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MONETARY DETERMINANTS OF HOUSE PRICES IN CENTRAL AND EASTERN EUROPEAN COUNTRIES

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Abstract: This research aimed at the empirical estimation of the monetary determinants of house prices in the Czech Republic, Hungary, Poland, and Romania. The application of quarterly panel data for the period 2010-2019 indicates that a central bank policy rate increase was responsible for the fall in house prices, with a similar effect on house prices by a higher consumer inflation and nominal (real) exchange rate undervaluation. There was no reaction of house prices to the business cycle. However, the housing boom had a positive contribution to cyclical changes in output, while not affecting consumer prices and exchange rate.

Keywords: house prices, interest rate, exchange rate, Central and Eastern Europe.

1. Introduction

The recent strong rebound of house prices, especially in the Czech Republic and Hungary (Figure 1), cannot but create numerous interpretations of house price developments, as well as explanations for their macroeconomic implications. Regarding the CEE countries, Égert and Mihaljek (2007, pp. 367-388) showed the importance of a low interest rate as a determinant of higher house prices, but the evidence is scarce in more recent studies. Instead, individual country studies highlighted the importance of wages, the unemployment rate and building plot

prices (Kalabiska and Hlavacek, 2020), population growth (Czinkan and Horváth, 2019, pp. 2-31) and output growth (Cohen and Karpavičiūtė, 2017, pp. 49-63). However, Leszczyński and Olszewski (2017, pp. 136-151) found that house prices in the 17 largest cities in Poland depend on the real interest rate. Among other monetary factors, it is not ruled out that the housing market is influenced not only by monetary liquidity and credit channels, but by the nominal (real) exchange rate as well.

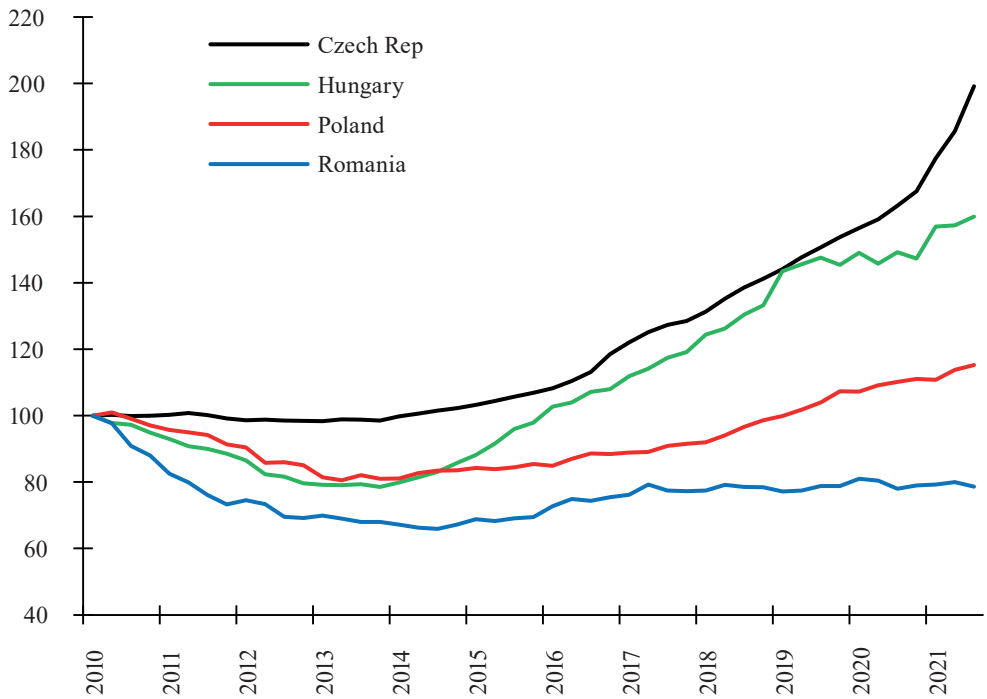


Fig. 1. Real residential property prices for the CEE-4 countries (index, 2010 = 100)

Source: Federal Reserve Bank of St. Louis (www.fred.stlouisfed.org).

