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Original Research Article

Analysis of Interactions between Financial Markets and the Real Economy: The Case of Morocco

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Abstract

This study analyses the interactions between financial conditions and real activity in Morocco by examining the policy rate, bank credit, real GDP and inflation together. Using annual data covering 1995–2024, a VECM–SVAR framework is employed to capture both long-term relationships and the propagation of macro-financial shocks. The results show that a single cointegration vector links monetary conditions, credit and real activity in a sustainable manner. Bank credit is the main channel of adjustment in the system, while the policy rate appears to be largely exogenous and insensitive to imbalances. In general, monetary shocks have moderate effects, transmitted mainly via credit, while inflationary shocks are more powerful and persistent, leading to a marked tightening of financial conditions. These conclusions highlight the need to strengthen monetary transmission, develop countercyclical macroprudential tools and improve coordination between monetary, fiscal and structural policies in order to support macro-financial stability in Morocco.

Keywords: Credit, Currency, GDP, Inflation, Monetary transmission, Morocco, VECM, SVAR.

1. INTRODUCTION

Financial markets and the real economy form the two fundamental pillars of a country's economic architecture, shaping each other through complex channels of information, credit and expectations. Far from evolving as two separate spheres, they form an integrated system in which financial signals influence real activity, while macroeconomic performance feeds back into asset valuations, credit conditions and investor sentiment. This dynamic interaction is central to understanding contemporary economic fluctuations, the transmission of economic policy and long-term growth (Benhabib *et al.*, 2019; Mclean & Zhao, 2014; Rivas-Aceves & Dávila-Aragón, 2021).

Financial markets affect the real economy through several mechanisms. First, by determining the cost and availability of capital, which are generally measured by interest rates and credit growth, they directly influence investment, production and employment decisions (Chiorazzo *et al.*, 2017). Second, market prices act as information aggregators, transmitting expectations about productivity, profitability and public policy, which guide the allocation of resources (Benhabib *et al.*, 2019). Thirdly, through wealth and collateral effects, fluctuations in asset prices influence consumption, debt capacity and aggregate demand (Jarrow, 2014). However, these links are not unidirectional: macroeconomic shocks, inflation dynamics and structural changes in the productive apparatus in turn impact financial stability, credit supply and interest rate developments (Aizenman *et al.*, 2013). The result is a system of interdependence and amplification in which financial and real variables co-evolve and reinforce each other over the economic cycle.

Despite extensive theoretical and empirical research, several questions remain open, particularly regarding the intensity, direction and asymmetry of these interactions in emerging economies. Unlike advanced economies, which are characterized by deep and diversified financial systems, countries such as Morocco have a system largely dominated by the banking sector, relatively underdeveloped capital markets and credit transmission channels influenced by regulatory, structural and informational constraints. This configuration can alter the speed and scale of interactions between the financial and real spheres, and even weaken certain traditional monetary or credit transmission channels. Understanding these dynamics is essential for developing policies that reconcile financial development and macroeconomic stability.

Furthermore, the recent period of tightening international financial conditions, high inflation and post-pandemic recovery highlights the increased sensitivity of real economies to financial shocks. As Pošta & Pikhart, (2015a) point out, financial risk often acts as an amplifier rather than a source of real fluctuations. This raises a key question: how do shocks originating from financial variables such as interest rates, private sector credit, or price dynamics, spread within the Moroccan economy, and to what extent do they feed back into financial performance and monetary conditions?

Answering these questions requires an empirical approach capable of capturing the dynamic, bidirectional relationships between financial and real variables. The vector error correction model (VECM), combined with a structural VAR (SVAR) specification for short-term dynamics, and provides a suitable framework for this purpose. By identifying structural shocks using theoretical restrictions, this methodology makes it possible to trace the transmission mechanisms of interest rate, credit, activity and price shocks. It also makes it possible to determine whether financial developments in Morocco mainly influence the real economy, or whether they are themselves a consequence of it, while assessing the magnitude and persistence of these effects.

Although several international studies have analyzed similar interactions using VAR, VECM or DSGE models (Aizenman *et al.*, 2013; Benhabib *et al.*, 2019; Ciola, 2020), the empirical evidence available for Morocco remains limited. Most national analyses focus either on monetary transmission or on the dynamics of certain sectors, without explicitly modeling the bidirectional relationship between monetary conditions, credit, inflation and real activity. This research aims to fill this gap by developing a VECM–SVAR framework incorporating four key macro-financial indicators: the interbank rate, credit to the private sector, real GDP and the general price level.

The objective is twofold: firstly, to identify the direction and magnitude of the causal links between financial and real variables in Morocco; second, to analyze how shocks whether monetary, financial, or macroeconomic propagate within this system. This work thus contributes to the literature on finance-economy interactions in emerging economies and provides useful empirical evidence for policymakers seeking to strengthen financial stability while supporting sustainable and resilient growth.

The rest of the article presents the theoretical foundations and previous studies, describes the data and the VECM–SVAR methodology, presents the results of the impulse response and diagnostic analyses, and concludes with the economic policy implications for Morocco's financial development strategy and macroeconomic resilience.

