

House Prices under Pressure: The Effect of Rising Borrowing Costs and Inflation*

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This policy brief assesses how rising inflation and borrowing costs may impact the housing market in Slovakia. The results of our analysis, in combination with the expected future path of inflation and interest rates, strongly suggest a downward trend in house prices going forward. More specifically, this policy brief shows that rising mortgage interest rates, rising inflation, and increasing government bond yields, historically had a downward impact on real property prices in Slovakia. The tightening of bank credit conditions, expressed through rising mortgage lending rates, has a sizeable and immediate adverse effect on the housing market. Rising inflation reduces disposable income and slows the economy. This also reduces real house prices, although with a lag. Rising government bond yields due to monetary policy tightening, finally, have a long-lasting negative impact on the housing market and the economy.



Expected future inflation and interest rate developments suggest a stagnation or even decline of real house prices.



A monetary policy tightening has an adverse and relatively protracted effect on the economy and the housing market.



Tightening of bank credit conditions has a negative and immediate impact on the housing market.



Rising inflation reduces disposable income, worsens economic conditions, and puts downward pressure on real house prices.

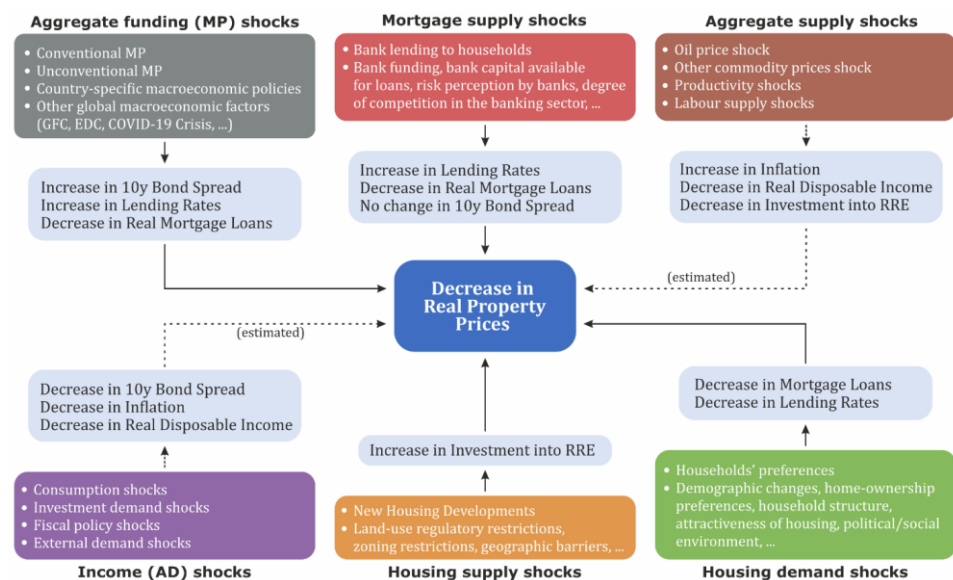
* We would like to thank Reiner Martin, Ján Klacso, Pavel Gertler, Michal Horváth, Ján Beka and Carlos Canizares Martínez for their helpful comments and discussions.

The Housing Market in Slovakia

The housing market is central to the Slovak economy, with a very high ratio of owner-occupied housing. It is almost exclusively bank financed and impacted by numerous structural shocks originating in various economic sectors (e.g., commercial banks, central banks, households, developers, firms, government, or the external sector). We summarize these potential shocks in [Chart 1](#) and describe their typical impact on real house prices.

Chart 1

Structural drives of the housing market in Slovakia



Source: See [Appendix A](#).

We study the historical relationship between inflation, interest rates, and the real estate market during 2004Q2-2022Q2 using a structural VAR model¹. The model includes variables covering the housing market (house prices and volume of housing) and the mortgage market (lending rate and volume of loans). We also include key macroeconomic variables that may impact the real estate market in Slovakia (general level of interest rates, inflation, and economic activity). More details about the model and the variables are provided in [Appendix A](#).