Over the last few decades, housing markets have started to play a role in macroeconomic developments. Usually, house price booms are caused by fundamental factors (interest rates, income, credit standards), and can be magnified by market expectations of price dynamics (Duca, Muellbauer, and Murphy, 2021, pp. 773-864). In such a context, it is possible to hypothesise that a prolonged period of the low interest rates observed in the CEE countries since the beginning of the world monetary crisis in 2008, with the successful tackling of the Greek debt crisis by the end of 2014, set in motion a boom on the real estate market, especially in the Czech Republic and Hungary. It is interesting that the Covid-19 pandemic has not interrupted the upward trend in house prices in the CEE countries, except for Romania (Figure 1).

On the other hand, overshooting house price and the eventual fall in prices, probably with undershooting, can trigger a serious economic slowdown. As Jordà, Schularick, and Taylor (2016, pp. 107-152) emphasised, an empirical evaluation of the link between interest rates and house prices is important in the assessment of whether monetary policy is effective in keeping house prices under control.

The aim of this study was to provide an empirical estimation of the relationship between house prices and the central bank policy rate, as well as to demonstrate the potential effects of the business cycle, inflation, and the nominal (real) exchange rate. Although the focus of this article is on the determinants of house prices, the panel vector autoregression (PVAR) model allows for the analysis of their impact on other macroeconomic variables as well.

In the remainder of the paper, Section 2 provides a brief survey of the results of theoretical and empirical studies. Section 3 presents data and a statistical model. The empirical results are discussed in Section 4. The conclusions and policy implications are summarised in Section 5.

2. Analytical framework

Most theoretical models imply the instrumental role of the interest rate in the determination of house prices, but the transmission mechanisms are not uniform. On the other hand, housing market is likely to have significant macroeconomic effects ranging from output dynamics to availability of credit and nominal (real) exchange rate changes. Recent contributions to the literature on the connections between housing and credit markets, financial stability and the wider economy were provided by Duca et al. (2021, pp. 773-864), Kuchler, Piazzesi, and Stroebel (2022). A review of earlier studies can be found in Iossifov, Čihák and Shanghavi (2008).

2.1. Theoretical models

If households maximise their utility from consuming goods and housing over a lifetime, an expression for house prices is as follows (Himmelberg, Mayer, and Sinai, 2005, pp. 4-79; Miles and Monroe, 2020):

$$P_t^H = \frac{Rent_t}{r_t + \tau_t + \delta_t - E_t\rho_{t+1} + \psi_t}, \tag{1}$$

where $Rent_t$ is the real rent (minus any tax that a renter is liable to), r_t is the risk-free return on assets, τ_t is net tax imposed on owners of housing, δ_t is the comprehensive measure of the maintenance costs, including depreciation and insurance, $E_t\rho_{t+1}$ is the expected rise in real house prices, and ψ_t is the risk premium.

Equation (1) implies that rents are equal to the user's costs of housing. Expectations of higher house prices lead to an increase in their current level, similar to lower interest rates or a fall in the risk premium.

Martin, Schmitt, and Westerhoff (2020, pp. 491-532) elaborated a behavioural stock-flow housing market model that may explain endogenous boom-bust cycles and central bank stabilisation policies. The relationship between housing prices and interest rates is as follows:

$$P_t^H = \frac{E_t P_{t+1}^H + Rent_t - H_t \lambda V_t P_{t+1}^H}{1 + r_t + \delta_t}, \tag{2}$$

where P_{t+1}^H is the expected house price level, $V_t P_{t+1}^H$ is the expected variance of house prices, H_t is the supply of housing stock, and λ is the measure of risk aversion.

The expected house prices are formed in the following way:

$$E_t P_{t+1}^H = \frac{P_{t-1} + \chi\left(P_{t-1} - P^*\right) + P_{t-1}\eta\left(P^* - P_{t-1}\right)^2 + \phi\eta\left(P^* - P_{t-1}\right)^3}{1 + \eta\left(P^* - P_{t-1}\right)^2}, \tag{3}$$

where P^* is the housing market's equilibrium price, χ is the parameter that implies a continuation of the current phase in the housing market cycle, η is the switching parameter, and ϕ is the mean-reversion parameter.

As the expected house prices demonstrate a strong nonlinearity, it increases the probability of housing bubbles. However, central banks can stabilise a housing market by the following interest rate rule:

$$r_t = r_0 + \rho\left(\frac{P_{t-1} - P^*}{P^*}\right), \tag{4}$$

where r_0 is the central bank's target interest rate.

It is argued that house prices become more sensitive in respect of the interest rate changes in a low interest rate environment. Under such conditions, an increase in interest rates would cause a disproportionately large decline in house prices, especially if risk-adjusted rents remain constant. In turn, lower house prices are expected to bring about a decrease in output.

