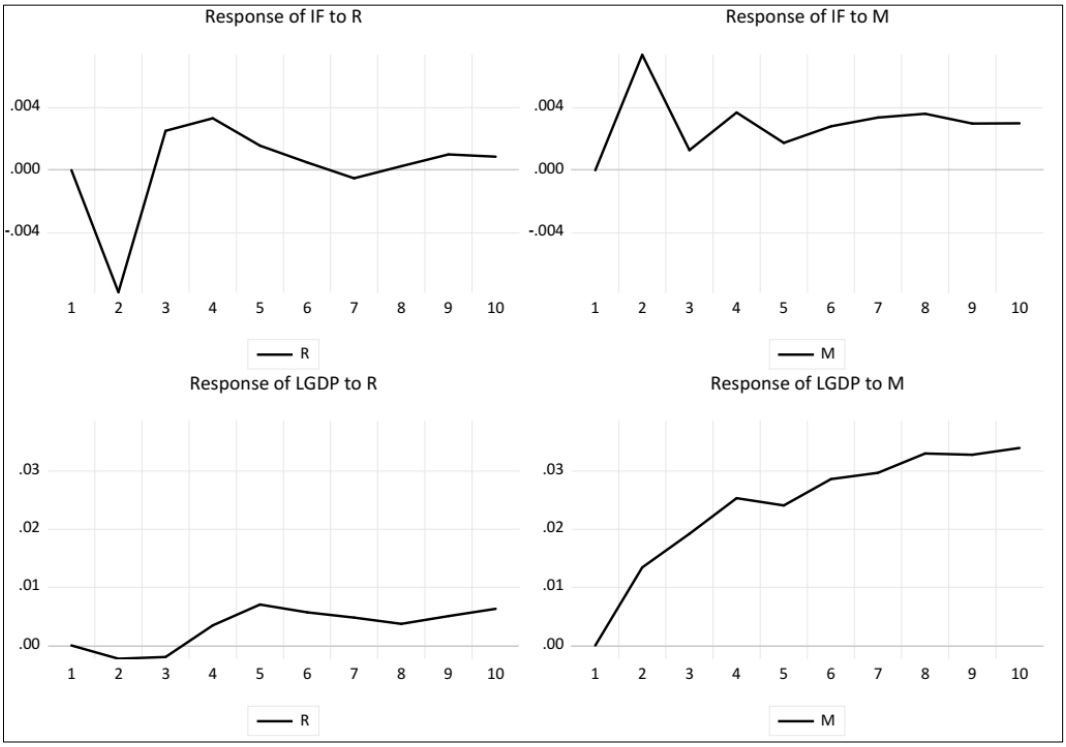
In light of the long-term relationship, a 1 percentage point increase in interbank rate leads to a slight rise in inflation estimated at 0.62 percentage point. This positive effect is statistically significant, which indicates that interest rate based monetary policy is not effective at maintaining price stability in the long-term. In addition, inflation rate increases by 0.17 percentage point following a positive variation in money supply equivalent to 1 percentage point of GDP. This significant positive link between the two variables means that monetary authorities could generate a long-term decrease in inflation by reducing permanently their money supply especially in times of high inflationary pressures. The long-run coefficient associated to GDP is significant and estimated at -0.095, which reveals the negative effect of this variable on price level. As for government expenditure and current account balance, they do not play a significant role in explaining inflation long-term dynamics.

In the short-term, monetary authorities could maintain inflation at a low level by prioritizing the adjustment of interest rate as a key monetary policy variable. Indeed, inflation is negatively related to interbank rate and the coefficient associated to this predictor is significant and estimated at -1.13. Conversely, the central bank seems unable to stabilize prices through an adjustment of its money supply since aggregate M3 has no significant impact on inflation rate in the short-run. GDP, government expenditure and current account balance do not exert an upward pressure on prices, which is reflected by their negative and significant short-term coefficients (i.e. estimated at -0.12, -0.76 and -0.43 respectively).

In overall, Moroccan central bank could manage to control inflation effectively by prioritizing the use of interest rate as a policy variable in the short-term and by adjusting its money supply in the long term.

We focus our next analysis on impulse response functions in order to explore the possibility of reconciling between targeting inflation and supporting economic growth in Morocco.

Figure 1. Response to one standard deviation innovations



Following a positive shock in interbank rate, inflation drops substantially in the short-term (i.e. over the first two years), shows a positive reaction over the next three years and returns to its initial baseline by the end of the sixth year, which confirms our previous findings. Indeed, prioritizing the adjustment of interest rate as a monetary policy variable allows an effective control of inflation in the short-term. In addition, output shows a limited negative reaction to shock in interbank rate over the three first years before moving upward starting from the fourth year. The direction of output response indicates that a restrictive monetary policy based on interest rate does not hamper significantly economic activity. Finally, the impact of an increase in money supply on inflation and output is positive and noticeable over the analysis period. Thus, a monetary expansion stimulates economic activity and generates inflationary pressures that last in the long term.

In light of the impulse response analysis, there is a margin for reconciliation between price stability and economic growth whenever monetary authorities base their inflation control efforts on interest rate adjustment. Indeed, an increase in central bank's policy rate alleviates inflationary pressures in the short-term without

hampering economic activity. The margin for reconciliation between inflation control and growth becomes tighter if central bank's price stabilization efforts are based on a permanent contraction in money supply. Indeed, a positive shock in this variable produces a long-term positive effect on price level and output, which means that monetary contraction would curb inflation and reduce the economy's growth potential.

5. Conclusion

In this research paper, we used the VECM framework to assess Moroccan central bank's ability to target inflation. The interpretation of the model's coefficients allowed us to draw some interesting conclusions about the short and long-term implications of monetary policy in Morocco. In addition, we explored the possibility of reconciling between inflation control and growth stimulation through an impulse response analysis.

An interest rate based monetary policy is not effective at maintaining price stability in the long-term. However, monetary authorities could generate a long-term decrease in inflation by reducing permanently their money supply especially in times of high inflationary pressures. In the short-term, monetary authorities could maintain inflation at a low level by prioritizing the adjustment of interest rate as a key monetary policy variable. Conversely, the central bank seems unable to stabilize prices in the short-run through an adjustment of its money supply.

An increase in central bank's policy rate eases inflationary pressures in the short-run without reducing the economy's growth potential. This result reveals the existence of a margin for reconciliation between price stability and economic growth whenever the central bank bases its inflation control efforts on interest rate adjustment. This margin becomes tighter if monetary authorities attempt to curb inflation through a permanent monetary contraction since reducing money supply would hamper economic activity.

Prioritizing interest rate adjustments as monetary policy measure could be a relevant choice in a context of moderate and short-lived inflation since it provides a wide margin for reconciling price stability and economic growth. In times of high and persistent inflation, the central bank should prioritize inflation control through a permanent decrease in its money supply.

Appendixes

Table A1. VAR lag order selection criteria

Lag	LR	FPE	AIC	SC	HQ
1	NA	3.97e-21	-29.96437	-28.41297*	-29.41239*
2	47.78193	4.73e-21	-29.90740	-26.80460	-28.80344
3	51.13413*	3.49e-21*	-30.56936*	-25.91517	-28.91344

Table A2. VECM residual tests

Autocorrelation LM test	White heteroskedasticity test	Normality test
0.525526 (0.9623)	515.6943 (0.8197)	18.06903 (0.1136)

( ) P-value.

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