We identify four distinct periods of the housing market cycle in Slovakia ([Chart 2](#)), which broadly reflect the general macroeconomic history of Slovakia. We decompose the effect of the individual structural shocks summarized in [Chart 1](#) on real quarterly house price growth in Slovakia².

The first period covers the volatile years from the introduction of the standardized mortgage market until and including the Global Financial Crisis. The start of the mortgage market in the early 2000s and the positive economic development until mid-2008 led to increasing demand for housing and growing mortgage lending by banks. Thus, housing demand shocks and mortgage supply shocks explain most of the increase in real property prices during this period. During the Global Financial Crisis, however, demand for housing loans decreased, and the reluctance of banks to lend increased. In addition, insufficient monetary policy loosening during the crisis contributed to the decrease in real house prices.

¹ In the VAR model, we use zero and sign restrictions to identify and analyze the structural drivers of the housing market in Slovakia. We provide additional modelling details in [Appendix A](#).

² Real house prices are obtained using CPI as a deflator.

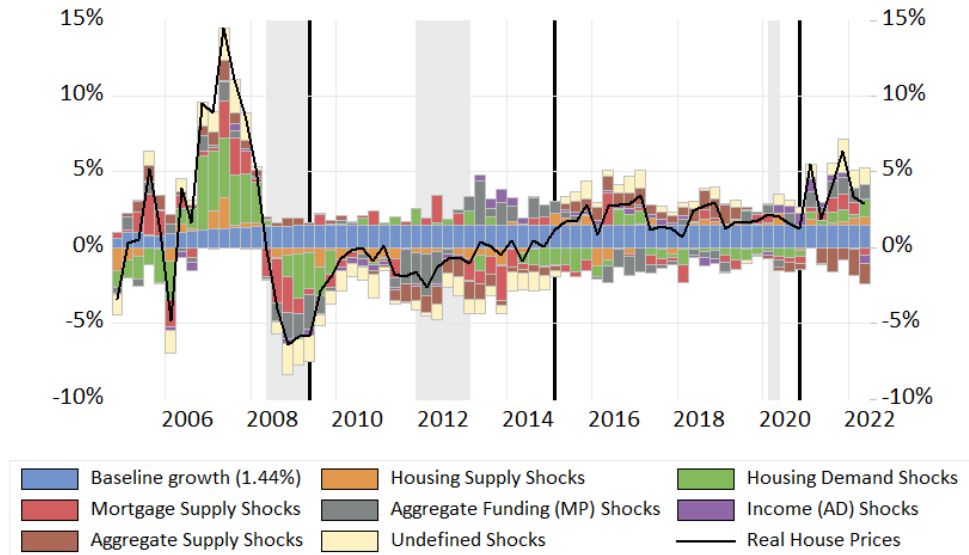
During 2009-2015, real property prices declined persistently, because of the European sovereign debt crisis, stagnant economic growth, and higher inflation. The European debt crisis between 2011-2012 caused a widening of (Slovak) bond spreads, reduced bank lending, low economic growth, and persistently high unemployment. All these factors put downward pressure on real property prices. However, ECB monetary policy started to contribute positively to house price growth at the end of this period.

From 2016 to 2020, house prices were growing at a level consistent with the long-term average (baseline) growth³. Low inflation and increasing income contributed positively to real house price growth. Overall, the growth was close to the baseline level, and most structural drivers seem to offset each other.

The final period of 2021-2022 was volatile, with historically high real house price growth. Lending rates hit their lowest levels in history, mortgage loans rose significantly, and monetary policy remained accommodative for most of this period. These developments manifest themselves through positive mortgage supply, housing demand, and aggregate funding shocks, although this changed towards the end of the sample. On the opposite side, the unfavorable effects of rising inflation and declining disposable income (adverse aggregate supply shocks) were gaining momentum, exerting downward pressure on real house prices.

Chart 2

Historical decomposition of quarterly real house price growth



Notes: Shaded areas represent EA recessions according to Euro Area Business Cycle Network. Black vertical lines represent thresholds between different stages of the housing market cycle.

Source: Authors' own computation.