Lin and Tsai (2021, pp. 776-798) argue that a gradual rise or fall in the interest rate does not cause persistent deviations of house prices from the equilibrium level. However, a substantial fall in the interest rate is likely to create a housing bubble, with disruption in the real sector to follow. Martinez-Garcia and Grossman (2020) demonstrate that bubbles in the real (nominal) house markets can be rational and caused by a low interest rate, along with stock market growth, higher disposable income, and higher inflation. On the other hand, housing markets can affect both output and prices, as well as the financial sector, through numerous mechanisms.

Bahadir and Gumus (2021) propose a two-sector small open economy RBC model that explains the co-movement between the business cycle and house prices. Besides capital and labour, entrepreneurs use real estate in the production of tradable

and non-tradable goods, while households obtain utility from housing services. As the real estate is used as collateral, this kind of constraints on borrowing has asymmetric effects across two sectors of the economy. A house price increase results in an expansionary effect in both sectors, while a real exchange rate (RER) appreciation brings about a reallocation of labour away from the tradable sector, thus causing contraction in it. However, expansion in the non-tradable sector has a larger magnitude and the overall effect on total output is positive. The theoretical considerations are supported by empirical study conducted by means of the PVAR model for nine emerging economies and seven industrial economies.

Martin, Moral-Benito, and Schmitz (2021, pp. 1013-1053) proposed a different transmission mechanism. For a two-sector economy with housing and non-housing sectors, a rising demand for housing initially crowds out the amount of credit for the latter, however later mortgage repayments allow for an increase in credit supply to the non-housing sector. If one assume a positive relationship between the amount of credit and output, the model implies a possibility of economic slowdown in the short run, which gives way to a stronger overall growth as the housing boom continues.

If higher house prices increase the wealth obtained from assets, it is likely to stimulate consumption and output, regardless of the structural features of the economy, but an inverse relationship emerges in the occurrence of housing transaction costs and simultaneous changes in both house prices and interest rates (Song, 2010).

2.2. Empirical studies

Studies show that the interest rates play a significant role in house price developments. Using data for 47 advanced and emerging market economies, Sutton, Mihaljek and Subelyte (2017) prove that fluctuations of house prices are closely related to short-term interest rates, especially in countries with weak securitisation of home mortgages. For the 28 EU countries, it was found by Cunha and Lobão (2021, pp. 331-348), the house prices are influenced by interest rates and output growth, along with such specific features as tourism, cost of construction and building permits. An earlier study of 20 industrial countries by Iossifov et al. (2008) suggests a less than proportional inverse relationship between the short-term interest rate and the quarter-on-quarter growth rate of real residential housing prices.

Among individual country studies for the CEE countries, the interest rate explains the change in house prices for Bulgaria, Croatia, the Czech Republic, and Estonia (Vizek, 2010, pp. 27-59). Kotseva and Yanchev (2017) confirmed the inverse relationship between the interest rate and house prices. Both studies utilised the vector error correction model (VECM) approach. However, no links between the real estate prices and inflation or interest rate was found for Lithuania (Cohen and Karpavičiūtė, 2017, pp. 49-63). For the USA, it is not ruled out that an increase in the interest rate eliminates the boom-bust cycle in the real estate market, but at the prohibitive cost of unemployment and deflation (Jorda et al., 2015, pp. 107-152).

Except for the study by Vizek (2010, pp. 27-59), there is uniform evidence for the CEE countries that house prices are dependent on output growth (Cohen and Karpavičiūtė, 2017, pp. 49-63; Kotseva and Yanchev, 2017). The majority of empirical studies are in favour of inertia in house prices (Cohen and Karpavičiūtė, 2017, pp. 49-63; Cunha and Lobão, 2021, pp. 331-348; Vizek, 2010), thus suggesting a lack of both market efficiency and price self-correcting mechanisms.

As the theoretical arguments on the relation between the housing market and output are ambiguous, the same holds for empirical studies. For a panel of European countries, it was found that house prices amplify business cycles in the short run, while contributing to an overall slowdown (Cuestas, Kukk, and Levenko, 2021). However, estimates for several CEE countries demonstrated the stimulating effect of housing wealth on private consumption both in the short and long run (Čeh Časni, 2014, pp. 392-406). As housing booms used to be associated with periods of intense economic growth, downturns in housing markets have the potential of making recessions longer and deeper (Claessens, Kose, and Terrones, 2009, pp. 653-700). A fall in house prices is associated with a decrease in construction volumes and private consumption (through the wealth effect), with unfavourable indirect effects related to spending on real estate services and durable goods (Duca et al., 2021, pp. 773-864).

