Monetary policy and real estate asset prices in Morocco

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Abstract

   This study investigates the role of housing prices in the Moroccan economy and their response to monetary policy shocks. Using a Structural Vector Autoregression (SVAR) model, we explore the transmission mechanisms of monetary policy through various channels, including interest rates, credit availability, and consumer confidence. The analysis uses a comprehensive dataset spanning the period from 2006 to 2024, focusing on macroeconomic indicators, monetary policy instruments, and the Real Estate Asset Price Index (REPI). Empirical findings reveal that contractionary monetary policy leads to a delayed decline in housing prices, which may reflect structural rigidities in Morocco's real estate market. This study contributes to understanding the interplay between monetary policy and asset markets in emerging economies, providing insights for policymakers seeking to balance growth and stability objectives.

1. Introduction

Real estate assets serve as critical transmission channels for monetary policy, playing a pivotal role in shaping economic outcomes. Their value responds significantly to changes in monetary policy while also shaping the wealth of economic agents and influencing production costs. Several studies, including those by Mishkin (2007) and Muellbauer and Murphy (2008), have examined how the housing market contributes to the spread of monetary policy shocks. Changes in housing prices affect household consumption through wealth effects and the use of housing as collateral, as well as residential investment by influencing the relationship between housing values and construction costs, a mechanism known as Tobin's q (Goodhart & Hofmann, 2008). Additionally, housing prices are influenced by credit availability and interest rate fluctuations, which are themselves determined by monetary policy (Muellbauer and Murphy, 2008).

The interplay between monetary policy and housing prices has significant implications for financial stability and macroeconomic performance. A tightening of monetary policy, typically achieved through higher interest rates, increases borrowing costs, and reduces credit availability, leading to a decline in housing demand and prices. Conversely, expansionary monetary policy, characterized by lower interest rates, facilitates credit access, and stimulates housing market activity, driving up prices.

In recent years, housing prices have experienced significant increases globally, often surpassing pre-2008 levels. For instance, the United States saw record housing price growth of 14.8% in 2022 compared to the previous peak of 11.3% in 2005 (see Appendix 1). This surge in real estate prices has bolstered household wealth, stimulated consumer spending, and contributed to inflationary pressures.

In contrast, Morocco experienced a decline in real estate prices during 2021 (-2.8%), and the first before recording a modest increase of 0.51% in 2022 and 1.5% in 2023.

Given this context, it becomes imperative to investigate the intricate relationship between monetary policy and real estate asset prices in Morocco. To address this gap, the following research question is posed: How does monetary policy influence real estate asset prices in Morocco?

The primary contribution of this paper lies in being among the first to examine the impact of monetary policy on real estate asset prices in Morocco. By employing a Structural Vector Autoregression (SVAR) model alongside complementary econometric approaches, we analyze how housing prices respond to monetary policy shocks, particularly through changes in interest rates. Drawing on quarterly data spanning from 2006 to 2024, this study investigates the dynamic relationship between interest rate adjustments and asset price movements in the Moroccan context. The findings provide valuable insights into the transmission mechanisms of monetary policy within the Moroccan housing market. Specifically, a 12-basis-point increase in the Treasury Bill Rate (TBR_1Y) results in a 0.3% decline in housing prices after six quarters. Additionally, a monetary policy shock leading to a 10-basis-point increase in the TMP rate causes a 0.35% reduction in housing prices over the same period. These results highlight the sensitivity of the housing

market to interest rate changes, providing essential guidance for shaping monetary policy and ensuring financial stability.

This paper is structured as follows: Section 2 reviews the relevant literature on the role of housing prices in monetary policy transmission. Section 3 provides an overview of the Moroccan housing market and its unique features. Section 4 describes the data and methodology employed in the analysis. Section 5 presents the empirical findings. Finally, Section 6 concludes with a summary of the key insights and discussions.

2. Literature review

2.1. The role of housing prices in the economy

Housing prices play a pivotal role in shaping economic outcomes through three primary channels: the wealth effect, financial stability, and market signaling.

Housing prices are a crucial driver of economic activity due to their significant influence on household wealth and consumption. For many households, real estate constitutes the largest component of their asset portfolio. An increase in housing prices directly boosts household net worth, which, in turn, enhances consumer confidence and encourages higher spending. This relationship, often referred to as the "wealth effect". This concept posits that rising home values increase household wealth, which, in turn, stimulates consumption. This perspective builds on Modigliani's life-cycle hypothesis (Modigliani, 1986), which suggests that households base their consumption not only on current income but also by the total resources they expect to receive throughout their lives. Subsequent empirical studies, such as those by Mishkin (2001, 2007), confirm that rising property values play a key role in bolstering consumer sentiment and driving economic growth, highlighting the interconnectedness of housing markets and broader macroeconomic performance.

Housing prices also play a critical role in maintaining financial stability, as fluctuations in property values can significantly affect the broader financial system. Rising housing prices enhance household borrowing capacity by increasing collateral values, thereby boosting credit access and consumption. Conversely, declining prices tighten borrowing constraints, reduce consumption, and create feedback loops that amplify economic shocks, including those stemming from monetary policy adjustments (Aoki et al., 2004). Furthermore, falling housing prices can undermine the liquidity of financial assets, such as mortgage-backed securities, as evidenced during the 2008 global financial crisis, when declining home values triggered widespread financial disruptions. These effects extend beyond households and financial institutions, impacting consumer confidence, construction activity, and employment, thereby exacerbating macroeconomic challenges (Iacoviello, 2005).