³ In addition to business cycle shocks, long-term economic developments may influence house price growth. The baseline growth may partly reflect Slovakia's convergence process aimed at reducing unemployment and boosting growth and investment.

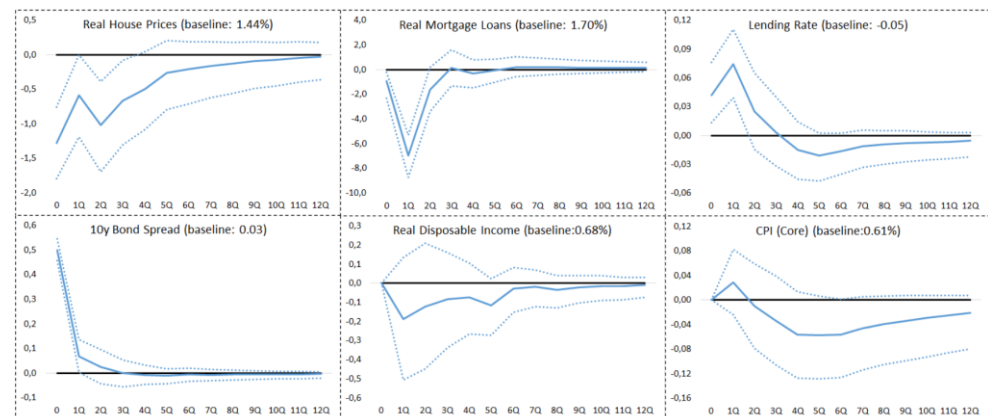
The Transmission Mechanism of Rising Inflation and Interest Rates

This section explains in more detail the transmission mechanism of rising inflation and rising interest rates on real house prices. More specifically, we use our VAR model and so-called ‘impulse response functions’ to analyze the impact of the selected adverse shocks on the housing market. We provide more details on the calibration of the magnitudes of these shocks in [Appendix B](#).

A monetary policy tightening expressed through a substantial widening of the spread of Slovak government bond yields has an adverse and relatively protracted effect on the housing market and the economy⁴. The rising spread ([Chart 3](#)) causes the lending rate to increase immediately, which peaks in the next quarter before it quickly returns to its baseline level. Mortgage loan growth is only slightly depressed on impact, but the effect of the shock is fully reflected in the next quarter in the form of declining loan growth. As a result, house prices immediately decrease and stay subdued for the next three quarters. It is interesting to note that house prices are subdued longer than mortgage loans. One explanation is that the monetary tightening is also associated with the expectation channel, so the response of house prices is more persistent. The reaction of the real economy (disposable income and inflation) is lagged and negative, however insignificant.

Chart 3

The transmission mechanism of the monetary policy tightening



Notes: The solid line depicts the median response at each horizon across all accepted models, while the dotted lines show the 68% interval response across all accepted models. Responses are in percentage points.

Source: Authors’ own computation.

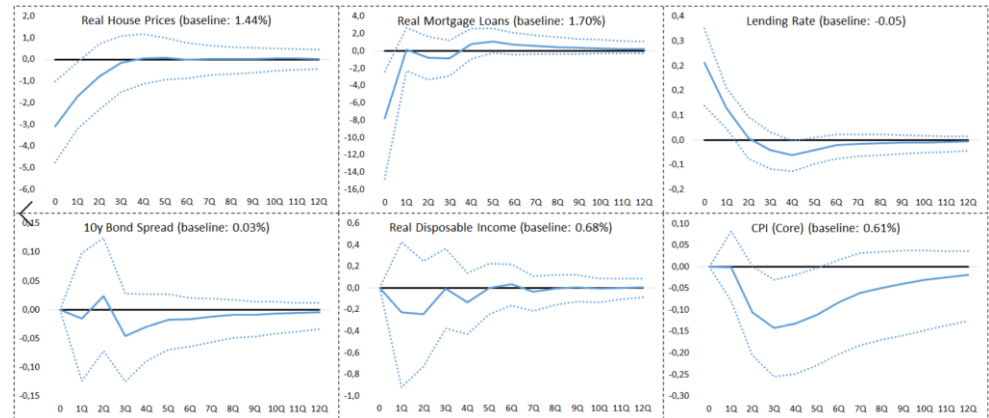
A rise in the mortgage lending rate (not triggered by tightening monetary policy) has a negative, immediate, and significant impact on the housing market. This type of shock is especially relevant for Slovakia as a member of the monetary union. In addition to the monetary policy set by the ECB, which Slovak banks transmit to the real economy, they are also a source of additional lending shocks⁵. An increase in the lending rate (e.g., banks assume that new lending is riskier and restrict credit flows to households) immediately reduces mortgage growth ([Chart 4](#)) and is accompanied by an instant fall in real house prices. The negative effect on the housing market persists for three quarters, followed by an adjustment of house prices to baseline growth. The economy, especially inflation, reacts with a lag of two quarters. The decline in inflation reaches its peak in the third quarter after the shock.