2. LITERATURE REVIEWS

Financial markets and the real economy form a co-evolving system in which capital, risk and information circulate continuously. Beyond the traditional view of finance as a neutral intermediary that merely connects savers and investors, recent literature emphasizes a profound informational interdependence: companies learn from market prices, which aggregate expectations and private signals, while markets learn from companies' disclosures and actual decisions. This mutual learning creates strategic complementarities in information production: when one side (investors or companies) produces more information, the other has an incentive to produce more; conversely, in times of downturn, information production contracts on both sides, paving the way for self-fulfilling uncertainty traps. In this type of configuration, a simultaneous peak in financial uncertainty (volatility, fear indices) and real uncertainty (productivity dispersion, forecasting errors) can occur without any major fundamental shock, simply because each side anticipates that the other will reduce its information efforts (Benhabib *et al.*, 2019). This approach complements the financial accelerator mechanism: very often, financial risk does not initiate real cycles, but amplifies them (Pošta & Pikhart, 2015), as confirmed by structural VAR models for the Czech Republic, where financial risk factors significantly affect real variables as amplifiers rather than primary drivers.

Within this general framework, the literature identifies several major transmission channels between the financial and real spheres, foremost among which are the information and price channel, the credit and external financing channel, the asset price and wealth channel, and finally financial cycles and crises. On the information and price side, modern markets do more than just balance supply and demand: prices act as the sensory organ of the economy. They aggregate information on demand, productivity and economic policy, and guide investment and resource allocation decisions. When prices are informative and transparency is high, firms invest more efficiently and aggregate output is higher; Conversely, when information production contracts, uncertainty increases, projects are poorly selected and growth deteriorates, with the possibility of shifting from a ‘good’ to a ‘bad’ equilibrium of low activity (Benhabib *et al.*, 2019).

At the same time, credit and external financing play a key role. Financial conditions determine access to financing and its cost; in times of recession or low confidence, external financing constraints tighten, so that companies rely more on self-financing than on investment opportunities, adjusting employment and investment downwards (Mclean & Zhao, 2014). In banking systems, the bank credit channel is particularly important: in Italy, for example, the business cycle

worsens the portfolio risk of banks, which then tighten their credit supply; this tightening in turn weighs on GDP via the credit supply channel and the borrower balance sheet channel (Chiorazzo *et al.,* 2017). In the euro area, Claessens *et al.*, (2011) show that credit booms and busts strongly influence real cycles, with particularly marked asymmetric effects during slowdowns. Multi-agent model simulations for Japan confirm that credit links can amplify macroeconomic fluctuations during crises (Suzuki *et al.,* 2014). At a more structural level, the pioneering work of King & Levine (1993) and Levine & Zervos (1998) show that a developed financial system promotes capital accumulation and long-term growth, which is confirmed by more recent studies on the link between financial stability, development and capital accumulation (Rivas-Aceves & Dávila-Aragón, 2021).

A third channel involves asset prices, the wealth of agents and the cost of using capital. Fluctuations in asset prices influence the value of collateral, household and corporate balance sheets, and therefore their ability to borrow and their propensity to consume. In Jarrow's model (2014), financial development stimulates production by enabling lending and borrowing, but production risks can trigger systemic defaults and tip the economy into a state of non-financing equilibrium where the authorities have very limited room for maneuver. Other studies take a more critical view: (McGoun & Makansi, 2013) describe a 'parasitic' tendency of finance, which can extract rents from the real economy; (Ciola, 2020) shows that when the bargaining power of the financial sector becomes excessive, it can discourage new firms from entering the market, slow growth and increase instability. In general, asset price booms can reduce the cost of capital and stimulate investment, but when these booms are driven by leverage and speculation, they tend to increase financial fragility and expose the real economy to greater risk when the cycle reverses.

Finally, the literature emphasizes the dynamics of financial cycles and crises, which are often marked by significant asymmetry. Expansion phases are generally gradual, while contractions are sudden and affect most sectors, especially in financially open economies (Aizenman *et al.,* 2013). Historical studies show that banking crises lead to prolonged recessions and slow recoveries (Reinhart & Rogoff, 2008). Numerous empirical studies highlight a close co-movement between financial and real factors: in the United States, Schwert (1989)demonstrates a strong correlation between stock market volatility and industrial production; Bernanke *et al.*, (1999) show that credit spreads amplify the effects of monetary shocks; Niang *et al.,* (2011) identify significant links between financial and macroeconomic variables, with markets adapting rapidly to new equilibria. Burenin (2022) describes how credit expansions at the beginning of the cycle can create the preconditions for crises by increasing leverage and fuelling speculation. At the international level, anticipated changes in the global real interest rate often coordinate expansion and contraction phases across countries, synchronizing movements in GDP, investment, employment and asset prices via leverage and collateral channels.

All of this research naturally leads us to question the ambivalent role of finance: depending on the context, it can either support growth or, conversely, increase instability. Theoretically and empirically, most studies conclude that financial development promotes growth by reducing friction and improving resource allocation (Rivas-Aceves & Dávila-Aragón, 2021). However, its effects are highly dependent on the macroeconomic 'regime' and institutional quality. In times of stress, recession, low confidence, high uncertainty, external financing frictions become more constraining, so that the adjustment in terms of investment and employment is more brutal (Mclean & Zhao, 2014). Conversely, 'over-financialisation' and excessive market power in the financial sector can reduce the entry of new businesses, increase inequality and weaken the system (Ciola, 2020; McGoun & Makansi, 2013).