Lastly, housing prices serve as critical economic signals, reflecting local demand-supply dynamics and broader economic conditions. Rising prices often indicate strong regional economic performance, attracting

investment in construction and real estate development (Case and Shiller, 2003). Glaeser and Gyourko (2005) highlight the role of housing prices in signaling market potential, which spurs economic activity in the real estate sector. Their research demonstrates that rising prices in particular areas can spur investment in construction and housing projects. Similarly, Case and Shiller (2003) and Poterba (1984) emphasize that housing price trends serve as a gauge for broader economic dynamics, shaping decisions about land use, infrastructure planning, and public policy. Additionally, fluctuations in housing prices influence consumer confidence and behavior. A substantial increase in housing prices may encourage households to view real estate as a lucrative investment or as a sign of financial stability, thereby driving greater economic activity. Conversely, falling housing prices can signal economic downturns or uncertainty, leading to reduced investment and slower growth in the real estate sector (Case and Shiller, 2003).

2.2. Channels through which Monetary Policy can affect housing prices

Monetary policy influences housing prices through several interconnected channels, each shaping the housing market and broader economic dynamics. The interest rate channel is one of the most direct mechanisms, as changes in interest rates driven by monetary policy affect the cost of borrowing. Lower interest rates reduce mortgage costs, increasing affordability and stimulating demand, which drives up housing prices. Conversely, higher rates dampen demand by raising borrowing costs, putting downward pressure on prices. This channel is particularly impactful in credit-reliant markets, as shown by studies from Aoki et al. (2004) and Iacoviello and Neri (2010).

The credit availability channel complements this by emphasizing how expansionary monetary policies lower interest rates and enhance liquidity, making financing more accessible to homebuyers. This increased access to credit elevates housing demand and pushes prices upward. Research by Bernanke (2007), Iacoviello (2005), and Mian and Sufi (2011) underscores the critical role of credit conditions in determining housing market activity.

The asset valuation and investment shifts channel highlights how lower interest rates reduce returns on alternative investments, such as bonds or savings accounts, prompting investors to seek higher returns in real estate. This reallocation of capital increases demand for housing, further elevating prices. Studies confirm the significant role this mechanism plays in driving housing market dynamics during periods of monetary easing.

The consumer confidence channel illustrates how accommodative monetary policy influences housing prices by boosting household optimism. Lower interest rates and improved credit conditions enhance perceptions of financial stability and future income prospects, encouraging consumers to make major purchases like homes. Case, Quigley, and Shiller (2005) and Mishkin (2007) demonstrate that increased consumer confidence amplifies housing demand, while Glaeser, Gyourko, and Saiz (2008) explore its broader effects

on economic activity.

Finally, the inflation expectations channel operates through anticipatory behavior. Higher inflation expectations lead households to predict rising housing prices in the future, motivating them to accelerate home purchases. This earlier demand exerts upward pressure on prices. Research by Case, Shiller, and Quigley (2005), and Mian, Rao, and Sufi (2013) highlight the importance of inflation expectations in shaping housing market behavior, particularly in the context of monetary policy shifts.

2.3. Empirical Evidence on the Impact of Monetary Policy on Housing Prices

A substantial body of empirical research has investigated how monetary policy influences real estate asset prices. Most studies consistently show that central bank interest rate decisions exert a significant and negative impact on housing prices using a structural VAR model. For instance, Ehrenbergerová and Bajzík (2020) conducted a meta-analysis of 31 studies spanning 27 countries to explore this relationship. Their findings reveal that, on average, a one-percentage-point rise in interest rates results in a median decline of 0.7% in housing prices within one year, increasing to 0.9% over a two-year horizon.

Berlemann and Freese (2012) focused on the Swiss housing market, analyzing interest rate shocks using a structural VAR (Vector Auto-Regression) model with data from 1987 to 2008. They confirmed that rising interest rates have a negative effect on housing prices. Similarly, McDonald and Stokes (2013) demonstrated that in the United States, increases in the Federal Reserve's interest rates lead to reductions in housing prices, whereas decreases stimulate price growth. Bjørnland and Jacobsen (2010) examined the role of housing prices in the monetary policy transmission mechanism across Norway, Sweden, and the United Kingdom. Using a structural VAR model, they observed that housing prices decline rapidly following an interest rate hike. Likewise, Giuliodori (2005) studied nine OECD countries, finding that interest rate shocks significantly impact housing prices across diverse economic contexts.

Structural VAR models are the dominant method in empirical studies on the effect of monetary policy on housing prices. Vargas-Silva (2008) applied this method to analyze the impact of monetary shocks on the U.S. housing market, using an identification strategy inspired by Uhlig (2005). The findings indicate that restrictive monetary policy shocks reduce housing starts and residential investment, with the magnitude of the effects depending on the time horizon of the restrictions. Similarly, Bian and Gete (2020) used a sign-restricted VAR to study the impact of monetary policy on housing prices in China, showing that monetary tightening, characterized by higher interest rates, leads to a significant decline in housing prices and construction activity through demand and financing cost channels.