⁴ There are several alternatives how to capture monetary policy tightening. One option would be to include the shadow rate. We tried this option, but we obtained more economically plausible results with Slovak’s 10-year government bond spread against Germany’s. We give a brief economic rationing behind using these spreads in [Appendix B](#).

⁵ For example, in addition to the ECB’s quantitative easing programs after 2015, Slovak banks significantly decreased lending rates due to a high degree of competition among them.

Chart 4

The transmission mechanism of a negative mortgage supply shock



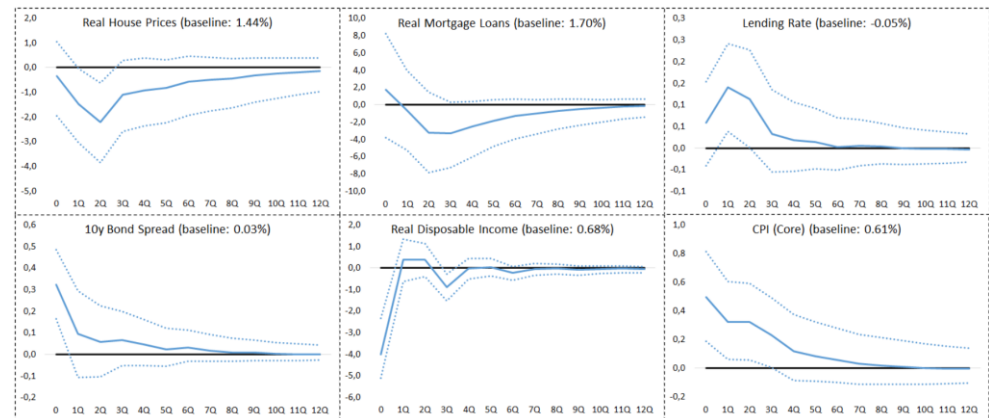
Notes: The solid line depicts the median response at each horizon across all accepted models, while the dotted lines show the 68% interval response across all accepted models. Responses are in percentage points.

Source: Authors' own computation.

Rising inflation at times of weak economic performance puts downward pressure on real house prices. This impact is lagged and materializes in the form of a decrease in real house prices in two subsequent quarters (Chart 5). The increase in inflation immediately reduces households' real disposable income. Banks thus demand higher risk premia, i.e., higher lending rates in the following quarters.

Chart 5

The transmission mechanism of a negative supply shock



Notes: The solid line depicts the median response at each horizon across all accepted models, while the dotted lines show the 68% interval response across all accepted models. Responses are in percentage points.

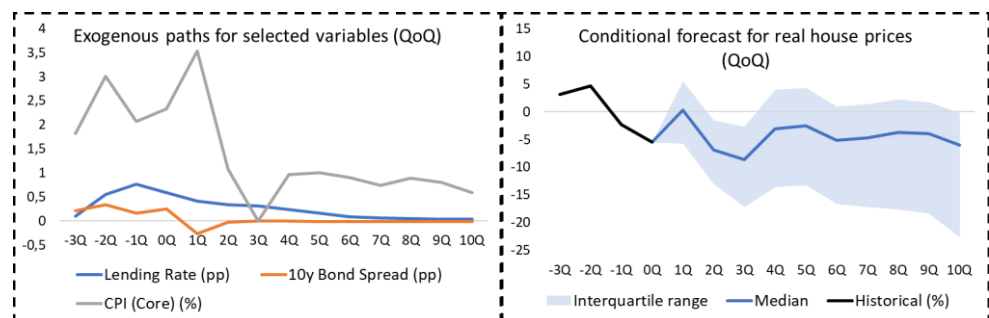
Source: Authors' own computation.