Furthermore, financial openness amplifies both positive and negative effects: it improves risk sharing in good times, but accelerates contagion in times of crisis (Aizenman *et al.,* 2013; Eppinger & Neugebauer, 2022). Recent work confirms this nuanced view: Asante et al. (2023) show that financial deepening supports growth in sub-Saharan Africa only when institutional quality is high. At the same time, economic policies, particularly monetary policy, play a key role in the link between finance and the real economy. Monetary policy acts mainly through asset prices, borrowing costs and wealth effects, as illustrated by empirical work on quantitative easing (QE) programmes. Bhattarai *et al.,* (2021) show that US QE shocks lead to lower long-term interest rates, currency appreciation and a significant rise in asset prices in emerging economies. These effects improve financial conditions, but also increase vulnerability in the event of a reversal of capital flows. At the same time, financial integration does not systematically generate growth gains. Recent dynamic panel analyses highlight non-linear effects: Caporale et al. (2025) demonstrate that the benefits of financial integration only materialize when financial development, trade openness and institutional quality reach certain thresholds. Below these thresholds, integration tends to amplify macroeconomic imbalances and financial instability. To contain these systemic risks, China has adopted a two-pillar approach, the monetary policy and macroprudential policy, to limit contagion via interconnected networks (interbank lending, derivatives, common exposures). This strategy reduces financial fragility at the cost of a slight slowdown in growth Shouwei et al. (2022). In Europe, coordination between monetary and fiscal policies remains central to reducing

the recessionary effects of fiscal consolidation (Tepus *et al.*, 2011).

Recent reports from international organizations also highlight how debt accumulation, inflation shocks and digitalization are transforming the interactions between financial markets and the real economy. In this global landscape, the case of Morocco presents some important specificities. Existing empirical work focuses mainly on the link between finance and growth and on the interaction between the stock market and macroeconomic variables. Balghity & Alaoui (2022) highlight a significant long-term relationship between financial development (domestic credit, banking depth) and GDP, with weaker short-term effects. Yamani (2022), using a VAR model, shows that stock market capitalization and liquidity contribute positively to growth, while volatility has destabilizing effects. Rachida & Idriss (2024), show that GDP, bank credit, FDI and inflation are major determinants of the development of the Moroccan stock market. More recently, Ali (2025), using an SVAR, shows that monetary policy shocks significantly affect property prices, credit and consumption, confirming the role of financial conditions in the dynamics of demand and asset prices.

Table 1: Related studies and main contributions

Study	Year	Region	Methodology	Key Findings
Benhabib et al.	2019	Global	Information-based theory	Information complementarity, uncertainty traps, and existence of dual equilibria.
Kenza & Salah Eddine,	2016	MENA	Panel ARDL (PMG, MG, DFE)	Financial development (private credit/GDP, M2/GDP, banking assets) has a negative impact on growth in both the short and long run. Financial reforms recommended.
Shaddady,	2023	MENA	Panel (OLS, GMM, quantile regression, robustness tests)	Non-linear (inverted-U) link between financial development and growth: markets promote growth up to a threshold; beyond it, effect becomes negative. Financial institutions show limited or constraining impact.
Asante et al.	2024	Sub-Saharan Africa / MENA-relevant	Panel ARDL	Finance supports growth only when institutional quality is strong.
Yamani	2022	Morocco	VAR	Stock market development stimulates growth; volatility harms stability.
Rachida & Idriss	2024	Morocco	ARDL	GDP, credit, and FDI influence financial market development.
Balghity & Alaoui	2022	Morocco	Cointegration & causality	Evidence of a long-run relationship between finance and growth.
Ali	2025	Morocco	SVAR	Monetary policy shocks affect real estate prices; credit responds to monetary impulses.

Source: Author compilation

Previous studies, whether international, regional or specifically devoted to Morocco, have greatly contributed to improving understanding of the link between the financial sphere and the real economy. However, despite the wealth of literature on this subject, no study has yet proposed a structural macro-financial framework applied to the Moroccan case that jointly identifies the interactions between interest rates, bank credit, real activity and prices. Existing national analyses generally examine these channels in isolation, focusing either on the stock market, monetary policy alone, or long-term dynamics via cointegration, without offering an integrated framework for isolating structural shocks and tracking their propagation in a Moroccan economy dominated by bank intermediation.

It is precisely in this context that the present study fits in. Drawing on these theoretical and empirical contributions, it proposes to focus on a core set of four macro-financial variables that are essential for Morocco: the interbank interest rate, monetary sector credit to the private sector, real GDP and the general price level. The interbank rate captures monetary conditions and the cost of short-term financing; credit to the private sector measures the banking channel in a system where finance is largely dominated by banks; real GDP reflects the core of economic activity; and the price level summarizes inflationary pressures, which are central to monetary policy and real cash balances.

By combining a Johansen-type error correction model (VECM) to analyze the long-term relationship and an SVAR-type structural specification to examine short-term dynamics, the study aims to highlight the transmission mechanisms between these four variables, provide structural evidence on the direction, magnitude and persistence of macro-financial shocks, and to situate the Moroccan case in the broader debate on the

interaction between financial markets and the real economy in emerging economies. It thus provides a novel integrated framework for understanding financial transmission in a bank-based economy such as Morocco's.

