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Monetary Determinants of House Prices in the European Countries

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ABSTRACT

Objective: The aim of this article is to investigate monetary policy effects on the house prices for the panel of 12 Central and Eastern European (CEE-12) countries, 12 small European countries (EU-12) and 5 largest European countries plus the UK (EU-6).

Research Design & Methods: A five-variable Panel Vector Autoregressive (PVAR) model is estimated for quarterly data from 2010Q1 to 2023Q2.

Findings: An increase in the short-term interest rate has a depressing effect on the house prices in the European countries, along with higher inflation and exchange rate depreciation (to less extent). An increase of output over the business cycle brings about a temporary decrease in house prices in both CEE-12 and the EU-12 countries. As intuitively expected, a housing boom is expansionary and inflationary in all European countries, though with a different time profile. There is strong evidence of the interest rate response to house prices in the CEE-12 countries and the EU-12 countries (at longer horizons).

Implications/Recommendations: This paper supports the proposals for using monetary tightening in response to the boom in the housing market. It is especially the case for the CEE

countries where a two-way causality between the short-term interest rates and house prices seems to be particularly strong.

Contribution: This paper contributes to studies of stabilisation properties of monetary policies in the European countries, in the presence of real and nominal effects of housing markets.

Article type: original article.

Keywords: house prices, interest rate, output gap, inflation, PVAR model.

JEL Classification: E31, E47, E52, R31.

1. Introduction

Following a decline in the wake of the 2008–2009 financial crisis, house prices have been on the rise since the middle of last decade in all groups of European countries (Fig. 1). Similarly, a recent downward correction of the house prices can be related to a steep increase in the short-term interest rates. An inverse relationship between the two variables can be explained on theoretical grounds (for example, Martin, Schmitt & Westerhoff, 2022), while being widely supported by empirical studies for both industrial and developing countries. For example, it is the case for Australia (Wadud, Bashar & Ahmed, 2009), Canada (André *et al.*, 2022), Germany (Hanck & Prüser, 2020), Norway (Anundsen & Jansen, 2013), the UK (Elbourne, 2008; André *et al.*, 2022), and the US (Horvath & Rothman, 2021; Eickmeier & Hofmann, 2010; Jarociński & Smets, 2008). Similar conclusions of a strong link between the short-term interest rate and house prices are obtained for a sample of OECD countries (Sá, Towbin & Wieladek, 2011), 17 industrialised economies (Goodhart & Hofmann, 2008), 20 advanced countries (Iossifov, Čihák & Shanghavi, 2008). Moreover, monetary policy effects on house prices can be much stronger as compared with the output effects (Benati, 2021). As it is obtained on the basis of 31 studies, there is strong interest rate sensitivity of house prices, with the value of regression coefficient at 0.7–0.9 (Ehrenbergerová & Bajzík, 2020). There is evidence of the inverse relationship between interest rate and house prices for the Central and Eastern Europe (CEE) countries as well (Gasparyniene, Venclauskiene & Remeikiene, 2014).

However, a few studies do not support a strong link between the monetary policy stance and house prices (Bernanke, 2010; Shi, Jou & Tripe, 2014; Stahlecker, 2024). The strength of the monetary policy effects on the housing market depends on the level of financial development (Koeniger, Lennartz & Ramelet, 2022), quality of the financial system (Duca, Muellbauer & Murphy, 2021) and/or mortgage markets (Sá, Towbin & Wieladek, 2011), or the level of financial liberalisation (Chen & Lin, 2022). Different supply constraints can affect sensitivity of house prices with respect

to interest rates as well (Miller, Sklarz & Thibodeau, 2005). On the other hand, it cannot be ruled out that the central bank responds to house prices, along with reaction to consumer price inflation and output gap (Finocchiaro & von Heideken, 2009), especially in the countries adopting a policy of inflation targeting (Chen & Lin, 2022). As house prices are likely to have both nominal (inflation) and real (output) effects, it creates an indirect transmission channel for monetary policy as well. For example, a positive link between house prices and macroeconomic developments is found in the abovementioned studies for 17 industrialised countries (Goodhart & Hofmann, 2008), Sweden (Gustafsson, Stockhammar & Österholmb, 2016), and the UK (Elbourne, 2008).

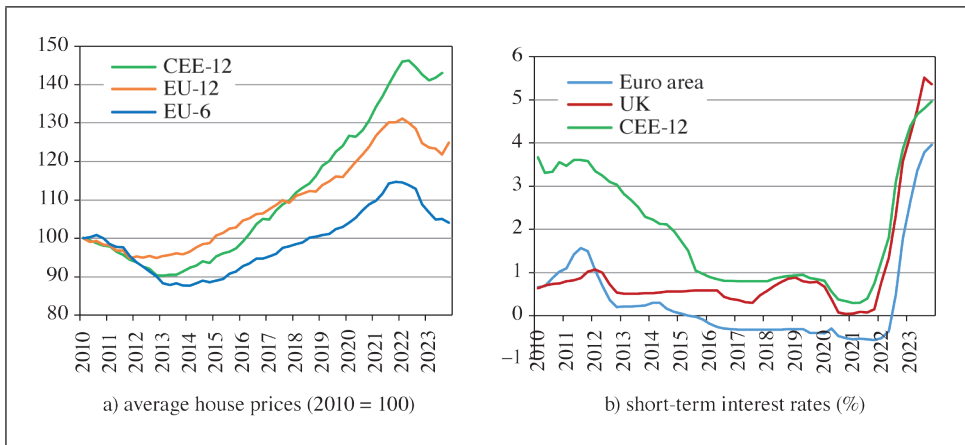


Fig. 1. Real House Prices (a) and Short-term Interest Rates (b) in the European Countries, 2010–2023

Source: own study, based on Federal Reserve Bank of St. Louis (2024), BIS Data Portal (2024).