3. Data and statistical model

3.1. Data

The dataset adopted quarterly series for the period between 2010Q1 and 2019Q4 for the Czech Republic, Hungary, Poland and Romania, as provided by the Federal Reserve Bank of St. Louis, the IMF International Financial Statistics and the Bank of International Settlements databases. Such a choice was motivated by the availability of data and the deliberate intention not to include the turbulent period of the COVID-19 pandemic since the beginning of 2020. The analysed variables include the rate of change in the real housing prices (%), h_{it}, deviations of both nominal and real effective exchange rates from their long-term level (%), e_{it} and q_{it}, respectively, the consumer price inflation (%), cpi_{it}, the CB policy rate (%), rcb_{it}, and the business cycle (%), y_{it}. GDP data are seasonally adjusted with the Census X-11 method. Both output and nominal (real) exchange rates were de-trended with the Hodrick-Prescott filter.

Besides five endogenous variables, this study's PVAR model includes several exogenous variables: volatility of housing prices, as obtained by the EGARCH(2,2) model, growth rates of house prices for the euro area, changes in the measure of monetary freedom according to the Index of Economic Freedom by the Washington-based Heritage Foundation, and country-specific dummies for crisis developments. In addition, interaction variables of house prices for the euro area and monetary

freedom with the crisis dummy are used. House price volatility is important because of its relation to the expectations of future prices (Kuchler et al., 2022), which in turn determine current house prices (equation (1)). House prices for the euro area are important as a source of possible spillovers within the European housing market.

Descriptive statistics are presented in Table 1. On average, the CB policy rate is slightly positive in real terms (minus inflation). Real house prices are much more volatile compared to the business cycle or nominal (real) exchange rate misalignment. All Pesaran's cross-sectional independence tests suggest the presence of cross--sectional dependency in the panel set (Table 2).

Table 1. Descriptive statistics

Variable	Mean	Max	Min	STD	Skew.	Kurt.
Gross domestic product (y_{it})	0.02	4.16	−4.29	1.74	0.38	2.50
Consumer price inflation (cpi_{it})	2.14	8.23	−2.59	2.03	0.37	3.16
Central bank policy rate (rcb_{it})	2.42	7.0	0.05	1.97	0.81	2.51
NEER misalignment (e_{it})	0.08	7.39	−5.88	2.31	0.43	3.37
RER misalignment (rer_{it})	0.10	6.50	−5.50	2.37	0.34	2.81
Real house prices (h_{it})	1.36	16.49	−18.61	7.53	−0.31	2.74

Source: own calculations.

Table 2. Pesaran's cross-sectional independence test results

Tests	Variables					
	y_{it}	cpi_{it}	rcb_{it}	e_{it}	rer_{it}	h_{it}
Breusch-Pagan LM	120.12***	124.85***	107.12***	40.97***	44.11***	141.96***
Pesaran scaled LM	32.94***	34.31***	29.19***	10.09***	11.01***	39.25***
Bias-corrected scaled LM	32.84***	34.26***	29.14***	10.04***	10.95***	39.20***
Pesaran CD	10.74***	11.02***	7.15***	5.40***	5.41***	11.85***

Note: The null hypotheses of cross-sectional independence are rejected at the level of 1% (***), 5% (**), 10% (*).

Source: own calculations.

Based on the Pesaran's covariate-augmented Dickey-Fuller (CADF) test and the Levin, Lin and Chu (LLC) test (Table 3), stationarity at level is confirmed for all variables, although at lower level of statistical significance for inflation and the CB policy rate. As for the cross-sectional augmented Im, the Pesaran and Shin (CIPS) test, stationarity at level is not confirmed for two abovementioned variables.

Table 3. Panel unit roots test results

Tests	Option	Variables					
		y_{it}	cpi_{it}	rcb_{it}	e_{it}	rer_{it}	h_{it}
CADF	Level	−2.78***	−1.46*	−1.88**	−4.12***	−3.85***	−1.80**
	Δ	−4.50***	−7.21***	−5.58***	−7.19***	−6.80***	−7.18***
LLC	Level	−1.70**	−2.31**	−3.63***	−4.12***	−3.85***	−1.80**
	Δ	−11.55***	−8.47***	−5.87***	−7.19***	−6.80***	−7.18***
CIPS	Level	−2.26**	−1.08	0.42	−4.12***	−3.84***	−0.17
	Δ	−2.52***	−5.51***	−3.15***	−7.95***	−7.42***	−4.73***

Note: The null hypotheses of cross-sectional independence are rejected at the level of 1% (***), 5% (**), 10% (*); a specification with a constant and three lags is chosen, the CIPS test, as the LLC and CADF tests are used with a specification with no intercept and trend and three lags; Δ refers to first differences.