Expectations on the Future Path of the Housing Market

Expected future inflation and interest rate developments suggest that real house prices are likely to stagnate or even decrease for the foreseeable future⁶. We use the analyzed relationship between inflation, interest rates, and the housing market to generate a range of ‘conditional’ real house price forecasts considering the expected future developments for inflation and interest rates. We set the future path of inflation and interest rates according to NBS (ECB) forecasts for the next ten quarters, starting in 2023Q1 ([Chart 6](#), left). Looking at the range of forecasts, we observe a decline in real house prices during the analyzed period ([Chart 6](#), right⁷). Although the forecast range is quite wide, carrying a substantial portion of uncertainty, the decline is especially prominent and significant in a short-term horizon (2nd and 3rd quarter of 2023).

It is important to stress the high degree of uncertainty in these simulations. One possible source of uncertainty is the high volatility in the data. The other sources of uncertainty, probably more dominant, are extraordinarily large changes in the observed series towards the end of the sample (e.g., bond spreads, lending rate, or inflation). These are likely to produce unstable or a lot more volatile paths for real house prices.

Chart 6
Conditional forecast for real house prices



Notes: The exogenous paths for selected variables follow the NBS (ECB) forecasts. We study the effects of only the three previously analyzed structural shocks (monetary policy, mortgage supply, and aggregate supply structural shocks). The last observation for this exercise is 2022Q4. Before computing descriptive statistics from the simulated paths, we removed outliers (mainly explosive models) from the set of admissible models.

Source: Authors' own computation.

⁶ Topalova et al. (2023), in their broader assessments of the European housing markets, came to a similar conclusion. Their analysis shows that falling real incomes and surging borrowing costs led to a turning point in the housing markets.

⁷ For nominal growth, see [Appendix C](#).

Conclusion

The current environment of high inflation and tightening monetary policy creates a lot of questions about the future development of house prices.

Our results suggest that rising borrowing costs and inflation historically led to a significant deceleration of the housing market in Slovakia. In more detail, a monetary policy tightening, expressed as a substantial widening of the government bond yield spread, has an adverse and relatively protracted impact on house price growth. The rise in inflation, paired with a decline in real disposable income, lowers economic activity and is followed by a drop in house prices. The effect of tighter bank lending conditions is immediately reflected in the housing market and creates downward pressure on house prices. The identified relationships between these key economic variables, together with current expectations for inflation and interest rates, suggest a downward trend in house prices in Slovakia, although there is still a high degree of uncertainty regarding this forecast.

References

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Appendix A

Details of the Structural VAR Model⁸

Raw variables included in the model are listed in [Table 1](#). All time series are transformed into percentual (except interest rates) quarterly changes to ensure stationarity.

Table 1
Data used in SVAR analysis

Variable	Description	Unit	Source
Real residential investment	Gross fixed capital formation	EUR	OECD
Real house prices	Average house price (supply)	EUR/m ²	NBS MaP DB
Real mortgage loans	New housing loans	EUR thousand	NBS MaP DB
Lending rate	Lending rate on new housing loans	% p.a.	NBS MaP DB
10y bond spread	10y government bond yield against Germany's	p.p.	Eurostat
Real disposable income	Household gross disposable income	EUR	SOSR
CPI (Core)	Core inflation index	index	OECD

Source: NBS, SOSR, Eurostat, ECB, OECD.