3. METHODOLOGY

This study is based on annual data covering the period from 1995 to 2024, which makes it possible to examine both short-term adjustments and long-term structural relationships between financial conditions and real economic activity in Morocco. The annual frequency and the moderate sample size require a parsimonious econometric framework. For this purpose, the study employs a combination of a Vector Error Correction Model (VECM) to capture long-run cointegration, and a Structural VAR (SVAR) to identify contemporaneous shocks and their transmission.

3.1. Data and Variable Selection

The data come from Bank Al-Maghrib and the World Bank. Four macro-financial variables are retained, as they represent the main transmission channels in an emerging economy where monetary policy operates primarily through the banking sector:

Table 2: Presentation of variables

Variable	Notation	Justification
Policy rate	IT	Main monetary policy instrument guiding financing conditions in the economy.
Credit to the private sector	LMSCPS	Main driver of financing in a bank-dominated financial system.
Real GDP	LGDP	Central indicator of real economic activity.
General price level	LCPI	Reflects inflationary pressures and the real effects of monetary shocks.

Source: Author compilation

3.2. Model choice and estimation procedure

The first stage of the analysis consists of determining the optimal dynamic structure of the selected variables. The Akaike Information Criterion (AIC), applied to a VAR in levels, indicates a relatively parsimonious structure. Given the annual frequency of the data and in order to avoid over-parameterization, the model retains two lags, which provides a balanced compromise between dynamic richness and statistical stability. On this basis, the existence of a long-run equilibrium relationship between the policy rate, private-sector credit, real GDP and the general price level is examined using the Johansen cointegration test. The trace statistic indicates the presence of a single cointegrating vector, revealing that the four variables co-move around a stable macro-financial equilibrium trajectory. The VECM is estimated through the representation:

$$\Delta Y_t = \alpha\beta' Y_{t-1} + \Gamma_1 \Delta Y_{t-1} + \varepsilon_t,$$

Where the term $\beta' Y_{t-1}$ captures the long-run equilibrium relation, the coefficient αmeasures the speed of adjustment toward this equilibrium when deviations occur, and the matrix $\Gamma_1$captures short-term dynamics. This stage makes it possible to characterise at the same time the structural adjustment mechanisms and the short-run interactions between monetary policy, banking credit, inflation and real activity.

To complement this analysis, a Structural VAR (SVAR) is then estimated in order to identify contemporaneous shocks and trace their propagation throughout the economy. The structural dynamics rely on the relation:

$$Y_t = C + A_1 Y_{t-1} + A_2 Y_{t-2} + u_t,$$

Where the structural innovations $\varepsilon_t$are defined through

$$u_t = A^{-1}\varepsilon_t.$$

Identification is based on a Cholesky decomposition that imposes a causal ordering consistent with monetary transmission mechanisms in a bank-based economy. In this structure, the policy rate IT affects the entire system instantaneously, bank credit LMSCPS adjusts next with operational delays, real LGDP responds according to financing conditions and demand, and prices LCPI react last because of their relative rigidity. This ordering makes it possible to distinguish monetary shocks, credit shocks, real-activity shocks and inflation shocks, which constitute the main drivers of macro-financial dynamics.

The dynamic analysis rests on two sets of impulse-response functions, the first derived from the SVAR, which describe the immediate effects of contemporaneous structural shocks, and the second obtained from the restricted VAR representation of the VECM, which incorporates explicitly the long-run equilibrium constraint. Comparing these two approaches allows the distinction between instantaneous responses and structural adjustment mechanisms, ensuring coherence of the results across different time horizons.

Finally, the reliability of the model is evaluated through several robustness tests. The Portmanteau test confirms the absence of residual autocorrelation. The Jarque–Bera test assesses the normality of the residuals. The ARCH test examines potential heteroskedasticity. The analysis of the roots of the VAR confirms the dynamic stability of the system. These diagnostic checks validate the statistical robustness of the chosen specification and the relevance of the combined VECM–

SVAR framework for analyzing macro-financial interactions in Morocco.

4. RESULTS

4.1. Descriptive analysis

The descriptive statistics of the raw series MSCPS, GDP, IT and CPI over the period 1995–2024 show dynamics consistent with the structural evolution of the Moroccan economy. Credit to the private sector (MSCPS) follows a strongly upward trend, reflecting the deepening of the banking system. GDP displays a regular and relatively stable progression, consistent with the sustained growth observed during the period. The policy rate (IT) evolves within a narrow range but undergoes occasional adjustments linked to monetary policy decisions. Finally, the consumer price index (CPI) increases moderately, indicating overall contained inflation.

These behaviors justify applying a logarithmic transformation in order to homogenize magnitudes and stabilize variance before econometric analysis.

Table 3: Descriptive statistics of the variables

Statistic	MSCPS	LGDP	IT	LGPL
Number of observations	30	30	30	30
Minimum	26.48	3.33e+11	1.50	76.26
Maximum	66.13	1.46e+12	7.00	129.60
Mean	51.01	8.42e+11	3.47	98.77
Variance	149.84	1.20e+23	2.11	211.76
Standard deviation	12.24	3.46e+11	1.45	14.55
Normality test (W)	0.885	0.945	0.848	0.962
p-value	0.0037	0.126	0.00056	0.339

Source: Author compilation

4.2. Correlation analysis

The correlation matrix highlights several strong relationships between the variables. Credit to the private sector (MSCPS) is highly correlated with GDP (0.83) and inflation (CPI) (0.81), suggesting that credit expansion accompanies both economic growth and price pressures. GDP also exhibits an extremely high correlation with CPI (0.99), indicating a joint movement between real activity and the general price level.