Source: own calculations.

3.2. Statistical model

For the analysis of the relationship between housing prices and their determinants the author used a PVAR methodology that combines the advantages of the traditional VAR approach, such as the treatment of all variables as endogenous and interdependent ones, with the panel data approach, which allows for unobserved individual heterogeneity and the appropriate treatment of dynamic and static interdependencies, as well as cross-sectional heterogeneity (Canova and Ciccarelli, 2013). The estimation of the average effects can be useful for the analysis of country--specific differences relative to the average in the presence of interdependencies.

The PVAR model is as follows:

$$Y_{it} = \Gamma_0 + \Gamma_1 Y_{it-1} + \Gamma_2 X_{it} + \eta_i + \upsilon_t + \varepsilon_{it}, \quad i = 1,\ldots,N, \tag{5}$$

where Y_{it} is either a four-variable vector (y_{it}, cpi_{it}, rcb_{it}, h_{it}) or a five-variable vector of the endogenous variables (y_{it}, e_{it}, cpi_{it}, rcb_{it}, h_{it}), X_{it} is a vector of exogenous variables, Γ_0 is the constant term, Γ_1 and Γ_2 are matrices of coefficients for endogenous and exogenous variables, respectively, η_i denotes fixed effects, υ_t denotes the forward mean-differencing (or time fixed effect), ε_{it} is a vector of normally distributed, serially uncorrelated and mutually orthogonal white noise disturbances, i represents countries in the sample and t is the time dimension.

In the case of a baseline four-variable SVAR-I, the specification of the contemporaneous restrictions for $Au_{it} = B\varepsilon_{it}$ is as follows:

$$y = u_1 + a_4 h, \tag{6}$$

$$cpi = b_1 y + u_2, \tag{7}$$

$$rcb = c_1 y + c_2 cpi + u_3, \quad (8)$$

$$h = d_1 cpi + d_2 rcb + u_4, \quad (9)$$

where y is the output gap, cpi is the consumer price inflation, rcb is the CB policy rate, and h is the real house price.

In equation (6), the output gap is assumed to be contemporaneously influenced by the price dynamics in the housing market. As implied by the New Keynesian models, inflation is dependent on the output gap (equation (7)). The central bank reacts to both output gap and inflation, which reflects the Taylor rule for the monetary regime of inflation targeting (equation (8)). Finally, house prices respond in the current period to both inflation and the CB interest rate (equation (9)), which is consistent with the role of interest rate in the price dynamics of the housing market.

The Helmert procedure is used for time demeaning and forward mean-differencing of the data. The system is estimated using four lags. The estimated impulse response functions (IRFs) are presented in the next section.

4. Empirical results

4.1. The baseline model

The IRFs over 16 quarters for the SVAR-I model are presented in Figure 2. The main result was that an increase in the CB policy rate had a persistent negative effect on house prices that lasted up to 10 quarters, with a peak at 7 quarters since the shock. This is in accordance with the results from other studies suggesting that changes in the interest rates affect house prices gradually (Sutton et al., 2017). The same downward pressure on house prices is exerted by inflation. Impulse responses did not reveal any impact of the business cycle on house prices. This runs counter to the results of other studies, such as Cohen and Karpavičiūtė (2017, pp. 49-63) and Kotseva and Yanchev (2017). On the other hand, there was a statistically significant expansionary effect of house prices on the output gap. Except for the business cycle, there was no impact on other endogenous variables, including the CB policy rate. In line with other studies (Cohen and Karpavičiūtė, 2017, pp. 49-63; Cunha and Lobão, 2021, pp. 331-348; Vizek, 2010), the house prices were inertial.

Among other results, there was a two-way causality between output gap and inflation. As assumed by the New Keynesian models, an economic boom is inflationary, while inflation contributes to output growth. The central banks of the CEE-4 countries react to either inflation or to output gap, as implied by the Taylor rule, however there was no reaction to the house prices. Following a restrictionary monetary shock, there is evidence of a short-lived fall in output (up to 3 quarters), although with no impact on inflation.