Alternative methodological approaches have provided further evidence on this topic. Sa, Towbin, and Wieladek (2011) applied a DSGE (Dynamic Stochastic General Equilibrium) model to advanced economies, concluding that higher interest rates substantially reduce housing prices, with the extent of this effect

depending on the structural features of local mortgage markets. In emerging markets such as China, Zhang and Zoli (2014) utilized a GVAR (Global Vector Autoregression) model to investigate the interplay between monetary policy, housing prices, and macroeconomic variables, highlighting a heightened sensitivity of housing prices to interest rate fluctuations in credit-intensive economies.

In France, Monnet and Wolf (2020) used a microeconomic dataset to assess regional variations in housing price responses to unexpected monetary policy changes. Their findings revealed significant heterogeneity across regions, influenced by factors such as population density and local demand conditions.

In summary, existing literature establishes a robust consensus: restrictive monetary policy typically leads to a decline in housing prices and, consequently, a reduction in demand, while expansionary policy produces the opposite effects. Nevertheless, the magnitude and nature of these impacts depend on the institutional and structural characteristics of individual housing markets, emphasizing the importance of context-specific analyses.

3. Real Estate Market in Morocco

The real estate market in Morocco continues to be a pivotal sector within the national economy, exhibiting strong interconnections with key industries such services, the financial system, logistics and infrastructure.

One of the main levers of this dynamic lies in the integration of the real estate sector within the banking and financial system.

Figure 1: Share of Real Estate Loans in Total Bank Credit (%)
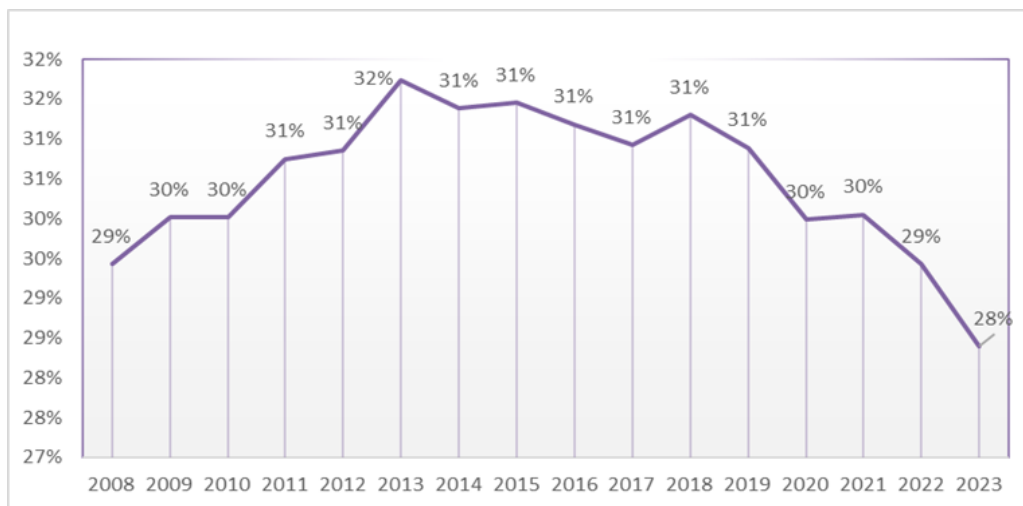
As of 2023, outstanding real estate loans amounted to MAD 301.6 billion, representing over 28% of total banking credit, according to Bank Al-Maghrib. This underscores the sector's critical role in the financial ecosystem. While the share of real estate in total credit has slightly declined due to increased diversification of lending activities, loans to real estate developers remain the backbone of real estate financing. This financing is instrumental in advancing large-scale construction and infrastructure projects, which are crucial for meeting the country's housing and urbanization demands. Meanwhile, housing loans continue to expand steadily,

supported by targeted government policies that aim to enhance homeownership and address Morocco's growing housing needs.

In addition to traditional financing mechanisms, the sector has embraced financial innovation to sustain its growth and resilience. Real estate "Murabaha", a participatory financing tool, has gained significant traction in recent years. By October 2023, participatory financing reached MAD 21.1 billion, marking an annual growth rate of 14%.[1] This illustrates the sector's ability to adapt to emerging trends and diversify funding sources, fostering its stability amidst evolving economic conditions.

Such financial mechanisms are complemented by the government's efforts to promote housing accessibility and support urbanization. Since 2007, the real estate market has played a pivotal role in Morocco's socio-economic transformation, contributing to urban development, job creation, and private investment. Programs such as "Fogarim" and "Fogaloge", established by the Moroccan government through the Central Guarantee Fund (CCG)[2], now known as **Tamwilcom**, have been instrumental in improving housing access for vulnerable and middle-income groups, further underscoring the strategic importance of the sector. These combined efforts by public policies and private initiatives have reinforced the real estate market's role as a key pillar of Morocco's economic strategy.

Figure 2: Evolution of real estate loans, housing loans and developer loans (in MDH)


The Moroccan real estate market has shown varying trends in transaction volumes across residential, land, and commercial segments from 2007 to 2023. Residential transactions dominate the market, consistently ranging between 30000 and 50000 annually, reflecting sustained housing demand driven by urbanization and population growth. Land transactions have remained stable but limited, indicating consistent interest in land acquisition for development or investment. Commercial transactions, the smallest segment, have stayed below 10'000 annually, highlighting an underdeveloped market. The market experienced a sharp decline in 2020 due to the COVID-19 pandemic but rebounded strongly in 2021, particularly in the residential sector, with signs of stabilization in subsequent years. These trends emphasize the resilience of the Moroccan real

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[1] Bank Al-Maghrib, "Annual Report 2023," highlighting data on real estate loans and participatory financing trends.
[2] La Caisse Centrale de Garantie (CCG)

estate market, the prominence of the residential sector, and potential opportunities to stimulate growth in underperforming segments like commercial real estate.