We identify six out of the seven possible structural shocks. One structural shock is left unidentified and acts as a buffer for other types of structural shocks. We follow the literature ([Lo Duca et al. \(2022\)](#), [Huber and Punzi \(2020\)](#), [Nocera and Roma \(2018\)](#), [Tobwin and Weber \(2015\)](#) among others), where several structural drivers of the housing market are usually identified. The combination of zero and sign short-run restrictions is imposed in the model ([Table 2](#)), allowing us to specify the response of the variables to the structural shocks in line with the economic theory. Sign restrictions are based on the general market model, where shifts in the demand curve move the price and volume in the same direction, and on the contrary, shifts in the supply curve move the price and volume in the opposite direction. Pass-through from the financial sector to the real economy is identified by zero restrictions, meaning that some variables may respond only with a lag to structural shocks.

The model is estimated with two lags⁹ and intercept for all equations. We use [Breitenlechner et al. \(2019\)](#) algorithm with Bayesian estimation to generate a set of thousand admissible structural models, which satisfy our identification scheme. We calculate the median response and the 68% confidence interval across all accepted models at each horizon.

Table 2
Identification scheme

Structural shocks →		Housing Supply Shock	Housing (Mortgage) Preference Demand Shock	Mortgage Supply Shock	MP (Aggregate Funding) Shock	Income (AD) Shock	Aggregate Supply Shock
Endogenous variables ↓							
Housing Market	Real Residential Investment	+	0	0	0		-
	Real House Prices	-	-	-	-		
Mortgage Market	Real Mortgage Loans		-	-	-		
	Lending Rate		-	+	+		
Aggregate Market	10y Bond Spread	0	0	0	+	-	
	Real Disposable Income	0	0	0	0	-	-
	CPI (Core)	0	0	0	0	-	+

Notes: (+/-) sign restrictions, (0) zero restrictions, () not restricted.

Source: [Lo Duca et al. \(2022\)](#) and authors.

⁸ A more detailed explanation of structural VAR models can be found in [Kilian and Lütkepohl \(2017\)](#).

⁹ Based on the information criteria.

Appendix B

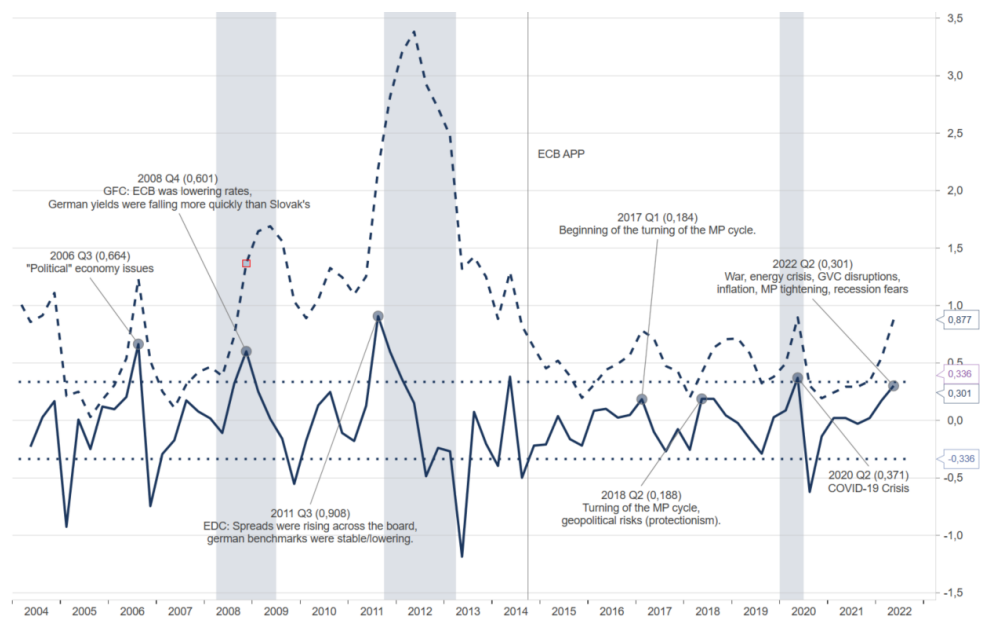
Calibration of the Shocks for the IR functions

Calibrating the size of the monetary policy tightening shock (10y bond spread)

10y government bond yield spread is a convenient measure of funding costs in the Slovak economy while having several dimensions. First, it captures the changes in the conventional monetary policy stance through the relationship between short-term interest rates (e.g., policy rate, interbank rate, etc.) and longer rates, such as 10y government bond yields. Second, it captures the changes in unconventional monetary policy when non-standard tools (QE, FG, etc.) are in place. They aim to alter borrowing costs through the impact on government bond yields. Next, it captures country-specific risks related to other macroeconomic policies. Finally, the 10y government bond yield also serves as the reference rate for retail bank rates in Slovakia (Chart 7).