The policy rate (IT) is negatively correlated with all variables: GDP (-0.80), credit (-0.76) and CPI (-0.79). This negative relationship is consistent with the monetary transmission mechanism, whereby higher interest rates tend to restrain credit, demand and price dynamics.

Overall, these correlations confirm expected macro-financial relationships and reinforce the relevance of a dynamic modeling approach such as the VECM–SVAR framework for analyzing the interactions between interest rates, credit, economic activity and inflation.

Table 4: Correlation matrix

Variables	MSCPS	GDP	IT	CPI
MSCPS	1.000	0.829	-0.763	0.815
GDP	0.829	1.000	-0.804	0.991
IT	-0.763	-0.804	1.000	-0.788
CPI	0.815	0.991	-0.788	1.000

Source: Author compilation

4.3. Stationarity of the variables

The results of the ADF and KPSS tests show that all variables (MSCPS, GDP, IT and CPI) are non-stationary in levels but become stationary after first differencing. The ADF test systematically rejects stationarity in levels, while the KPSS test confirms non-stationarity for all series, except for CPI where evidence of stationarity remains weak. In all cases, the two tests converge toward the same conclusion: all variables are integrated of order one, I(1).

Table 5: Stationarity results (ADF and KPSS)

Test	Transformation	MSCPS	GDP	IT	CPI
ADF	Level	Non-stationary	Non-stationary	Non-stationary	Non-stationary
ADF	First difference	Stationary	Stationary	Stationary	Stationary
KPSS	Level	Non-stationary	Non-stationary	Non-stationary	Stationary
KPSS	First difference	Stationary	Stationary	Stationary	Stationary
Order of integration		**I(1)**	**I(1)**	**I(1)**	**I(1)**

Source: Author compilation

This finding justifies the use of the Johansen cointegration test and the implementation of a VECM–SVAR framework to analyze jointly the long-term relationships and short-term dynamics among the macro-financial variables under study.

4.4. Model estimation

4.4.1. Selection of the number of lags

The first step consists of determining the optimal number of lags for the VAR model in levels, which is an essential prerequisite for applying the Johansen cointegration test. To this end, the main information criteria are used: Akaike (AIC), Hannan–Quinn (HQ), Schwarz (SC) and the Final Prediction Error (FPE).

The results suggested by each of the criteria are presented in the following table.

Table 6: Optimal lag length

Criterion	AIC	HQ	SC	FPE
Optimal lag	4	4	4	4

Source: Author compilation

The estimated values for lags 1 to 4 consistently confirm this conclusion, as the AIC reaches its minimum at p = 4 (−26.56), the HQ criterion also reaches its minimum at p = 4 (−25.62), the SC criterion reaches its minimum at p = 4 (−23.27), and the FPE obtains its minimum at p = 4 (8.09×10^{-12}).

Thus, all criteria identify a VAR(4) as the optimal specification. However, the relatively small size of the sample, consisting of 28 annual observations, exposes the model to a risk of over-parameterization, which may deteriorate the precision of the estimates and significantly reduce the degrees of freedom. In accordance with recommendations from applied econometric literature, which favors a more parsimonious structure when data are limited, we retain a VAR(2) specification. This choice preserves the essential dynamics of the system while ensuring more robust and economically meaningful estimation.

4.4.2. Johansen Cointegration Test

The existence of long-run relationships among the variables is then examined using the Johansen cointegration test, estimated with a trend in the cointegration equation and a transitory specification.

Table 7: Cointegration Test

Hypothesis	Trace Statistic	10%	5%	1%
r = 0	62.85	59.14	62.99	70.05
r ≤ 1	31.67	39.06	42.44	48.45
r ≤ 2	18.56	22.76	25.32	30.45
r ≤ 3	6.49	10.49	12.25	16.26

Source: Author compilation

The trace statistic associated with the null hypothesis r = 0 (no cointegration) is equal to 62.85, which exceeds the 10 percent critical value (59.14) and is very close to the 5 percent threshold (62.99). This hypothesis is therefore rejected, indicating the presence of at least one cointegrating relationship among the variables. In contrast, for hypotheses r ≤ 1, r ≤ 2 and r ≤ 3, the observed trace statistics (31.67, 18.56 and 6.49) all remain below the critical values at the 10 percent level as well as at the more restrictive 5 percent and 1 percent thresholds. These hypotheses cannot therefore be rejected. We therefore retain a cointegration rank of r = 1, implying the existence of a unique long-run relationship linking the interest rate, private-sector credit, real GDP and the general price level. This result is consistent with the structure of the system and will be used to estimate the VECM model in the following section.

4.4.3. Estimation of the VECM model

To examine the dynamic interactions between monetary conditions, credit, real activity and prices in Morocco, we estimate a Vector Error Correction Model that is consistent with the presence of a single cointegrating relationship among the four variables. This framework makes it possible to characterize both the long-run equilibrium linking the system and the short-run adjustments that restore this equilibrium when deviations occur. Table 8 presents the short-run coefficients of the VECM. Although most lagged differences are not statistically significant, the coefficient associated with the error-correction term (ECT) provides essential information on how each variable reacts to disequilibria in the long-run relationship.

