IMK
Macroeconomic Policy Institute

The IMK is an institute of the Hans-Böckler-Stiftung

More public house building to maintain capacity

Estimating declines in construction activity due to increased interest rates for 2023-2024

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Keynes Tagung, February 2024

Construction condition change

BUSINESS | GERMANY

Germany: New housing construction set to strongly decline

07/19/2023

By 2025, many European countries will see a decline in residential construction due to cost hikes and real estate market uncertainty. Germany is expected to see a 32% drop.

Sweden is expeted to see the strongest decline in residential construction in the coming years

Image: Ben Birchall/empics/picture alliance

Germany's Macroeconomic Policy Institute (IMK) has advocated that more public funds be spent on constructing affordable housing to fill the gaps left by dwindling investment from private construction companies due to rising costs.

lo/wmr (dpa, Reuters)

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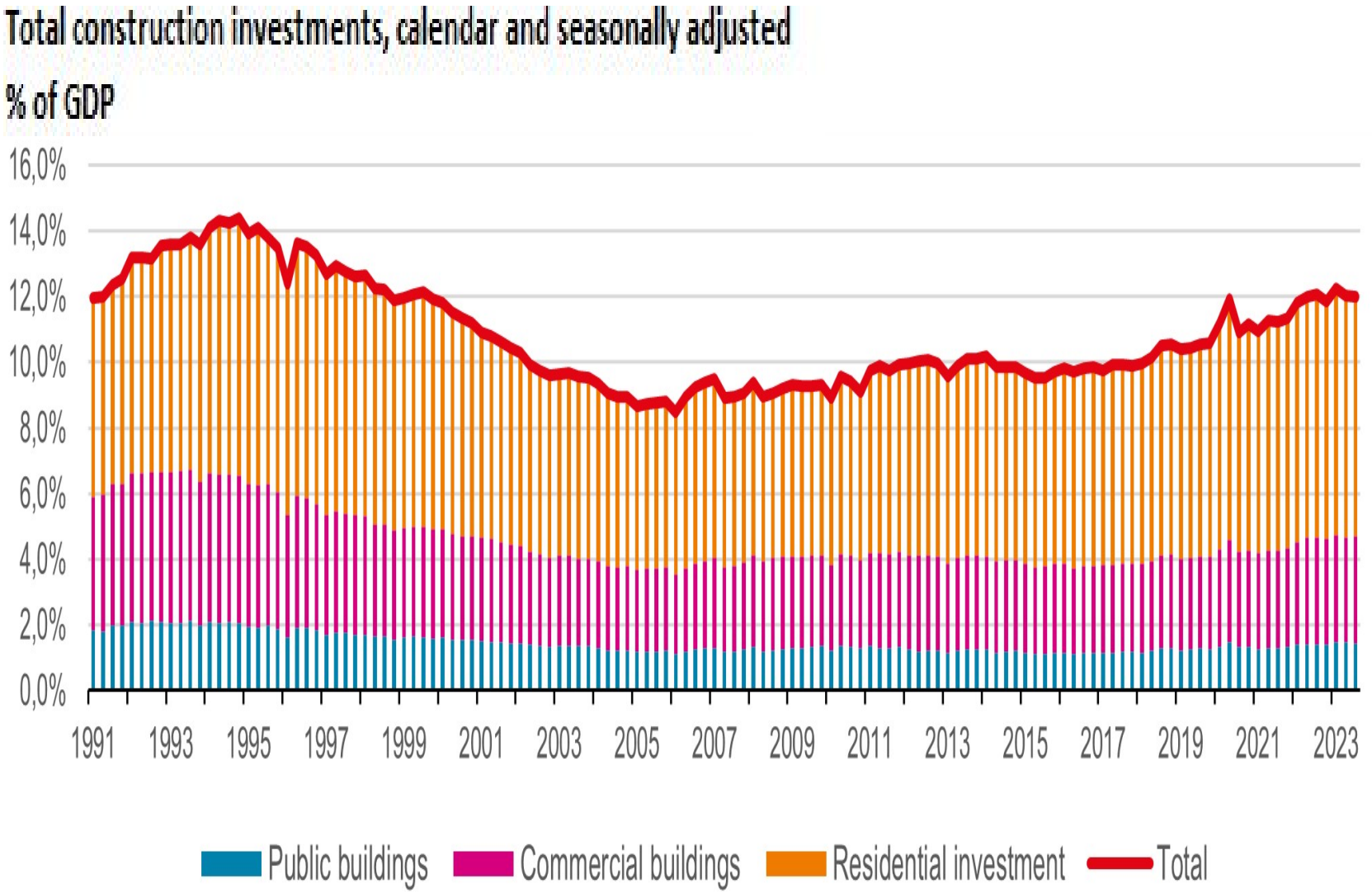
Construction activity shows long waves I