Figure 3: Evolution of the number of real estate asset transactions by type
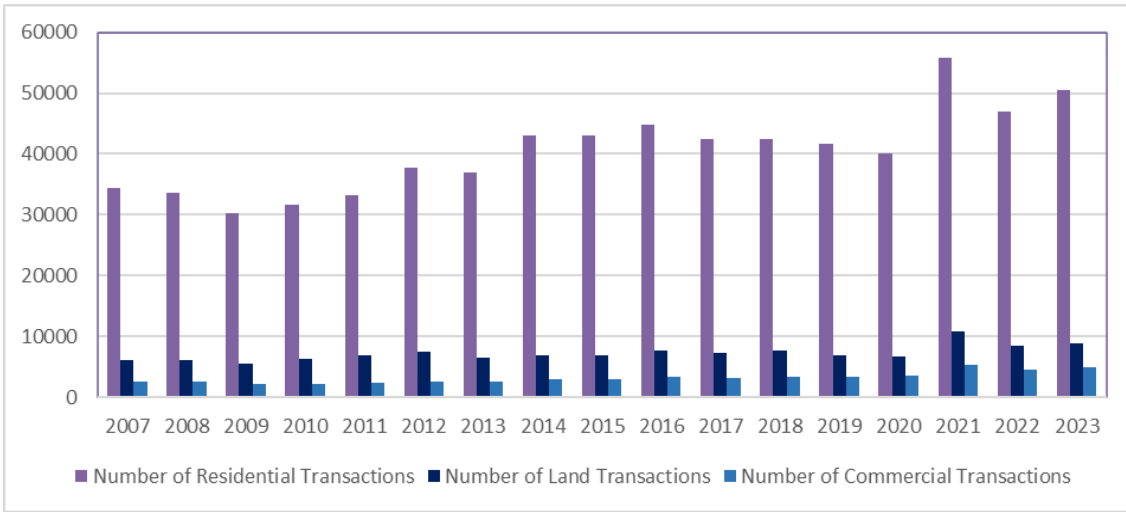
The real estate market's performance is also reflected in the evolution of the Real Estate Asset Price Index (REAPI). Between 2007 and 2023, REAPI exhibited varying trends across residential, commercial, and land segments. From 2007 to 2011, moderate volatility characterized the market, influenced by the global financial crisis. A growth phase followed between 2011 and 2017, driven by rising demand and stronger economic conditions, peaking in 2017 with increases of 4%, 5%, and 6% in residential, commercial, and land prices, respectively. However, the 2018–2020 period witnessed a downturn, amplified by the COVID-19 pandemic, with prices declining across all segments. Post-pandemic recovery began in 2021, and by 2023, all segments showed positive growth, signaling market stabilization and renewed confidence.

Figure 4: Rate of change in the real estate asset price index by type (in %)
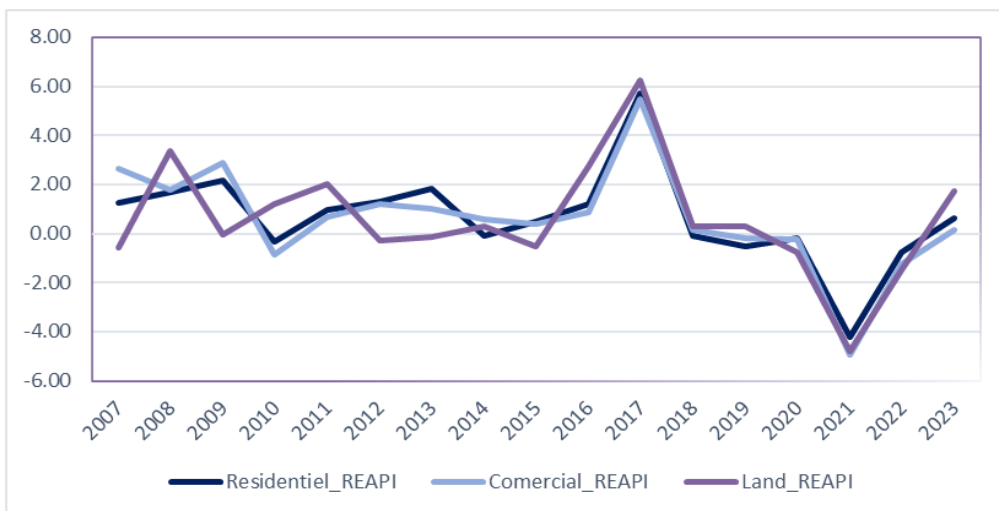
Through a combination of financial innovation, supportive government policies, and private sector investment, the real estate market has maintained its position as a cornerstone of economic development. Its resilience and adaptability continue to drive growth, while its influence extends to urbanization, financial stability, and socio-economic progress.

This interdependence between the sector and broader economic trends highlights its importance as a driver of Morocco's economic strategy.