Table 8: VECM – Estimation Results (Short-run Coefficients)

Explanatory variables	ΔIT	ΔLMSCPS	ΔLGDP	ΔLCPI
ECT$_{-1}$	−0.150	0.067*	−0.026*	−0.013*
Constant	81.34	−36.33**	14.11**	6.87**
ΔIT$_{-1}$	0.196	−0.070	−0.006	0.011
ΔLMSCPS$_{-1}$	−0.162	0.254	0.250*	0.015
ΔLGDP$_{-1}$	1.140	0.278	0.272	0.257
ΔLCPI$_{-1}$	1.159	0.069	0.512	−0.002

(*) significant at the 1 percent level, (**) at the 5 percent level.
Source: Author compilation

The estimated cointegration vector, normalized on real GDP, is given by:

$$LGDP_{t-1} = 0.0448IT_{t-1} + 0.3212\ LMSCPS_{t-1} + 0.3206\ LCPI_{t-1} + 0.0316\ trend_{t-1}$$

This relationship indicates that real economic activity in Morocco is structurally linked to monetary policy, the magnitude of bank credit and the general price level. Higher levels of credit and prices are associated with a higher long-run equilibrium level of real GDP, which reflects the role of bank financing and the observed correlation between inflation and output in emerging economies. Conversely, higher interest rates are associated with lower long-run production, illustrating the restrictive effect of tighter monetary conditions on the cost of capital.

Table 8 summarizes the coefficients of the error-correction term, which measure how each variable adjusts when the system deviates from its long-run equilibrium.

Table 9: Adjustment Coefficients (ECT)

Equation	ECT Coefficient	Significance	Interpretation
ΔIT	–0.1504	Not significant	No adjustment
ΔLMSCPS	+0.0670	1%	Positive adjustment
ΔLGDP	–0.0260	1%	Negative adjustment
ΔLCPI	–0.0127	1%	Negative adjustment

Source: Author compilation

The adjustment coefficients provide three key insights into Morocco's macro-financial dynamics. First, the interest rate does not react significantly to disequilibria, which confirms its essentially exogenous nature in the Moroccan context. Monetary policy decisions appear to be driven primarily by institutional objectives rather than by automatic market-based correction forces. This result is consistent with the discretionary role of the central bank and the predominance of administrative adjustments rather than market-determined adjustments during most of the period examined.

Second, bank credit exhibits the strongest and most significant adjustment. The positive and highly significant ECT coefficient indicates that credit increases when output, prices or long-term monetary conditions fall below their equilibrium levels and contracts when they exceed their equilibrium trajectory. This pattern highlights the central stabilizing function of the banking sector in Morocco, as adjustments in credit supply help restore macro-financial equilibrium, reflecting the dominant role of banks in financing the economy.

Third, real GDP and inflation adjust negatively to disequilibria, though at a slower pace. These coefficients suggest that when output or prices rise above (or fall below) their equilibrium level, they gradually decrease (or increase) over subsequent periods. The modest magnitude of these coefficients reflects the inertia typically observed in real and nominal variables in annual macroeconomic data, as well as the structural rigidities of the Moroccan economy.

Taken together, these results indicate a multi-speed adjustment process. While credit reacts relatively quickly to restore long-term coherence, output and prices correct more gradually, and the interest rate remains largely determined by monetary policy. This configuration is consistent with the characteristics of a bank-based emerging economy, where the financial sector plays a central intermediary role and where macroeconomic adjustments occur more slowly through the real side of the economy.

4.4.4. Model Diagnostic Tests

To ensure the statistical validity of the estimated VECM and the underlying reduced-form VAR, several diagnostic tests were conducted on the residuals. These tests assess whether the specification satisfies the classical assumptions required before proceeding to the structural identification and impulse-response analysis.

Table 10: Diagnostic Tests of the VAR/VECM Model

Test	Statistic	df	p-value	Conclusion
Portmanteau (Autocorrelation)	$\chi^2 = 72.542$	100	0.9824	No autocorrelation
Jarque–Bera (Normality, joint)	$\chi^2 = 15.35$	8	0.0527	Residualsapproximately normal
ARCH (Heteroskedasticity)	$\chi^2 = 240$	400	1.0000	No heteroskedasticity
Stability (Roots)	Max root = 1.1546	—	—	Model globally stable*

*Note: One root close to unity, but overall within acceptable stability bounds

Source: Author compilation

Table 10 shows that the reduced-form VAR satisfies the main statistical requirements. To begin with, the Portmanteau test confirms the absence of autocorrelation (p = 0.9824), indicating that the chosen lag length captures the system's dynamics adequately. Moreover, the joint Jarque–Bera test suggests that residuals are approximately normal (p = 0.0527), a result that is acceptable for annual macroeconomic data. In addition, the ARCH test reveals no heteroskedasticity (p = 1), supporting the stability of residual variance. Finally, the roots of the characteristic polynomial lie within acceptable bounds, confirming that the model is dynamically stable. Taken together, these results validate the robustness of the VAR specification and justify proceeding to the structural SVAR analysis.