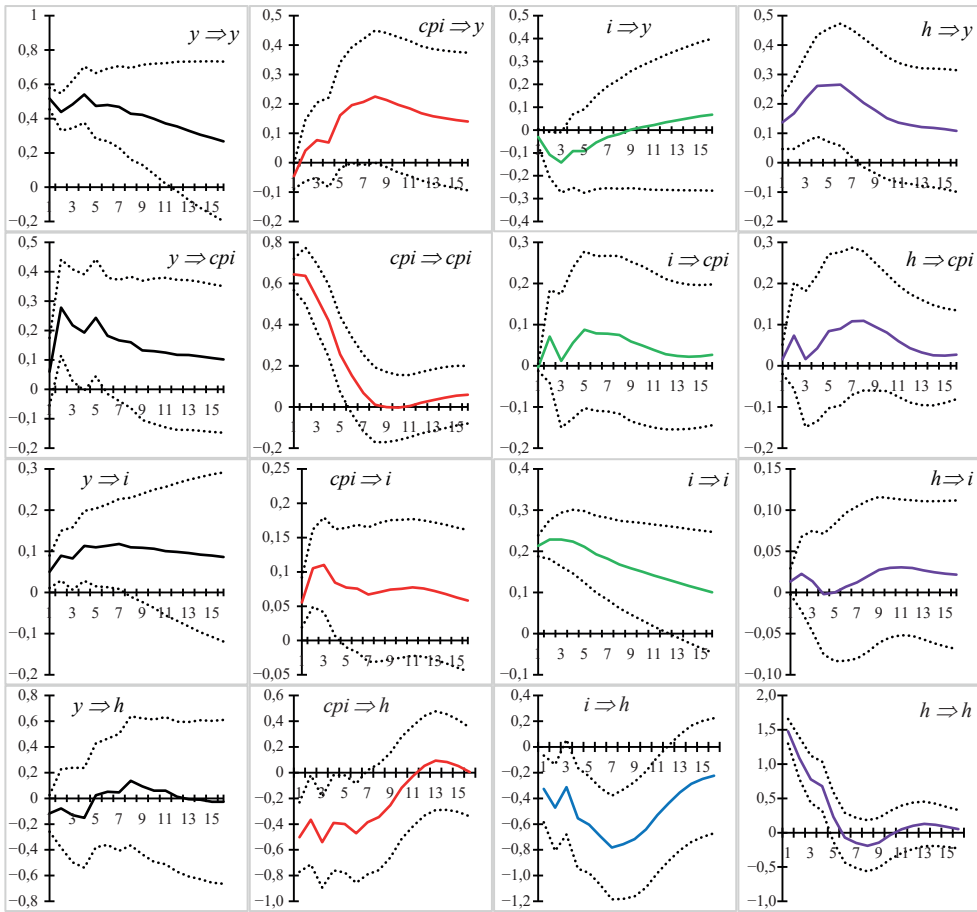


Fig. 2. Impulse responses for endogenous shocks (SVAR-I)

Source: own estimations.

To assess the importance of impulse responses, the forecast error variance decomposition (FEVD) was used (Table 4). It confirmed that changes in the CB policy rate were highly influential for house price dynamics (the fraction of variance in h_t explained by changes in rcb_t gradually increased from 12% to above 40%). Inflation was much less influential as a factor behind house prices (no more than 17% of variance). This is comparable with the impact of house prices on the business cycle (14% to 16% of variance). The fraction of house prices in the FEVD of inflation and the CB policy rate was marginal. Among other results, the output gap was an influential factor behind inflationary developments (above 20% of variation), while the fraction of inflation in the FEVD of output gap was about 10%. The reaction of the central banks to the output gap seemed to be more influential (20% of variance) compared to the response to inflation (13%).