4. Data and methodology

4.1. Data description

The dataset utilized in this study for Morocco consists of quarterly observations spanning from the fourth quarter of 2006 to the first quarter of 2024, encompassing a comprehensive range of economic and financial variables essential for empirical analysis.[3] All data used in this study is sourced directly from the Central Bank of Morocco (Bank Al-Maghrib) database, "Database of Monetary, Economic, and Financial Series."

First, macroeconomic indicators include gross domestic product (GDP) and the consumer price index (CPI). GDP serves as a measure of overall economic activity, while CPI is used to track inflation dynamics.

Second, to analyze the role of monetary policy, the dataset incorporates key instruments used by the Moroccan central bank: the interest rate and the reserve requirement. These tools play a critical role in transmitting monetary policy decisions to the real economy through interest rate and credit channels. Additionally, the weighted average rate on the interbank market (interbank rate)[4] is included as a central reference rate, closely aligned with the policy rate, to ensure the effective implementation of monetary policy. To capture the dynamics of Morocco's money market, treasury bond rates across a range of maturities—from short-term (3 and 6 months) to long-term (up to 20 years)—are included. Recognizing the central bank's emphasis on liquidity management, broad money (M3) is also included as a monetary aggregate reflecting intermediate policy objectives.

Finally, the real estate market is represented by the Real Estate Asset Price Index (REPI),[5] a quarterly indicator jointly developed by Bank Al-Maghrib and the National Agency for Land Conservation, Cadastre, and Cartography (ANCFCC). Benchmarked to 100 in 2006, the IPAI employs the repeat sales method, addressing the heterogeneity of real estate assets by focusing exclusively on properties that have undergone multiple transactions during the analyzed period. This index captures overall national real estate price trends and provides detailed insights into three subcategories: residential, land, and commercial properties.

4.2. Methodology

To assess the importance of the real estate price channel in Morocco and to know to what extent this channel contributes to the transmission of monetary policy decisions, this work is based on structural VAR modelling, in line with the empirical literature. The aim is to specify a model that captures the effects of a

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[3] The variables used are inspired by the work of Berlemann and Freese (2013).
[4] Weighted Average Rate; represents a benchmark interest rate for other financial markets. It serves as an indicator of the cost of short-term borrowing between banks within the interbank market. (Taux Moyen Pondéré (TMP) in French)
[5] Indice des Prix des Actifs Immobiliers (IPAI)

monetary policy shock on housing prices.

The structural VAR captures the dynamics of a vector of n endogenous variables X_t, which follows a vector autoregressive process defined as:

$$X_t = A_0 + A_1 X_{t-1} + \cdots + A_p X_{t-p} + \varepsilon_t \qquad (1)$$

$$X_t = A_0 + \sum_{i=1}^{p} A_i \cdot X_{t-i} + \varepsilon_t \qquad (2)$$

where ε_t denotes a $n \times 1$ vector of reduced-form shocks. The $n \times 1$ vector of constants A_0 and the $n \times n$ matrices A_i, which characterize the reduced-form model (Equation 2), are estimated by ordinary least squares.

It is assumed that $\varepsilon_t = B \cdot \mathbf{u}_t$, where $\mathbf{u}_t$ is a vector of independent structural shocks of mean zero and unit variance (hence $Var(\varepsilon_t) = BB'$). One of the components of $\mathbf{u}_t$ is a monetary policy shock. The responses of the endogenous variables to the monetary policy shock are known once the corresponding column of B is known (as well as the reduced form matrices A_i).

To isolate structural shocks, having estimates of the reduced-form shocks ε_t is not sufficient. Indeed, the fact that the covariance matrix of ε_t (that is BB') is estimated provides only $n(n+1)/2$ restrictions, while $n \times n$ are required to identify B. Hence, additional restrictions on the matrix B are required. This study adopts three identification approaches. The first is the "Cholesky Decomposition." This standard approach assumes that monetary policy (MP) shocks do not have an immediate effect on GDP, the price index, housing prices, or monetary aggregates, reflecting the delayed transmission of policy measures to the broader economy. This approach relies on the recursive ordering of variables and orthogonalizes shocks by isolating the relevant column of the structural impact matrix (B), allowing for the derivation of impulse response functions (IRFs). Employed in a similar context by, e.g., McDonald and Stokes (2013) and Bjornland and Jacobson (2010), it offers a straightforward and interpretable method to trace the effects of MP shocks.

The second approach, "Sign Restrictions", imposes theoretically motivated constraints on the direction of variable responses to identify MP shocks. Specifically, with this method we assume that a tightening monetary policy shock negatively impacts output, inflation, and monetary aggregates, consistent with standard macroeconomic theory.[6] Following Uhlig (2005), this method selects structural representations (matrices B) that satisfy these restrictions, enabling a broader range of plausible responses. By combining these approaches, the study balances the clarity of Cholesky decomposition with the flexibility of sign restrictions, ensuring robust insights into the role of monetary policy in the Moroccan housing market.