The aim of this article is to investigate monetary policy effects on the house prices for a panel of 12 CEE countries, 12 small European countries and 5 largest European countries (plus the UK). We try to answer the following questions: Is there any response of house prices to monetary policy shocks? What are real and nominal effects of the house price shocks? Is there causality running from house prices to the short-term interest rate? Although our focus is on the monetary policy effect on house prices, output effects of both macroeconomic variables are worth attention.

The rest of the paper is structured as follows: A brief and selective literature review is presented in section 2. In section 3, data and statistical model are presented. Section 4 provides with a discussion of the empirical findings. Section 5 reports on the robustness checks. Section 6 presents conclusions.

2. Literature Review

Numerous aspects of house price determinants and relevant output effects are surveyed by Duca, Muellbauer and Murphy (2021) and Gasparyniene, Venclauskiene and Remeikiene (2014). First, house price booms have been caused by lower interest rates, besides income, credit standards and housing supply conditions. Second, dynamic effects of the abovementioned fundamental factors can be strengthened by positive news about house prices or extrapolative expectations of future prices. Third, the scope of house price changes is magnified if homes are used as collateral.

As it was summarised earlier by Mishkin (2007), interest rate changes affect the housing market and output through various channels, such as the user cost of capital, expectations of future house prices, supply of new houses, wealth effects in the aggregate demand, balance sheet and credit-channel effects on consumer spending and housing demand. The neoclassical user cost of capital theory implies that a higher short-term interest rate is followed by an increase in long-term interest rates, with a rising user cost of capital contributing to a fall in demand for housing and stagnation of construction activities. However, a higher cost of construction activities works against higher house prices. If housing is a component of wealth, along with stocks and bonds, changes in house prices affect private consumption and thus aggregate demand. The balance sheet and credit channel effects imply that more valuable home equity has a potential of easing of credit constraints on homeowners thus contributing to higher spending and investments, especially if interest rates are low (Tsatsaronis & Zhu, 2004).

An expansionary effect is more likely in countries with high ownership and low property taxes; otherwise higher downpayments or higher property taxes put a constraint on consumption (Duca, Muellbauer & Murphy, 2021). Obviously, the link between house prices and output becomes weaker if higher house prices create an illusion of wealth, with the problem of debt accumulation being underestimated (Gimeno & Martínez-Carrascal, 2010). With house prices on a decline and resulting difficulties in access to credit, the burden of debt service becomes an instrumental factor behind a decrease in aggregate demand and crisis developments. In order to avoid counterproductive macroeconomic instability centred around housing market, stabilisation efforts are useful.

In the context of monetary determinants of house prices, Martin, Schmitt and Westerhoff (2022) have presented a model of the housing market, referencing central bank stabilisation policies via the interest rate:

$$P_t = \frac{E_t[P_{t+1}] + \alpha - (\beta + \lambda V_t[P_{t+1}])\gamma P_{t-1} - (\beta + \lambda V_t[P_{t+1}])\delta H_{t-1}}{1 + r_0 + \rho \left(\frac{P_{t-1} - P^*}{P^*} \right) + \delta}, \quad (1)$$

where P_t is the house price level, H_t is the housing stock, P^* is the housing market's fundamental price, r_0 is the central bank's base (target) interest rate, α is a scaling parameter in the relationship between demand and price of housing services, δ is the housing depreciation rate, λ is the risk aversion parameter, $E_t[P_{t+1}]$ and $V_t[P_{t+1}]$ stand for the investors' average future house price expectation and its variance, respectively. Parameters β and γ measure the sensitivity of the rent level with respect to the housing stock and the response of the housing stock to house prices, respectively.

House prices rise in the case of positive and less volatile future house price expectations, stronger demand for houses (α) combined with a lower sensitivity of the rent level with respect to the housing stock (β), less aversion to risk (λ), sluggish response of the housing stock to house prices (γ), and faster depreciation of the housing stock (δ). As expected, a higher supply of houses (with a lag) contributes to lower house prices.

The monetary policy rule of Eq. (1) implies that the central bank responds to the gap between the actual and fundamental house prices, $i_t = r_0 + \rho(P_{t-1} - P^*)/P^*$. If the lagged house price exceeds the equilibrium house price ($P_{t-1} > P^*$), which could be related to demographic and long-term income factors, a positive response from the central bank helps keeping the housing market in order. In the presence of a strong two-way causality between interest rate and house prices, the incidence of destabilising house price fluctuations is minimised. Stabilisation properties of monetary response to house prices are found by André *et al.* (2022) and Gustafsson, Stockhammar and Österholmb (2016). For Norway, it is established that low interest rates contribute to higher housing prices, which in turn lead to a credit expansion (Anundsen & Jansen, 2013).

However, not all studies are so optimistic on the benefits of monetary response to house prices. Accounting for endogenous mortgage defaults, Bekiros, Nilavongse and Uddin (2020) provide theoretical arguments that a monetary reaction to household credit growth can produce price instability, which used to be counterproductive in the long run. In a similar DSGE framework, Baldi (2014) finds that a monetary response to house prices brings about an output slowdown over a business cycle and welfare losses.

Expansionary monetary policy is not the only explanation for the rapid increase in house prices since the 2000s, as capital inflows are important either, at least for the OECD countries (Sá, Towbin & Wieladek, 2011). As argued by Bernanke (2010), significant cross-country differences in the monetary policy effects on house prices can be explained by the fact that capital inflows are associated with monetary tightening, not expansionary monetary policy. If a higher interest rate taps capital inflows, it creates a possibility of the direct proportionality between monetary tightening and house prices.