Table 4. Forecast error variance decomposition (SVAR-I)

Forecast horizon	4	8	12	16	Forecast horizon	4	8	12	16
Variation in output gap due to innovation in					Variation in central bank rate due to innovation in				
y	82	75	74	73	*y*	11	17	20	21
cpi	1	7	10	11	*cpi*	13	11	12	13
rcb	3	2	2	2	*rcb*	76	72	67	65
h	14	16	14	14	*h*	0	0	1	1
Variation in inflation due to innovation in					Variation in housing prices due to innovation in				
y	11	18	20	22	*y*	1	1	1	1
cpi	88	78	74	72	*cpi*	14	17	15	15
rcb	1	2	2	2	*rcb*	12	31	40	42
h	0	2	4	4	*h*	73	51	44	43

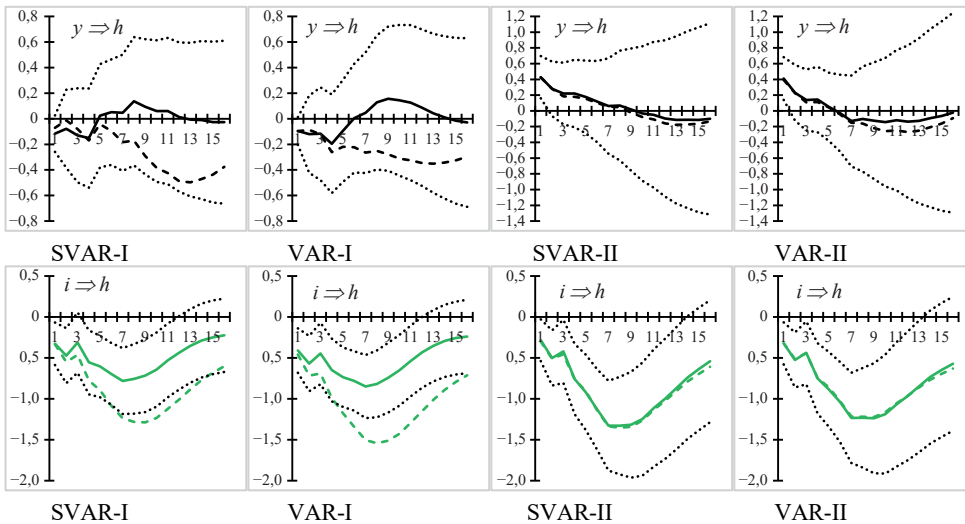
Source: own estimations.

4.2. The robustness check

The robustness of our results was tested along two main dimensions. First, the author estimate five-variable SVAR-II with an extra factor of nominal (real) exchange rate misalignment. Second, both SVAR-I and SVAR-II were re-estimated for a specification without external variables. The study also compared the impulse responses from SVARs with the IRF's from the VAR models with the Choleski decomposition of endogenous shocks.

In SVAR-II, a contemporaneous reaction of the output gap to house prices was substituted with the reaction to nominal (real) exchange rate misalignment and inflation. In the current period, the exchange rate has been influenced by inflation. In contrast to SVAR-I, inflation in the current period is under the impact of exchange rate and house prices. The monetary policy rule is extended by accounting for the exchange rate. Instead of inflation, the house prices react in the current period to the output gap (no changes in that there is a reaction to the CB policy rate).

The IRFs reported in Figure 3, suggest that there has been a very robust reaction of the house prices to the CB policy rate shock. In the absence of exogenous variables, interest rate effect on house prices becomes even stronger according to the IRFs from SVAR-I, while no changes were observed for the impulse responses from SVAR-II. It is possible to conclude that the exchange rate absorbs all kinds of effects that are represented by exogenous variables. If one includes the nominal and real exchange rate misalignments into the SVAR/VAR model, the share of changes in the house prices explained by the CB policy rate increases to 58% and 50%, respectively.



Note: the dashed line presents IRFs for the SVAR/VAR models without exogenous variables.

Fig. 3. Impulse responses of housing prices to output gap and central bank rates

Source: own estimations.

Despite slight changes in the IRFs, alternative specifications of the baseline model confirm the neutrality of house prices with respect to the business cycle. As for the SVAR-II model, there was a short-lived positive effect of the output gap on the house prices, but it was not influential (no more than 5% of variance). In the presence of exchange rate effects, the SVAR-II model signalled some weakening of the expansionary effect of house prices on output (not reported in this article), as was the case of the SVAR-I model (Figure 2).

If one accounts for the nominal (real) exchange rate misalignment, there are changes in the response of the house prices to inflation (Figure 4). As the SVAR-I model reports an inverse relationship between inflation and house prices (it is stronger in the specification without exogenous variables), impulse responses from the SVAR-II model indicated at least neutrality of the house price dynamics in response to the inflationary shock. The effect of nominal and real exchange rate undervaluation on the house prices was unambiguously negative. For the SVAR-II model, both inflation and the exchange rate explained up to 15% of variance in house prices in the specification with e_t, but increased to 28% in the specification with rer_t. It is interesting that only the undervaluation of the RER was expansionary for output, while the undervalued nominal exchange rate was contractionary.