4.4.5. SVAR and Structural Shocks

The estimation of the VECM established the existence of a long-run equilibrium relationship between the interest rate, private-sector credit, real activity and the general price level. However, like any reduced-form VAR model, the VECM does not make it possible to isolate true macroeconomic disturbances, since the estimated innovations remain correlated with one another. To identify orthogonal shocks with a clear economic interpretation, we first convert the VECM into a level VAR according to Johansen's representation, and then apply Cholesky decomposition to the variance–covariance matrix of the residuals.

The identification order adopted —IT → LMSCPS → LGDP → LGPL — is based on theoretical considerations widely documented in the monetary literature. The interbank rate is placed in the first position, reflecting its immediate adjustment to economic conditions and its role as the main instrument of monetary policy. Credit responds quickly to changes in interest rates but influences activity only with an operational delay; output reacts to financial conditions but affects prices gradually; and inflation, the most inertial variable, is logically positioned last. This ordering allows the identification of four structural shocks: a monetary policy shock, a credit shock, a real activity shock and an inflation shock.

The structural impulse responses derived from the SVAR, shown in Graph 1, provide valuable insights into the way economic disturbances propagate through the Moroccan macro-financial system. The following paragraphs analyze in turn the dynamics associated with each of the four structural shocks.

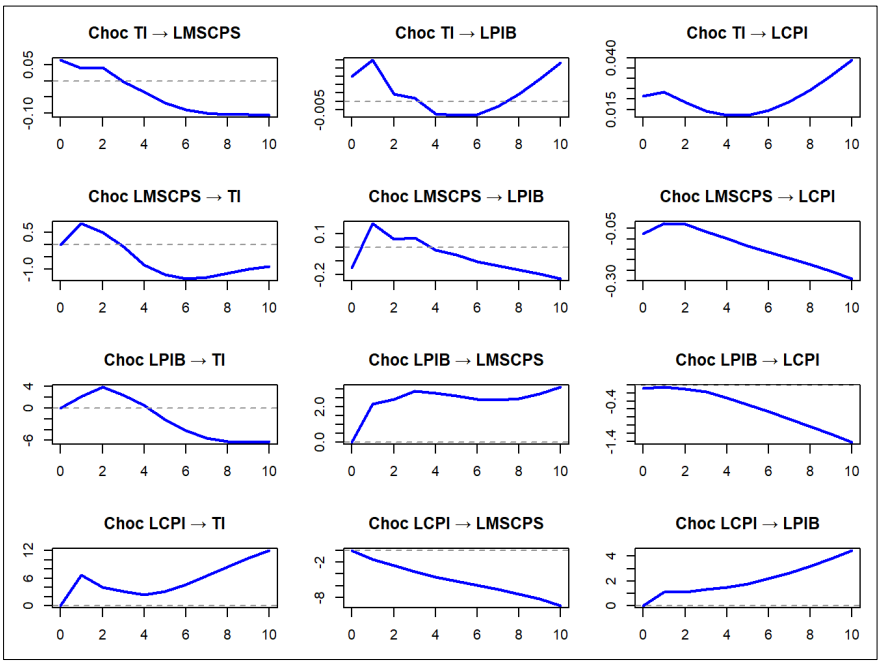

Figure 1: Responses to structural shocks

Source: Author compilation

The figure shows that an exogenous increase in the interest rate exerts a moderately contractionary effect on the Moroccan economy. Private-sector credit contracts gradually, confirming the existence of an interest rate channel operating through banking financing conditions. Real activity decreases slightly and only temporarily, suggesting a limited sensitivity of GDP to short-term interest rate fluctuations, likely due to structural rigidities and the dominant role of bank-based financing. Inflation reacts very weakly and with delay, highlighting the slow transmission of monetary policy to prices. Overall, the monetary shock clearly affects credit, but its impact on activity and prices remains limited, illustrating the restricted scope of monetary policy in a bank-based economy.

Extending this dynamic, a positive credit shock triggers a much stronger monetary reaction: the interest rate rises rapidly, suggesting that the central bank interprets this expansion as a sign of overheating or heightened financial risk. Credit quickly readjusts toward its equilibrium level, revealing an internal self-correcting mechanism within the banking sector. Real activity reacts only weakly, fluctuating around its long-term level without any lasting effect. Inflation gradually decreases a pattern typical of a supply-side shock linked to improved financing conditions. This result highlights the central role of the credit channel and the pronounced responsiveness of monetary policy to its fluctuations.

The real activity shock is characterized by a particularly strong monetary reaction. An unexpected increase in GDP leads to a notable rise in the interest rate, reflecting a preventive tightening aimed at avoiding demand pressures or macroeconomic imbalances. Bank credit reacts in a procyclical manner, adjusting upward in line with the expansion phase. However, this impact on activity remains temporary, as GDP gradually returns to its equilibrium level, indicating the absence of a self-sustaining dynamic. At the same time, inflation declines persistently, behavior consistent with a positive supply shock such as a productivity gain. In this context, a favorable activity shock primarily reflects an improvement in supply conditions rather than increased pressure on prices.

Finally, the inflation shock constitutes the most intense disturbance within the system. The interest rate rises sharply from the very first horizons, confirming the priority given to price stability. Credit contracts abruptly, more strongly than in all other scenarios, signaling a severe tightening of financing conditions. Real activity reacts positively at first, probably due to anticipation effects or temporary nominal mechanisms, before stabilizing. Inflation remains persistent and continues to rise despite the monetary tightening, reflecting a deep nominal shock that is difficult to absorb quickly. These dynamic underscores the structural vulnerability of the Moroccan economy to inflationary pressures.