While most recent DSGE models do not imply a strong link between house prices and output, a promising strand of research includes models with 1) distortions in financial markets (financial frictions) or 2) imperfect learning mechanisms (Williams, 2011). Financial frictions imply that relatively small changes in the short-term interest rate are behind disproportional changes in the value of housing assets (a financial accelerator effect), which in turn are materialised in excess fluctuations of aggregate demand. One of the explanations assume that market decisions are rational, but available information is imperfect thus making to learn through experience (imperfect learning). If the true value of asset prices is not known, it creates ground for excessive instability of output.

While the relationship between short-term interest rates and house prices has been paid enough attention in the literature, indirect effects of consumer prices and exchange rates on the housing market have not been widely explored. Specifically, the relationship between exchange rates and house prices used to be analysed with a focus on the causality running from exchange rates to house prices and not the other way (Yamaka *et al.*, 2022). It is found that exchange rate depreciation contributes to higher house prices in South Africa due to demand from non-resident buyers, with counter-cyclical properties as well (Davids, 2020), but no impact is found for Turkey (Sümer & Özorhon, 2020).

There are both theoretical and empirical arguments about positive correlation between house prices and inflation in China (Kuang & Liu, 2015). It is found that housing demand shocks significantly contribute to consumer prices in the US cities (Choi & Jo, 2020), but it is not ruled out that a house price boom is associated with low inflation as well (Bekiros, Nilavongse & Uddin, 2020). Moreover, a decline in inflation is expected in the case of a positive non-fundamental shock to house prices. A negative short-term relationship between house prices and core inflation is confirmed empirically for 15 OECD countries (Rufai, Aor & Salisu, 2025).

3. Data and Statistical Model

All time series spanning from 2010Q1 to 2023Q2 are obtained from the International Monetary Fund (2024), the Bank of International Settlements (BIS Data Portal, 2024) and the Federal Reserve Bank of St. Louis (2024). The following variables are used: the real house price index (2010 = 100), the consumer price index (2016 = 100), the nominal effective exchange rate (index, 2016 = 100), the short-term interest rate (%), the real gross domestic product (index, 2010 = 100). For estimation purposes, we used detrended values of both output and the exchange rate.

Empirical estimates are made for three groups of countries: CEE-12 (Czechia, Hungary, Poland, Romania, Serbia, Bulgaria, Croatia, Slovakia, Slovenia, Estonia, Latvia, Lithuania), EU-12 (Austria, Belgium, Cyprus, Denmark, Finland, Greece,

Ireland, Luxembourg, Norway, Portugal, Sweden, Switzerland), EU-6 (France, Germany, Italy, Netherlands, Spain plus the UK).

For all analysed countries, the ADF test reports the stationarity of the house price rate (in percent), with somewhat weaker evidence for Denmark, Italy, Spain and Switzerland. At the same time, the Supremum Augmented Dickey-Fuller (SADF) test which is based on the estimates the ADF model repeatedly on a forward expanding sample sequence does not indicate presence of the house price bubbles over the 2010Q1–2023Q2 period. Additionally, the absence of a house price bubble is suggested by the estimates of the EGARCH(2,2) model, as there are no signs of an increase in the house price volatility as measured by the conditional standard deviation (all results are available on request).

Our Structural Vector Autoregressive (SVAR) model is as follows (in terms of the contemporaneous innovations):

$$y = u_1 + a_1 e + a_2 \Delta h, \quad (2)$$

$$e = u_2, \quad (3)$$

$$\Delta p = b_1 y + b_2 e + u_3, \quad (4)$$

$$i = c_1 y + c_2 e + c_3 \Delta p + u_4, \quad (5)$$

$$\Delta h = d_1 e + d_2 \Delta p + d_3 i + u_4, \quad (6)$$

where y is the output gap (%), e is the exchange rate misalignment (%), Δp is the consumption price inflation (%), i is the short-term interest rate (%), Δh is the house price growth rate (%).

Endogenous variables of the real house prices, the real output, a general price level (consumer prices or GDP deflator), and the nominal short-term interest rate, as a proxy for the monetary policy stance, are used in the SVAR (VAR) models for a panel of 17 industrialised countries (Goodhart & Hofmann, 2008), 6 European countries (Carstensen, Hülsewig & Wollmershäuser, 2009), the USA, Canada and the UK (Benati, 2021), Australia (Wadud, Bashar & Ahmed, 2009). The effects of the nominal exchange rate are accounted for in the studies for Australia (Wadud, Bashar & Ahmed, 2009) and the UK (Elbourne, 2008), among others. It should be admitted that a relatively short data sample does not allow us to include extra variables in our SVAR model, such as government spending (Wadud, Bashar & Ahmed, 2009), banking reserves in the central bank (Benati, 2021), bank credit to the private sector (Goodhart & Hofmann, 2008), commodity prices (Elbourne, 2008; Benati, 2021), credit growth (Anundsen & Jansen, 2013), the unemployment rate (Gustafsson, Stockhammar & Österholmb, 2016) etc.

It is assumed that the output gap is affected in the current period by exchange rate and house price shocks (Eq. 2). It is consistent with empirical evidence that house price effects are demand-driven and related to expectations of future price

developments. Also, there is literature on the real effects of exchange rate misalignment (for example, Rodrik, 2008; Woodford, 2009; Bergin, 2022). In turn, such misalignments are exogenous in the current period (Eq. 3), with a pass-through to consumer inflation (Eq. 4). Although recent studies report the decline of the exchange rate effects on inflation, for example Ortega and Osbat (2020), changes in the exchange rate dynamics remain an important factor behind inflationary developments. In line with modern New Keynesian models, inflation is related to the output gap either. If house owners prevail in the economy, an increase in the house prices is likely to be inflationary via the wealth effect; otherwise, an inverse relationship between house prices and inflation is suggested. Empirical results are ambiguous (Bjørnland & Jacobsen, 2010; Kuang & Liu, 2015; Christou *et al.*, 2018). As it is common in the modelling of central bank response functions, the short-term interest rate is under influence of the output gap, exchange rate and inflation (Eq. 5). There is no immediate response of the interest rate to house prices in the current period.