Finally, the "High-Frequency" Approach leverages the immediate impact of MP decisions on financial markets. The key assumption is that changes in bond yields on days when MP decisions are announced are predominantly driven by MP shocks. A database of yield changes across maturities (3, 6 months, 2, 5, 10 years) is constructed, and principal component analysis (PCA) is applied to extract the first two components

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[6] This method is inspired by the work of Carlos Vargas-Silva (2007).

of the yield innovations. The factor loadings reveal that the first principal component (PC1) captures short-term yield variations, while the second (PC2) reflects MP-related shocks affecting long-term yields, consistent with the "path factor" concept introduced by Gürkaynak, Sack, and Swanson (2005). PC2 is integrated into the VAR model using Cholesky decomposition to analyze its effects. This approach, inspired by Kuttner (2001) and Cochrane and Piazzesi (2005), provides an innovative perspective by focusing on the intraday and short-term responses of yields to MP decisions. When applied to intraday data, as done in various studies on US and the euro area, it can provide a high-resolution perspective on monetary policy transmission. However, the accuracy tends to be lower when utilizing daily data, as is the case here. The results, detailed in Appendix 2, are less precise than those stemming from the other two approaches.

5. Empirical findings

This section analyses the dynamic effects of a monetary policy (MP) shock on key macroeconomic variables and housing prices in Morocco. The SVAR-based empirical results illustrate the transmission mechanisms of monetary policy and provide valuable insights into its implications for financial stability and economic activity.

Figure 5: Macroeconomic and Housing Market Responses to a Monetary Policy shock (Cholesky Decomposition with 90% Confidence Intervals)
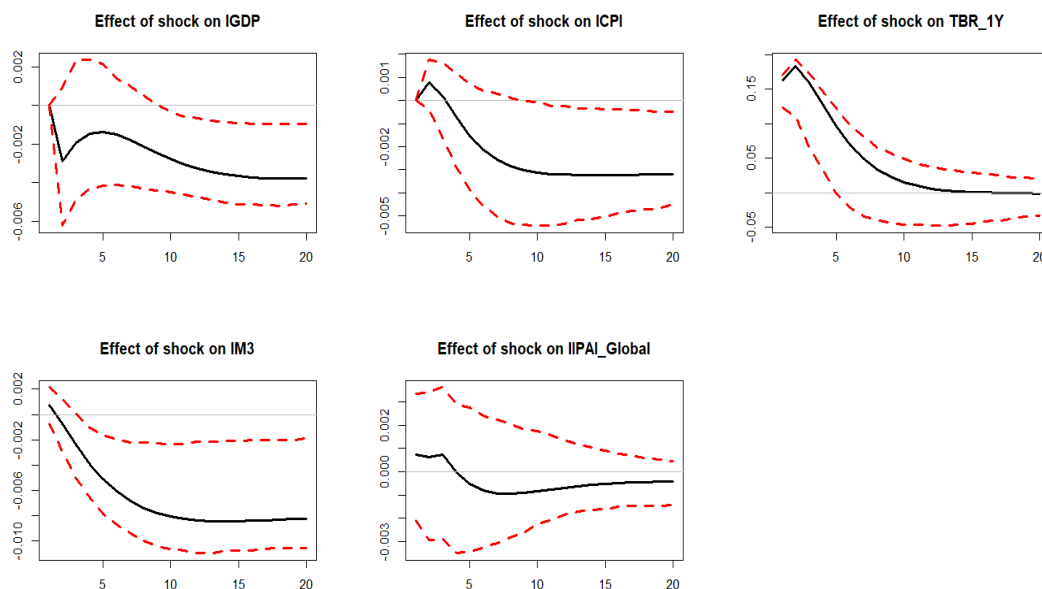

Figure 5 presents the impulse response functions (IRFs) obtained from an SVAR model estimated with a Cholesky decomposition. The IRFs trace the dynamic response of key variables to a contractionary monetary policy shock, represented by a 15-basis-point increase in the one-year Treasury bill rate (TBT_1Y). Following the shock, housing prices exhibit a 0.1% decline after six quarters, indicating that tighter monetary policy curtails housing demand and exerts downward pressure on prices. The delayed and

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moderate response may reflect structural rigidities in Morocco's real estate market, including limited financing alternatives. It is important to note that the 90% confidence interval surrounding the response of housing prices consistently includes zero, suggesting a lack of precision with this estimation approach.

Figure 6: Impact of Treasury Bill Rate Shock on Macroeconomic and Housing prices
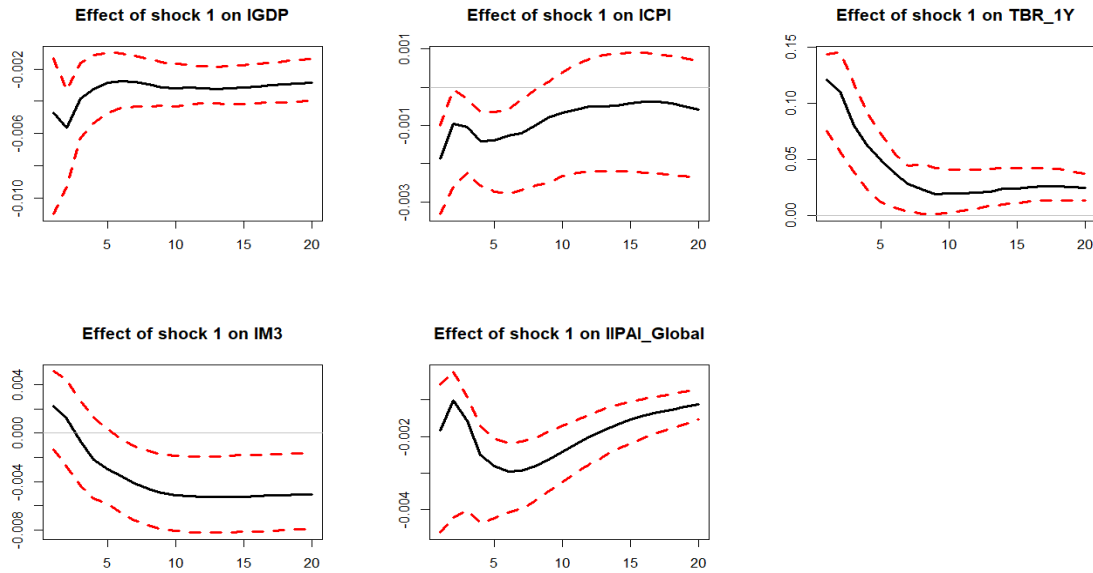**(Sign restrictions approach with 90% Confidence Intervals)**