Before the EDC (and ECB's Asset Purchase Programme) maximal change in the spread was around 70 bps, later around 30 bps. However, in the current uncertain period, we can observe a substantial widening again. Therefore, we use a 50 bps rise as an example.

Chart 7
Slovak 10y government bond yield against Germany's



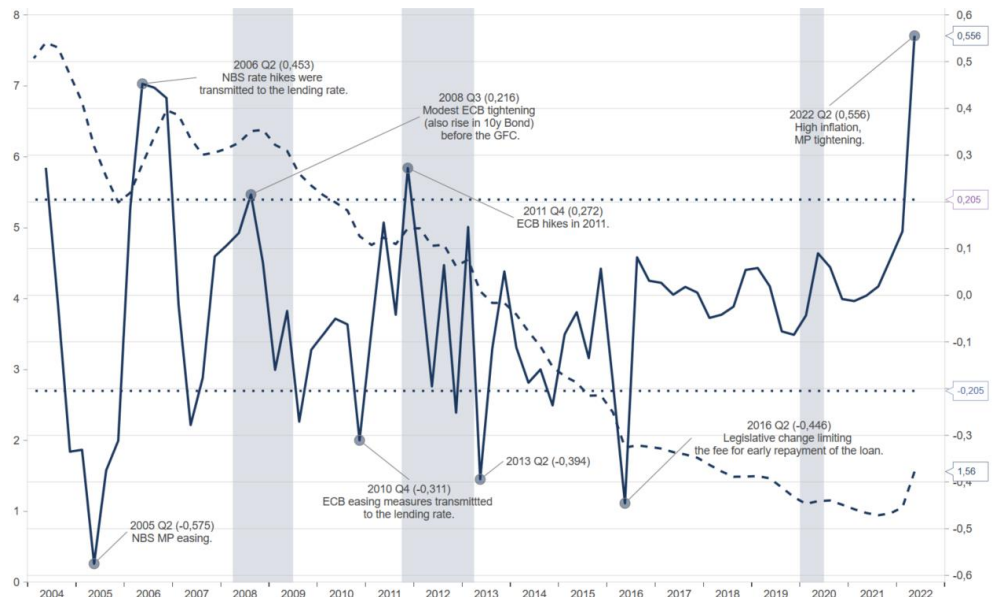
Notes: The dashed line shows a bond spread in pp, and the solid line represents QoQ changes in pp. Shaded areas represent EA recessions according to Euro Area Business Cycle Network.

Source: Authors' own computation, Eurostat.

Calibrating the size of the mortgage supply shock (lending rate)

Although the lending rate was generally on the downward path since the beginning of the sample, it experienced several periods of growth and decline (Chart 8). Periods of NBS/ECB's monetary policy easing alternated with periods of tightening. A structural change in the mortgage market in 2016 intensified the competition in the banking sector. This change was reflected in a sudden reduction in the cost of credit, followed by several years of moderate decline. However, since 2022 the mortgage lending rate has been experiencing the fastest growth in its history. We analyze the responses of macroeconomic variables to a 25 bps rise in the lending rate.