Finally, dynamics of house prices is dependent on exchange rate, inflation and the interest rate (Eq. 6). A positive reaction to the output gap is likely to occur with a lag, as higher households' income contributes to house prices. However, it is not ruled out that output boom is inflationary, with higher cost of living being a factor behind lower demand for housing. On the other hand, more expensive construction materials could offset a downward pressure on house prices, at least in the short run (Gustafsson, Stockhammar & Österholmb, 2016). If inflation triggers speculative behaviour among potential buyers, it could be a source of upward pressure on house prices either. Exchange rate impact on house prices is not straightforward, being dependent on the relative strength of demand-side and supply-side effects. A higher interest rate is likely to lower house prices.

For countries with a floating exchange rate, the central bank policy rate is used, while the short-term interest rate is used for other countries. Among the controls, the US short-term interest rate (%) and a crisis dummy for the COVID-19 pandemic are used. Based on the average of lag order tests, the PVAR model with four lags is used in estimations for all three groups of countries.

4. Empirical Results

Figure 2 displays the impulse response functions (IRFs) for reaction of house prices to a one standard deviation increase in other endogenous variables over a horizon of 16 quarters. Similar to other studies for the European countries (Anundsen & Jansen, 2013; Gaspareniene, Venclauskiene & Remeikiene, 2014; Hanck & Prüser, 2020; André *et al.*, 2022), a one-time positive shock to a short-term interest rate contributes to a decrease in house prices, which is lasting for approximately 8 quarters in the CEE-12 and the EU-12 countries while being more persistent in the EU-6 countries.

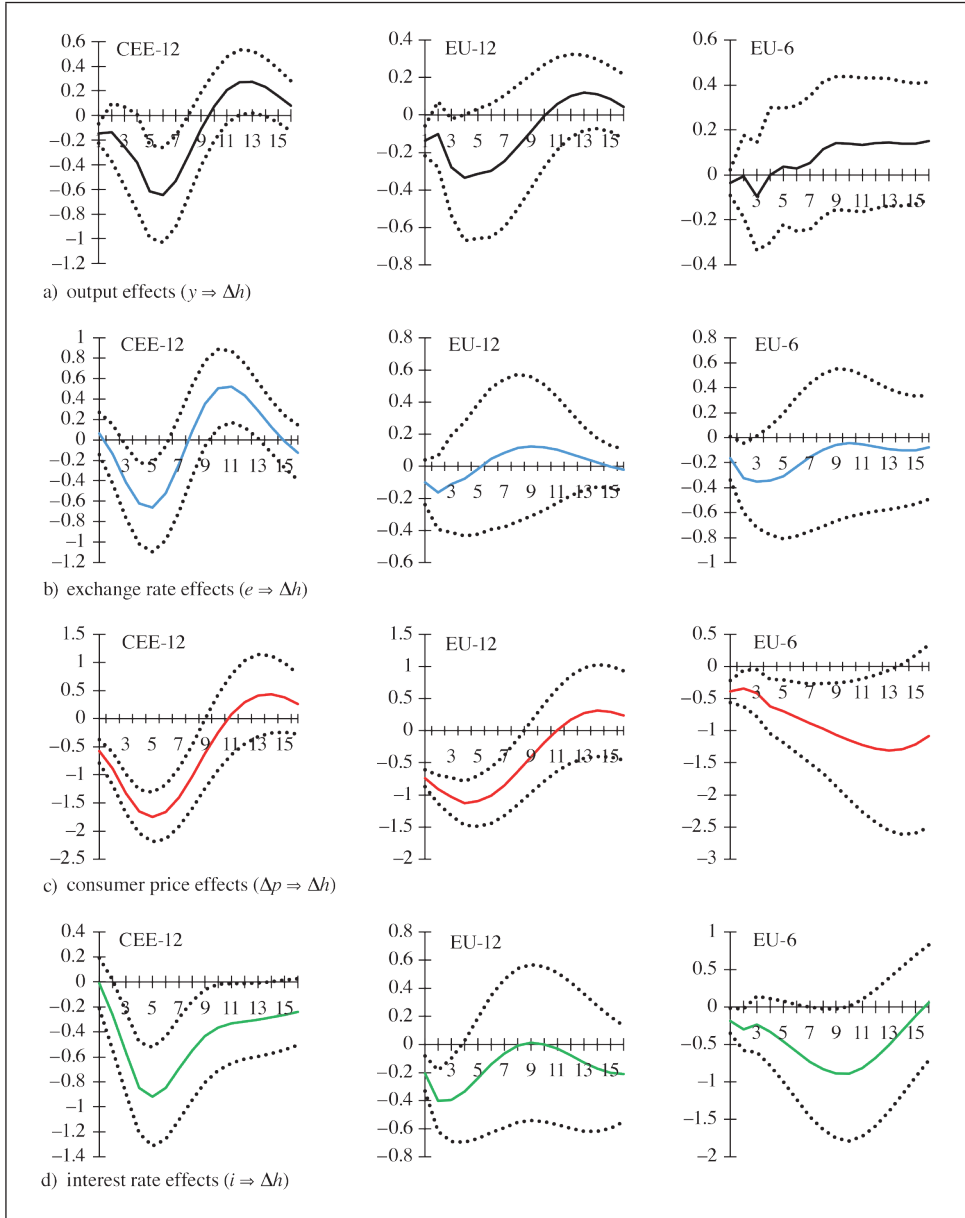


Fig. 2. Impulse Responses of House Prices to One Standard Deviation Innovations in Other Endogenous Variables

Notes: Here and hereafter the point estimates of the impulse response functions are presented in a band with ± 2 standard deviations.

Source: own estimations.