Figure 6 presents the IRFs from a VAR model with sign restrictions applied for eight periods. The results indicate that a 12-basis-point increase in the Treasury Bill Rate (TBR_1Y) leads to a 0.3% decline in housing prices after six quarters. This aligns with the dynamics observed in the standard SVAR model, but the effect is more important. These results appear to be more accurate than the previous ones, as the confidence interval for the response of housing prices does not include zero.

Figure 7: Impact of Interbank rate (TMP) Shock on Macroeconomic and Housing variables
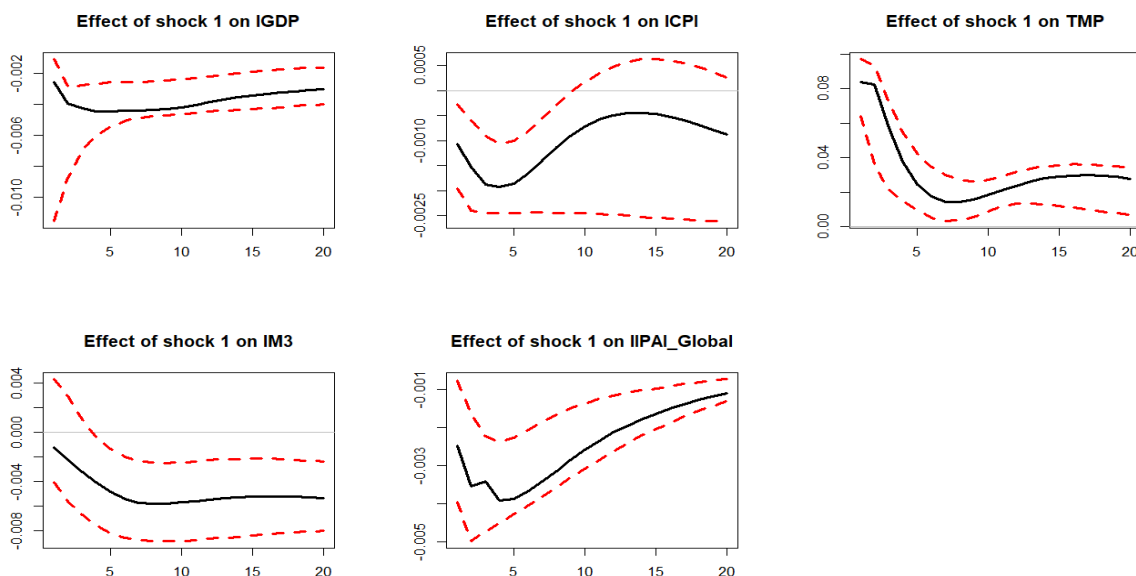**(Sign restrictions approach with 90% Confidence Intervals)**

Figure 7 shows the IRFs when the interbank rate (TMP) is used as the monetary policy instrument. A monetary policy shock causing a 10-basis-point to increase in TMP reduces housing prices by 0.4% after four quarters. This stronger response reflects the higher sensitivity of the housing market to interbank rate changes, arguably because these directly affect mortgage rates and borrowing costs.

The results indicate that a shock to the system triggers varied responses across macroeconomic indicators. For instance, a shock initially leads to a negative response in real GDP and consumer prices (lCPI), with the effects gradually fading over time, suggesting that the shock has a transitory impact on economic output and price levels. Similarly, the money supply (lM3) exhibits an initial negative response, reflecting the contractionary nature of the shock, with the effect dissipating over time.

This finding suggests that tighter monetary policy, reflected in higher short-term interest rates, dampens housing demand and prices over time. The delayed and relatively modest response of housing prices highlights the sluggish adjustment mechanisms in Morocco's real estate market, potentially due to structural factors such as market rigidity or limited financing alternatives. This evidence underscores the transmission channels of monetary policy in influencing asset prices, with implications for policymakers seeking to balance monetary and financial stability objectives.

In the case of Morocco, this result aligns with broader empirical evidence from countries with similar characteristics. For instance, a study on South Africa by Ncube and Ndou (2013) found that an increase in policy rates significantly dampens housing prices, with a delayed response due to slow adjustments in credit markets. Similarly, research on Turkey by Çatık and Karadaş (2017) highlights a comparable lagged effect, where housing prices respond to monetary tightening only after several quarters.

Overall, our findings underscore the significant influence of monetary policy on the Moroccan housing market and broader economic conditions, emphasizing the need for careful calibration of interest rates to balance economic growth and stability.