Chart 8
Lending rate on new housing loans



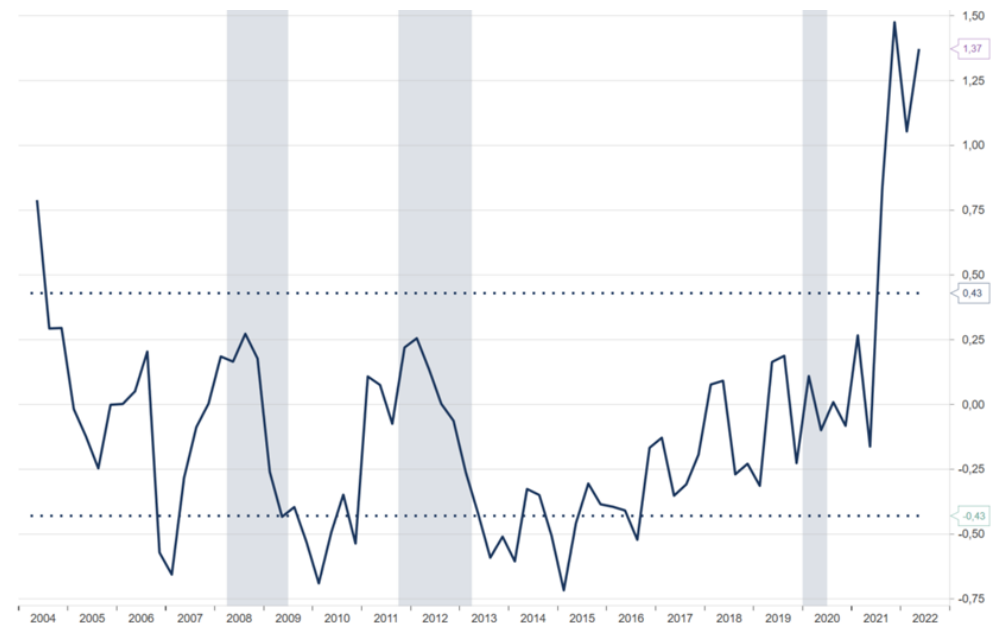
Notes: The dashed line shows a level of the lending rate (LHS, % p.a.), and the solid line represents QoQ changes (RHS, pp). Shaded areas represent Euro Area recessions according to Euro Area Business Cycle Network.

Source: Authors' own computation, NBS MaP DB.

Calibrating the size of the aggregate supply shock (inflation)

For a long period, inflation was stable until the recent burst (Chart 9). Given the available sample for other variables, a current rise in inflation is unprecedented. Below, we provide an example with a 0.5 pp rise in inflation.

Chart 9
Core Inflation



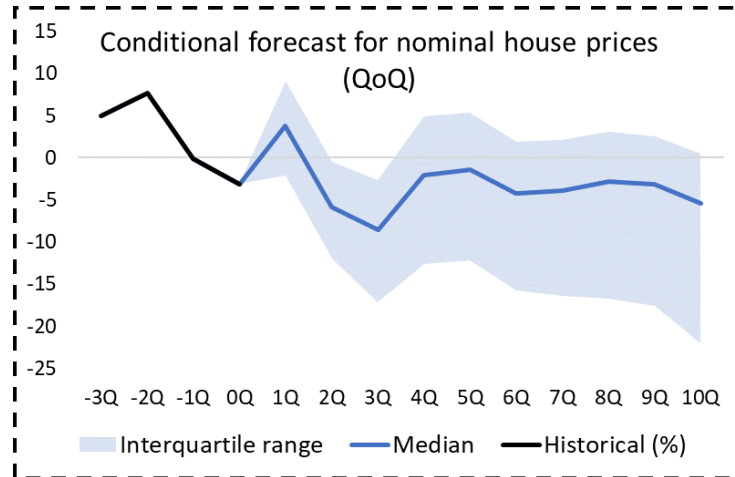
Note: QoQ change in pp. Shaded areas represent EA recessions according to Euro Area Business Cycle Network.

Source: Authors' own computation, OECD.

Appendix C

Conditional Forecast for Nominal House Prices

Chart 10
Conditional forecast for nominal house prices



Notes: The exogenous paths for selected variables follow the NBS (ECB) forecasts. We study the effects of only the three previously analyzed structural shocks (monetary policy, mortgage supply, and aggregate supply structural shocks). The last observation for this exercise is 2022Q4. Before computing descriptive statistics from the simulated paths, we removed outliers (mainly explosive models) from the set of admissible models.

Source: Authors' own computation.