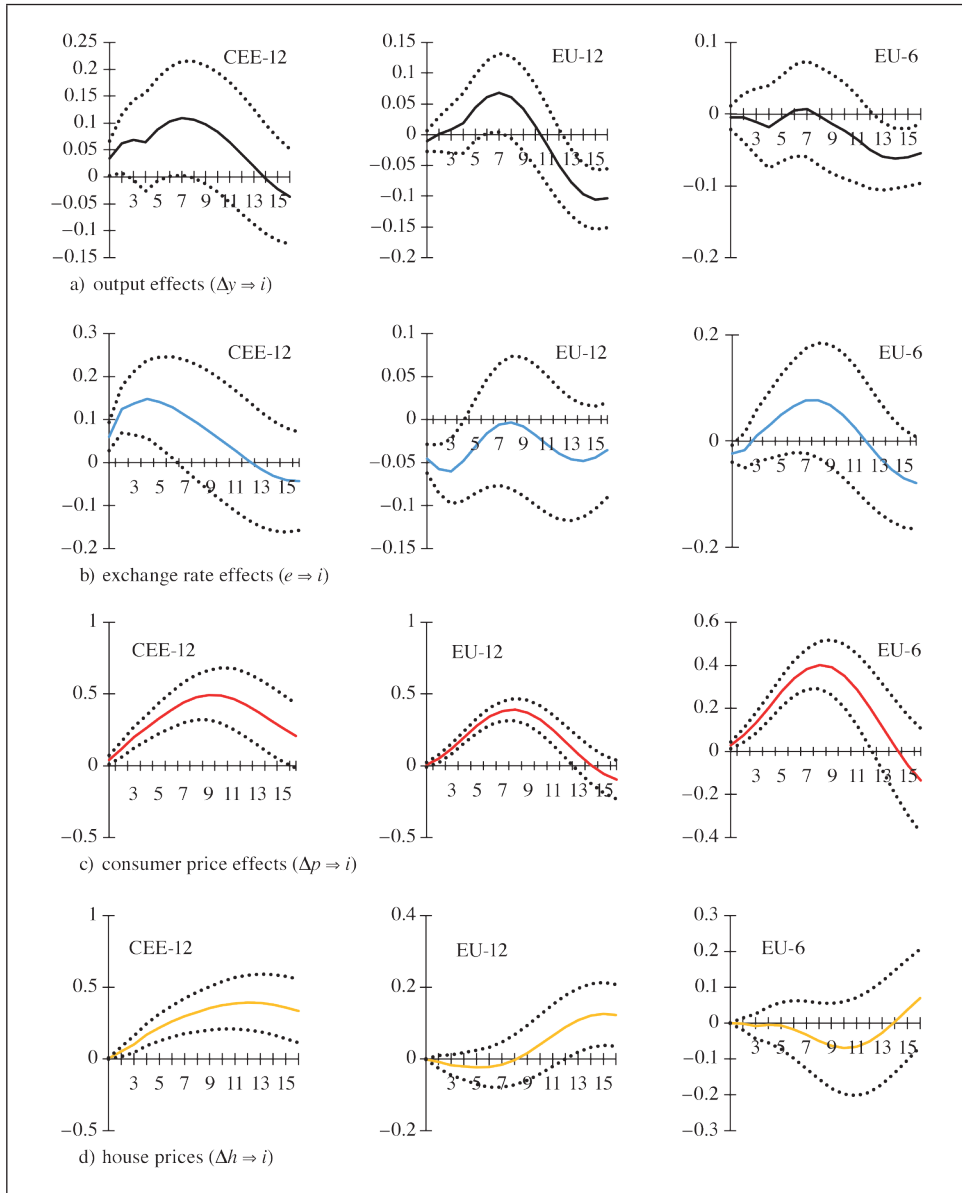


Fig. 3. Impulse Responses of Short-term Interest Rates to One Standard Deviation Innovations in Other Endogenous Variables

Source: own estimations.

Assuming that the central bank effectively controls the short-term interest rate, it means that it is possible to stabilise the housing market in line with theoretical arguments by Martin, Schmitt and Westerhoff (2022). In the absence of a direct link between interest rate and house prices, it makes it less likely that interest rate differentials and resulting capital inflows are behind house price changes, as it is argued by Bernanke (2010).

Among other monetary factors, there is a uniform depressing impact of inflation on house prices in all three groups of countries, which is quite persistent in the EU-6 countries. Such findings can be attributed to a negative wealth effect, as higher consumer prices curb the purchasing power of households. For the CEE-12 countries, a shock to the exchange rate – which indicates undervaluation of the currency – decreases house prices on impact but the effect is reversed with a peak at 10 to 12 quarters since the shock. Such findings can be explained by initial unfavourable supply-side effects, for example, due to higher costs of construction materials, while favourable demand-side effects dominate at longer horizons. Demand for houses by foreigners and returning native migrants is one of the likely factors, as a weaker currency makes local houses less expensive for foreign currency-denominated asset owners. In other European countries exchange rate effects on house prices are weak and short-lived. It is interesting that output effects on house prices are similar to those of exchange rate misalignments in the CEE-12 and the EU-12 countries, with neutrality observed in the EU-6 countries.

Considering a likely two-way causality between house prices and the interest rate, the response of interest rates to house prices is immediate and very strong in the CEE-12 countries (Fig. 3). Similar effect of a house price shock is observed in the EU-12 countries with 12 to 14 quarter lags. No impact is observed for the EU-6 countries. There is no difference across countries in that a consumer price shock is followed by a significant increase in the interest rate. The interest rate response is more persistent for the CEE-12 countries, remaining statistically significant after 16 quarters. As for the reaction to the output gap, it is similar for the CEE-12 and the EU-12 countries on impact but there are differences at longer horizons. A resulting decrease in the interest rate in the EU-12 countries is similar to the impulse response for the EU-6 countries at longer horizons, suggesting efforts to stimulate economic growth. For the EU-12 countries, it contrasts with a previous increase in the interest rate in response to economic boom.