6. Conclusion

This study has explored the transmission of monetary policy to the Moroccan real estate market, emphasizing housing prices as a critical channel. Using a Structural Vector Autoregression (SVAR) model, the findings indicate that contractionary monetary policy, through increased interest rates, leads to a moderate and delayed decline in housing prices. These results are consistent with global evidence and underscore the role of the housing market in the broader monetary policy transmission mechanism.

However, the relatively modest response of Moroccan housing prices to monetary policy shocks may be attributed to structural characteristics unique to the Moroccan market. Factors such as strong government intervention through social housing programs and limited reliance on variable-rate mortgages reduce the sensitivity of housing prices to changes in monetary policy. These structural features necessitate a tailored

approach when formulating monetary policies that consider the complexities of the local housing market. Future research should explore additional dimensions of this relationship, such as the regional heterogeneity of housing price responses and the role of informal housing markets. Such analyses may lead to a more nuanced understanding of how monetary policy functions within Morocco's distinct economic and institutional context. This insight can aid in formulating policies that effectively balance the dual objectives of economic growth and price stability.

Appendix 1 – International Comparison of Housing Price Growth Rates

Table 1: Housing Price Growth Rate (in %)

|	2019	2020	2021	2022
European Union - 27 countries	4.9	5.6	8.4	7.8
Germany	5.8	7.7	11.6	5.1
France	3.3	5.2	6.3	6.3
Hungary	17.0	4.9	16.5	22.3
Netherlands	7.2	8.0	14.5	13.3
Portugal	10.0	8.8	9.4	12.6
Turkey	4.8	23.8	37.5	154.2
US	3.4	6.1	17.1	14.8
Morocco	-1.24	0.04	-2.8	0.51

Appendix 2 – Results from the High-Frequency Approach:

The table below presents the factor loadings from the PCA analysis conducted on changes in yields of various maturities on the days when monetary policy decisions were announced. It can be argued that, on these days, most yield changes were driven by monetary policy. Given its loadings across different yields, PC2 seems to be a factor that influences the longer end of the yield curve, similar to the path factor identified by Gürkaynak et al. (2005). Specifically, a one-unit increase in PC2 is associated with yield increases of 0.3 percentage points for 2-year bonds, 0.5 percentage points for 5-year bonds, and 0.8 percentage points for 10-year bonds.

Table 2: PCA Factor Loadings for Treasury Yield Changes by Maturity

Treasury bills by maturity	PC1	PC2	PC3	PC4	PC5
3 Months	-0.94	0.01	0.02	0.03	0.34
6 Months	-0.33	0.01	-0.01	0.06	-0.94
2 Years	0.05	0.30	0.90	0.31	0.03
5 Years	0.05	0.52	-0.43	0.73	0.08
10 Years	0.00	0.80	-0.05	-0.61	0.04

Figure 8: Impulse Response Functions to a Shock of PC2

(Cholesky Decomposition with 80% Confidence Intervals)"
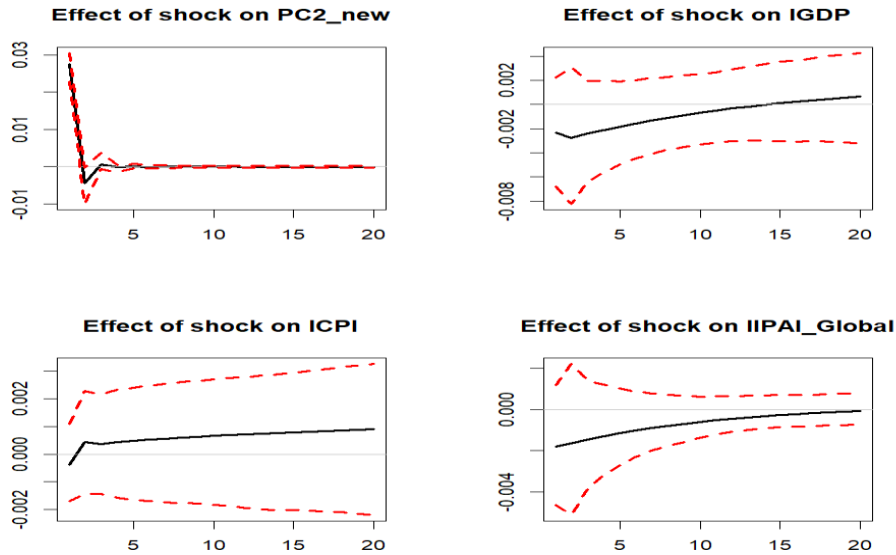
The previous figure has been obtained by running a SVAR using the Cholesky approach, with PC2 ordered first. (As this variable is constructed as a shock, it can be considered exogenous to the other variables, and therefore placed first among the endogenous variables.) Based on the factor loadings displayed above, we can map the impact of the second principal component (PC2) on bond yields: a one-standard-deviation shock in PC2, calibrated at 0.03, results in yield increases of approximately 1 basis point for 2-year bonds, 1.5 basis points for 5-year bonds, and 2.4 basis points for 10-year bonds. Consequently, the findings suggest that a monetary policy shock, which raises long-term interest rates by these amounts, leads to a 0.2% decline in housing prices (see bottom-right plot). This analysis therefore indicates a stronger effect than those derived from the two approaches presented in the main text. However, the confidence band shown in Figure 8 suggests that this effect is not accurately estimated.

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