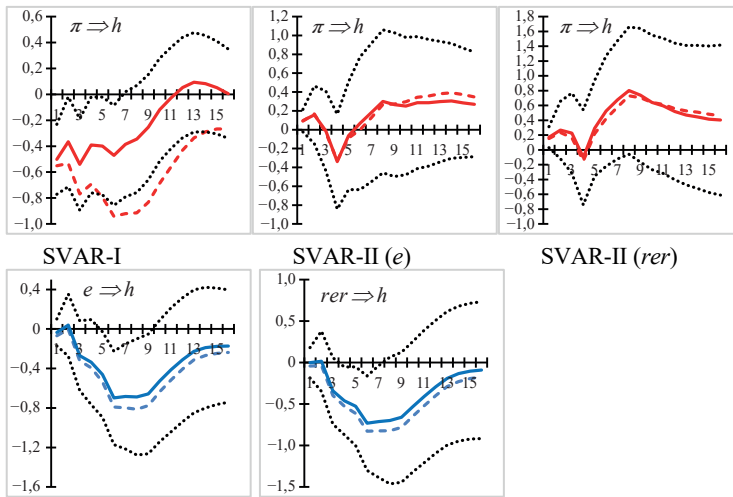


Fig. 4. Impulse responses of housing prices to inflation and nominal (real) exchange rates (alternative specifications)

Source: own estimations.

In contrast with the SVAR-I model, there is weak evidence of an anti-inflationary house price effect on the impact in the SVAR-II model with the nominal exchange rate, but it was not influential (7% of variance). It is worth noting that in both SVARs and VARs with a nominal (real) exchange rate there was the price puzzle, when an increase in the CB interest rate led to a higher inflation rate (6% of variance), with the overvaluation of the RER to follow (9%). Regardless of the exchange rate measure, it was confirmed that the economic boom was inflationary (up to 21% of variance) and the central banks reacted to both inflation (16%) and the output gap (13%).

5. Conclusions

Recent developments in the housing markets of the CEE countries, including the Czech Republic, Hungary, and Poland, have attracted attention to the role of monetary policy in the developments regarding house price. Using quarterly data for the post-crisis period of low interest rates, the relationship between house prices, central bank interest rates, output gap and inflation, as well as nominal (real) exchange rate misalignment, was estimated with the PVAR method. Several results were obtained. First, the central bank policy rate is a crucial factor behind house price developments. This means that the central bank interest rate hikes can prevent excessive house price increases that in turn may lead to instability in the housing sector. Second, both inflation and nominal (real) exchange rate undervaluation

contribute to a decrease in the house prices. Third, the housing market has an expansionary effect on output, while not affecting consumer prices and the exchange rate. At the same time, business cycle conditions in the CEE-4 countries seem to be neutral with respect to the house prices.

The policy implications of this study are fairly clear. First of all, the CB policy rate is able to prevent excessive price hikes in the housing market, while the direct losses to output ratio seems not to be very significant. As moderate growth in the house prices is likely to bring about economic slowdown, this should be helpful in containing inflation, even in the absence of a direct relation between higher CB policy rate and price dynamics. It is important to avoid the nominal (real) exchange rate overvaluation, as it leads to higher house prices.

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CZYNNIKI MONETARNE CEN NIERUCHOMOŚCI W KRAJACH EUROPY ŚRODKOWEJ I WSCHODNIEJ

Streszczenie: Przeprowadzone badanie ma na celu oszacowanie empiryczne czynników monetarnych dla cen nieruchomości w Republice Czeskiej, na Węgrzech, w Polsce i w Rumunii. Wykorzystując kwartalne dane panelowe z lat 2010-2019, stwierdzono, że wzrost stopy procentowej banku centralnego powoduje spadek cen nieruchomości, przy podobnym oddzialywaniu inflacji konsumenckiej i niedoszacowanego kursu walutowego w ujęciu nominalnym i realnym. Ceny nieruchomości nie zależą od cyklu koniunkturalnego, ale *boom* na rynku nieruchomości pozytywnie oddziałuje na cykliczne zmiany dochodu, nie mając jednocześnie wpływu na ceny konsumenckie i kurs walutowy.

Słowa kluczowe: ceny nieruchomości, stopa procentowa, kurs walutowy, Europa Środkowa i Wschodnia.