For the CEE-12 countries, the IRF suggests that central banks tend to counter depreciation pressure on local currencies with an interest rate hike, while a decrease in the central bank rate is taking place in order to prevent exchange rate from excessive appreciation (statistical significance is very strong up to 5 quarters after the exchange rate shock). Contrary to the effects for CEE-12 countries, the shock

to the exchange rate is met with a short-lived decrease in the interest rate in the EU-12 countries. It also appears from Figure 3 that the exchange rate depreciation contributes to decrease in the interest rate briefly for about a quarter before it begins to have an opposite effect on the interest rate.

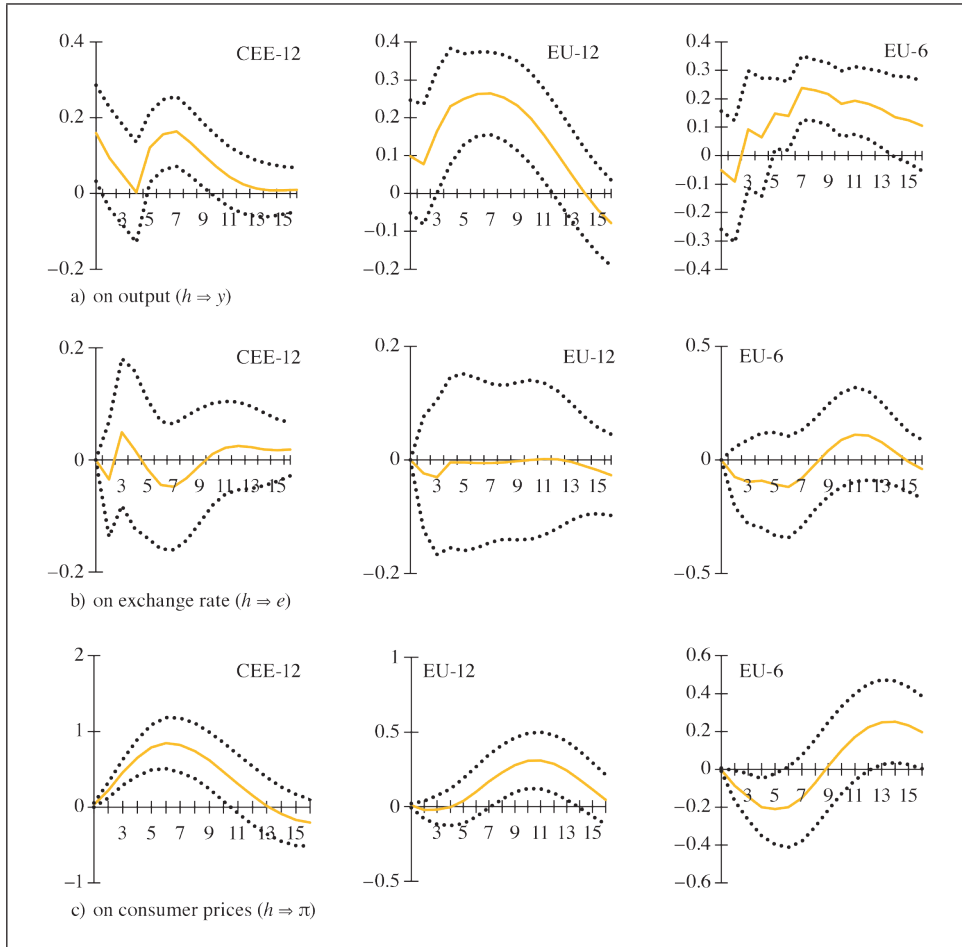


Fig. 4. Impulse Responses to One Standard Deviation Innovation in House Prices

Source: own estimations.

As Figure 4 shows, for any of three groups of countries the response of output to a positive house price shock is expansionary in nature, though with a slightly different time profile. The strongest effect is observed for the EU-12 countries at horizons between 4 and 11 quarters and for the EU-6 countries at horizons between

6 and 16 quarters. As argued by Tsatsaronis and Zhu (2004) and Gimeno and Martínez-Carrascal (2010), the expansionary effect could be due to the easing of credit constraints or presence of illusion of wealth. High house ownership and low property taxes also can play a role.

There is no evidence of any house price effects on exchange rate developments. For the CEE-12 countries, there is a strong causality running from house prices to inflation, with a peak after 6 quarters followed by a gradual decline since then. In the EU-12 countries impulse response for the house price shock exhibits a similar pattern at horizons beyond 6 quarters while there is no effect on impact. In contrast to the other countries, a house price shock results in a statistically significant but short-lived decline in inflation in the EU-6 countries, with a reversal at longer horizons. It is possible to hypothesise that spending on houses divert demand from consumer goods and services thus reducing the inflation rate significantly while the wealth effect starts to dominate at longer horizons. Based on the arguments by Bekiros, Nilavongse and Uddin (2020), a decline in inflation means dominance of non-fundamental shock to house prices.

Additional insights into the transmission mechanism of monetary policy are provided by analysis of the interest rate effects (Fig. 5). Besides direct effects on the house prices, monetary policy can work through its effects on the output gap, exchange rate and inflation. Our findings suggest that a higher interest rate has an immediate dampening effect on inflation rates in the EU-6 countries, with a return to the target in 8 quarters. The same anti-inflationary effect is observed for the EU-12 countries but with the so-called price effect at longer horizons, as there is an increase in the inflation rate. The same acceleration of inflation resulting from an increase in the interest rate is seen in the CEE-12 countries on impact thus magnifying a contractionary impact of monetary tightening on house prices. The relationship is just the opposite for both EU-12 and EU-6 countries, as a decline in inflation provides with support for the housing market, at least in the short run.