5. DISCUSSION

Our findings fit fully within the theoretical and empirical literature that highlights the deep interconnection between the financial sphere and real economic activity. The moderate response to the monetary shock observed in the SVAR confirms that the interest rate functions as a transmission channel, but with limited effectiveness in a system where finance remains heavily intermediated. This conclusion is consistent with studies showing that, in bank-based economies, monetary policy operates mainly through bank credit and that its effects on real demand are often dampened by structural rigidities, a pronounced preference for self-financing, or the shallow depth of financial markets (Chiorazzo *et al.*, 2017b; Mclean & Zhao, 2014b)

The dynamics of the credit shock highlight an especially active banking channel, consistent with the analyses of (Claessens *et al.*, 2011), which emphasize that credit fluctuations are among the major determinants of real cycles. The fact that the central bank reacts strongly to an unexpected expansion of credit, as suggested by our results, echoes concerns documented in the literature regarding credit booms, which tend to amplify macro-financial imbalances and increase the vulnerability of the system (Burenin, 2022; Suzuki *et al.*, 2014). The decline in inflation following a credit shock is also compatible with the hypothesis of a supply shock, consistent with studies highlighting the stabilizing role of financing in reducing intermediation costs or investment frictions (King & Levine, 1993; Rivas-Aceves & Dávila-Aragón, 2021b).

The real activity shock reveals a configuration similar to a positive supply shock. The negative and persistent reaction of inflation aligns with models in which productivity gains reduce cost pressures, temporarily stimulating credit and output before a return to equilibrium (Bernanke *et al.*, 1999). This dynamic also connects to information-based theories (Benhabib *et al.*, 2019b) according to which markets and firms jointly respond to signals of improvement in the productive environment, generating procyclical behavior in credit without triggering inflationary spirals. The rapid return of GDP to its equilibrium level further reflects the difficulty faced by emerging economies in transforming a positive shock into a self-sustaining dynamic, often due to structural constraints linked to investment, productivity or domestic demand.

Finally, the inflation shock appears as the most powerful and persistent disturbance, which confirms the prominence of nominal pressures in emerging economies, already emphasized by (Aizenman *et al.*, 2013b). The very strong reaction of the interest rate observed in our model is consistent with the findings of Ali (2025) for Morocco and with the central role

attributed to monetary policy in controlling inflationary tensions. The sharp contraction in credit also reflects the tightening mechanism documented in episodes of high inflation, where rising interest rates tend to reduce bank liquidity and the supply of financing. The self-sustaining nature of inflation, revealed by the persistence of the shock in our results, aligns with analyses that highlight price rigidity in emerging economies and the risk of inflationary spirals in contexts of weak competition and slow transmission of adjustments (Reinhart & Rogoff, 2008).

Overall, our results confirm the view of Moroccan finance as playing an ambivalent role: stabilising when shocks originate from supply or real activity, but amplifying when tensions arise from credit or inflation. They also support the idea, widely argued in the international and regional literature (Balghity & Alaoui, 2022; Yamani, 2022), that the interactions between finance and growth in emerging economies must be analyzed within a structural framework that simultaneously incorporates monetary, banking and real channels. In this sense, the VECM–SVAR framework employed here provides a complementary and integrated reading of these mechanisms by revealing the asymmetric importance of the different shocks, while situating the Moroccan case within the broader dynamics of bank-based developing economies.

6. CONCLUSION

This study proposes an integrated framework combining a VECM and a SVAR to analyze simultaneously the monetary, banking and real interactions in Morocco. In contrast to existing works, which often focus on a single transmission channel, this approach makes it possible to identify structural shocks and to trace their propagation in an economy dominated by banking intermediation. The analysis reveals asymmetric adjustments, a central role of credit and a persistent inflationary dynamic. The study thus enriches the national literature by offering a more comprehensive perspective on macro-financial transmission mechanisms. It provides a useful analytical basis for deepening the understanding of the links between interest rates, credit, activity and prices in emerging economies.

From a public policy perspective, three main orientations emerge. First, strengthening the effectiveness of monetary transmission is essential, notably through greater flexibility in banking interest rates, a deeper money market and mechanisms that improve the sensitivity of credit to monetary policy signals. Second, the strong responsiveness of credit observed in the results calls for the development of countercyclical macroprudential tools to contain excessive expansion phases and preserve financial stability. Third, the persistence of inflationary shocks highlights the importance of enhanced coordination between monetary, fiscal and sectoral policies, while reinforcing productive capacity and competition in order to mitigate price rigidities. In a context of increasing financial openness, these measures are crucial to strengthening macro-financial resilience.

Nevertheless, the analysis presents certain limitations. The use of annual data restricts the ability to capture rapid adjustments and may weaken the identification of short-term mechanisms. The limited number of macro-financial variables does not allow the model to encompass all dimensions of the Moroccan financial system, particularly asset prices, banking profitability or capital flows. Structural identification through Cholesky decomposition relies on a fixed causal ordering that could be refined using alternative methods such as sign restrictions or Bayesian approaches.

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