As there is a uniform immediate exchange rate appreciation resulting from a higher interest rate, it is an outcome which is favourable for house prices, especially in the CEE-12 countries. In the case of monetary tightening, both favourable indirect inflation and exchange rate effects on house prices are somewhat weakened by a direct contractionary effect on the output gap beyond 12th quarter after the interest rate shock. For the EU-6 countries, a contractionary effect of monetary tightening on the output gap occurs without indirect spillovers on the housing market as house prices are independent of the cyclical fluctuations in output. For two other groups of countries, a slowdown in output (at different horizons) helps to keep house prices lower in the CEE-12 countries, while an opposite outcome is likely in the EU-12 countries.

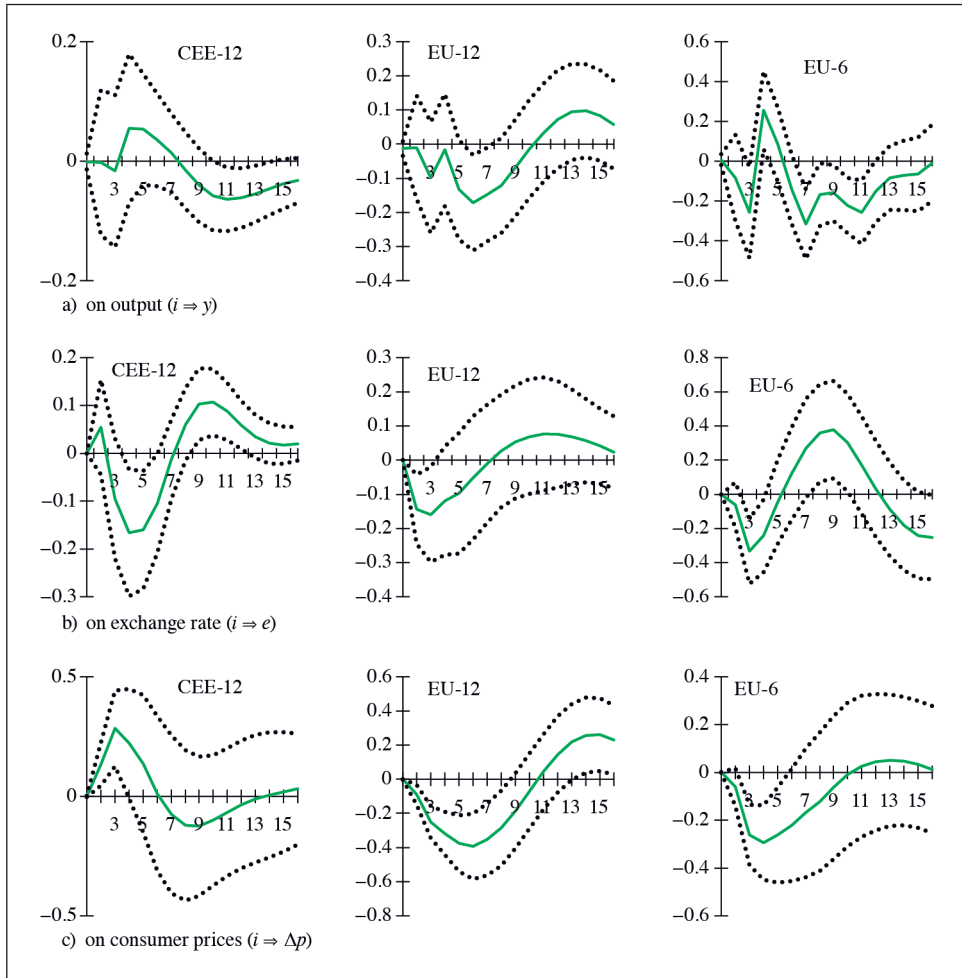


Fig. 5. Impulse Responses to One Standard Deviation Innovation in the Short-term Interest Rate
 Source: own estimations.

Despite statistically significant impulse responses, the analysis of the forecast error variance decomposition (FEVD) reveals that the fraction of changes in house prices explained by interest rate shocks is rather small (Table 1). However, house prices are significantly influenced by inflation rates. The effect is strongest in the CEE-12 and EU-6 countries, where the fraction of Δp in the FEVD of Δh gradually increases from 22% to 36% and from 5% to 31%, respectively. The importance of the inflationary shock for house prices is somewhat weaker in the EU-12 countries. Our results support findings by Benati (2021) in that monetary policy effects on house prices outperform monetary effects on output.

Table 2 reports the FEVD results for short-term interest rates. For both EU-12 and EU-6 countries, the dominant source of variance are innovations in inflation which account for more than 60% of FEVD at the end of a 16-quarter horizon. For the CEE-12 countries, the fraction of changes in the interest rate explained by inflation shocks is above 30%, whereas innovation in house prices accounts for as much as 23% of interest rate fluctuations.

Table 1. Forecast Error Variance Decomposition for House Prices

Country Group	Forecast Horizon				Country Group	Forecast Horizon			
	4	8	12	16		4	8	12	16
$y \Rightarrow \Delta h$					$e \Rightarrow \Delta h$				
CEE-12	1	4	4	4	CEE-12	2	3	4	4
EU-12	1	1	1	2	EU-12	0	0	0	0
EU-6	0	0	0	0	EU-6	2	2	1	1
$\Delta p \Rightarrow \Delta h$					$i \Rightarrow \Delta h$				
CEE-12	22	36	36	36	CEE-12	4	9	9	10
EU-12	18	21	20	21	EU-12	2	2	2	2
EU-6	5	11	22	31	EU-6	2	7	11	10

Source: own estimations.

Table 2. Forecast Error Variance Decomposition for the Short-term Interest Rate

Country Group	Forecast Horizon				Country Group	Forecast Horizon			
	4	8	12	16		4	8	12	16
$y \Rightarrow i$					$e \Rightarrow i$				
CEE-12	1	2	1	1	CEE-12	5	4	2	2
EU-12	0	2	1	4	EU-12	3	1	1	2
EU-6	0	0	0	1	EU-6	1	2	2	3
$\Delta p \Rightarrow i$					$\Delta h \Rightarrow i$				
CEE-12	10	24	32	32	CEE-12	3	11	18	23
EU-12	17	61	68	63	EU-12	0	0	1	5
EU-6	22	61	69	66	EU-6	0	0	1	2

Source: own estimations.

Similarly to André *et al.* (2022), Anundsen and Jansen (2013), Gustafsson, Stockhammar and Österholmb (2016), our findings support the stabilisation properties of monetary response to house prices, especially for the CEE-12 and EU-6 countries. However, it seems that indirect effects of monetary policy through inflation are more important in affecting house prices. Among setbacks of a monetary tightening

in response to higher house prices, such effects as output slowdown and the price puzzle, when a higher central bank interest rate is associated with an increase in the price level, are to be mentioned, in line with the arguments by Baldi (2014) or Bekiros, Nilavongse and Uddin (2020).

5. Robustness Checks

Our main results are subject to various robustness checks. First of all, we used deviations from the house price trend as a dependent variable instead of the rate of house price growth. For the CEE-12 countries, the only minor difference is that the inverse relationship between inflation and house prices becomes more persistent over time. For the EU-6 countries, a negative response of house prices to the interest rate disappears at longer horizons, while the causality running from house prices to interest rate becomes slightly positive, more in line with what is obtained for the CEE-12 and EU-12 countries. No changes in the IRFs for house price determinants are found in the EU-12 countries thus further confirming robustness of our results. However, there is a decline in the fraction of house price variance decomposition explained by consumer inflation rates as compared to SVAR model with the rate of house price growth, from 36% to 10% for the CEE-12 countries, from 21% to 8% for the EU-12 countries and from 31% to 8% for the EU-6 countries. Among the house price effects on other endogenous variables, the only significant difference is that the initial anti-inflationary impact of higher house prices in the EU-6 countries disappears completely, with an opposite inflationary effect being observed up to 10 quarters after a positive house price shock. Also, there is weak evidence in favour of an interest rate response to house prices at longer horizons, but against the back-drop of the same marginal fraction of house prices in the variance decomposition of interest rate, as in the case of the SVAR model with the rate of house price growth.

Second, our results stay intact if we drop the exchange rate in the baseline SVAR model thus reducing it to a four-variable model. In general, such an outcome can be attributed to the marginal role of exchange rate misalignments in European economies. At its maximum, the fraction of exchange rate reaches 10% in the variance decomposition of inflation for the CEE-12 countries. However, it is not ruled out that the exchange rate effects are stronger in the context of long-term relationships, especially for the CEE countries (Shevchuk, 2022).

Third, in the SVAR models for EU-12 and EU-6 countries we substituted a short-term interest rate with the so-called shadow interest rate, as provided by the Federal Reserve Bank of Atlanta. As defined by Wu and Xia (2016), the shadow rate is the central bank reference rate when the Zero Lower Bound (ZLB) is not binding, while being negative in the periods when unconventional policy tools are being implemented. It is confirmed that a higher shadow interest rate contributes to a fall in the house prices. Moreover, the inverse relationship between interest rate and house

prices becomes even stronger in both EU-12 and EU-6 countries. A negative effect of inflation on house prices is strengthened for the EU-12 countries, with no changes for the EU-6 countries. For both groups of countries, no changes between SVAR models estimates in that house prices are associated with a positive contribution to output. Inflationary effects of house prices are confirmed for the EU-12 countries, while these ones are lost in the estimates for the EU-6 countries. Similarly estimates from the baseline SVAR model, there is no response of the shadow interest rate to house prices in the the EU-6 countries, while a positive link at longer horizons between house prices and interest rate disappears for the EU-12 countries. As in the baseline SVAR model, a higher shadow interest rate is contractionary on impact, while bringing about a short-lived exchange rate appreciation which is followed by a depreciation above trend. In contrast to the estimates of the baseline SVAR model, an inverse relationship between the shadow interest rate and inflation is observed only at longer horizons for both EU-12 and EU-6 countries.

6. Conclusions

Using panel data estimates of quarterly data for the 2010–2023 period, it is found that house prices are expansionary and inflationary in all countries, though with a different time profile. As expected, house prices decline in response to higher short-term interest rates, with the strongest effect in the CEE-12 and the EU-6 countries. It means that it is possible to stabilise the housing market by a monetary policy reaction, though at the cost of output slowdown. For the CEE-12 countries, there are additional obstacles for stabilisation policies due to presence of the price puzzle. A conventional inverse relationship between interest rates and inflation is found for both EU-12 and EU-6 countries. Among other monetary factors, there is a uniform depressing impact of inflation on house prices in all three groups of countries. A similar negative effect of exchange rate depreciation is short-lived, with a reversal at longer horizons for the CEE-12 countries. An increase in output over the business cycle brings about a decrease in house prices in both CEE-12 and EU-12 countries, with a trough at 5 to 6 quarters.

There is strong evidence of the short-term interest rate response to house prices in the CEE-12 countries, with a similar (albeit weaker) monetary reaction for the EU-12 countries. No response is observed for the CEE-6 countries. On the basis of causality running from consumer prices to the short-term interest rate, it is possible to assume that the monetary reaction function of the central bank favours a response to inflation. As for the monetary response to the output gap, it is observed in the CEE-12 and EU-12 countries, with a reversal at longer horizons suggesting efforts to stimulate economic growth (similar to the EU-6 countries).

Authors' Contribution

The authors' individual contribution is as follows: Viktor Shevchuk – conceptualisation, methodology, validation, writing – review and editing; Roman Kopych – data collection, computing, writing – original draft.

Conflict of Interest

The authors declare no conflict of interest.

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