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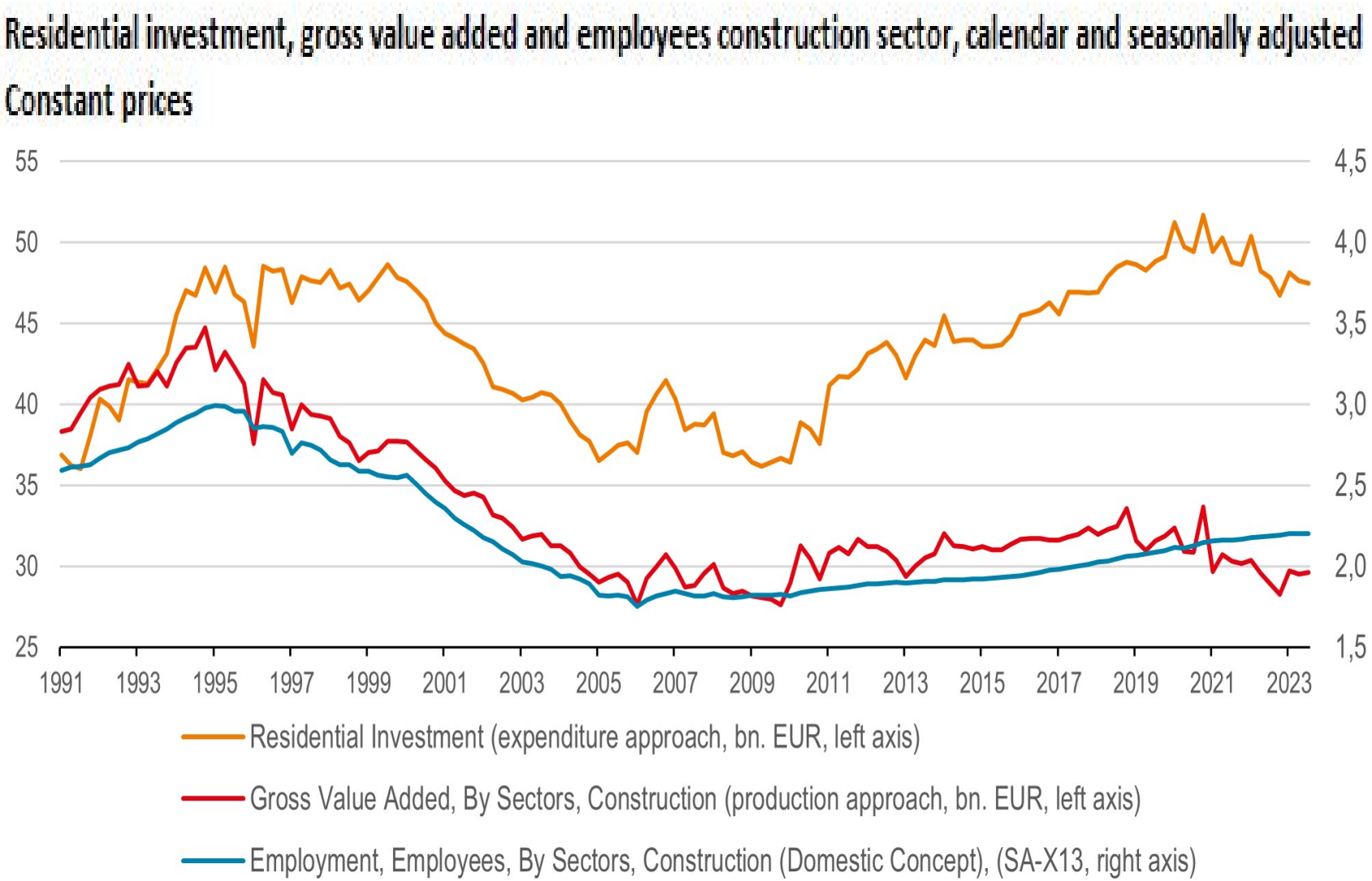
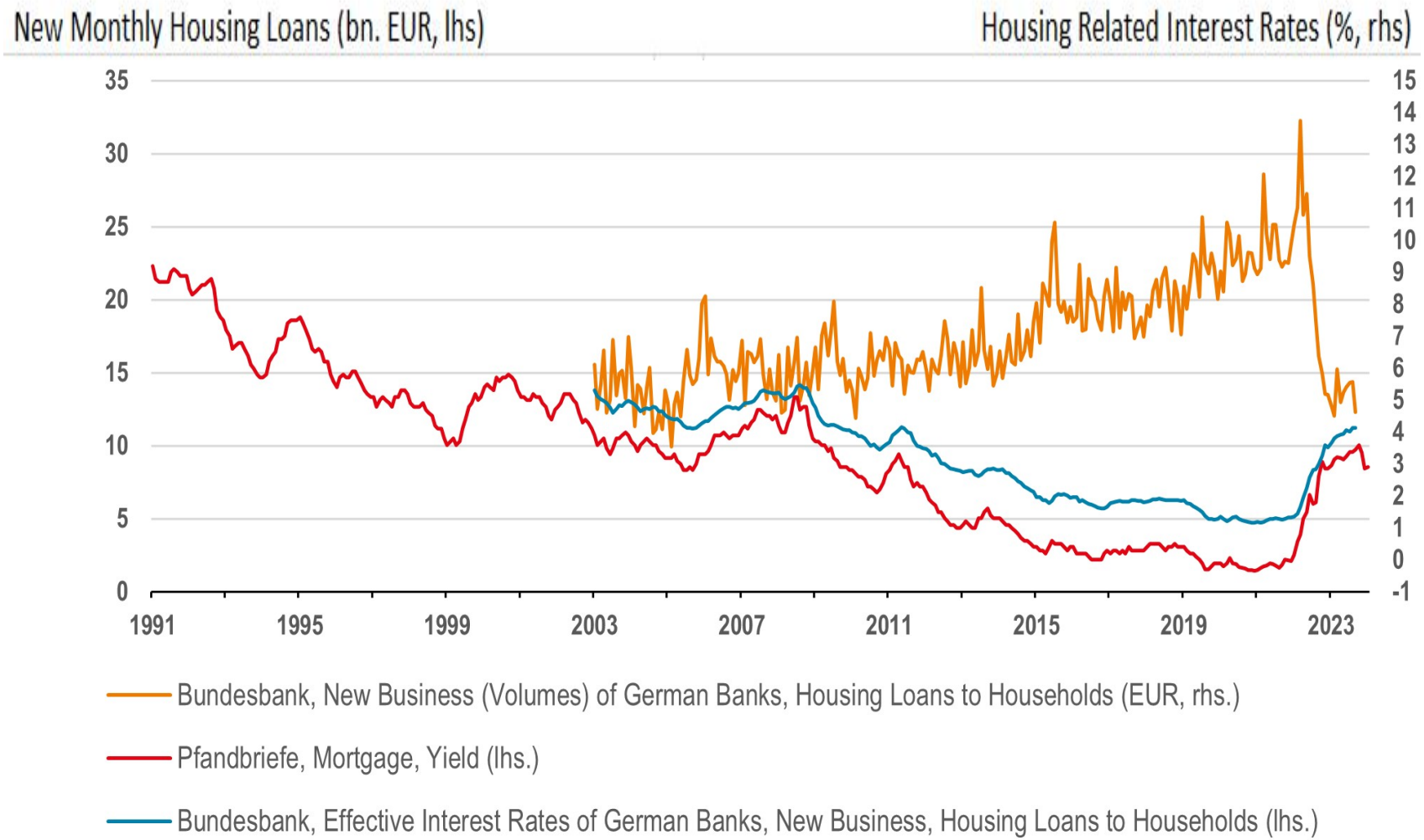
Construction activity shows long waves II



Construction sector condition change I



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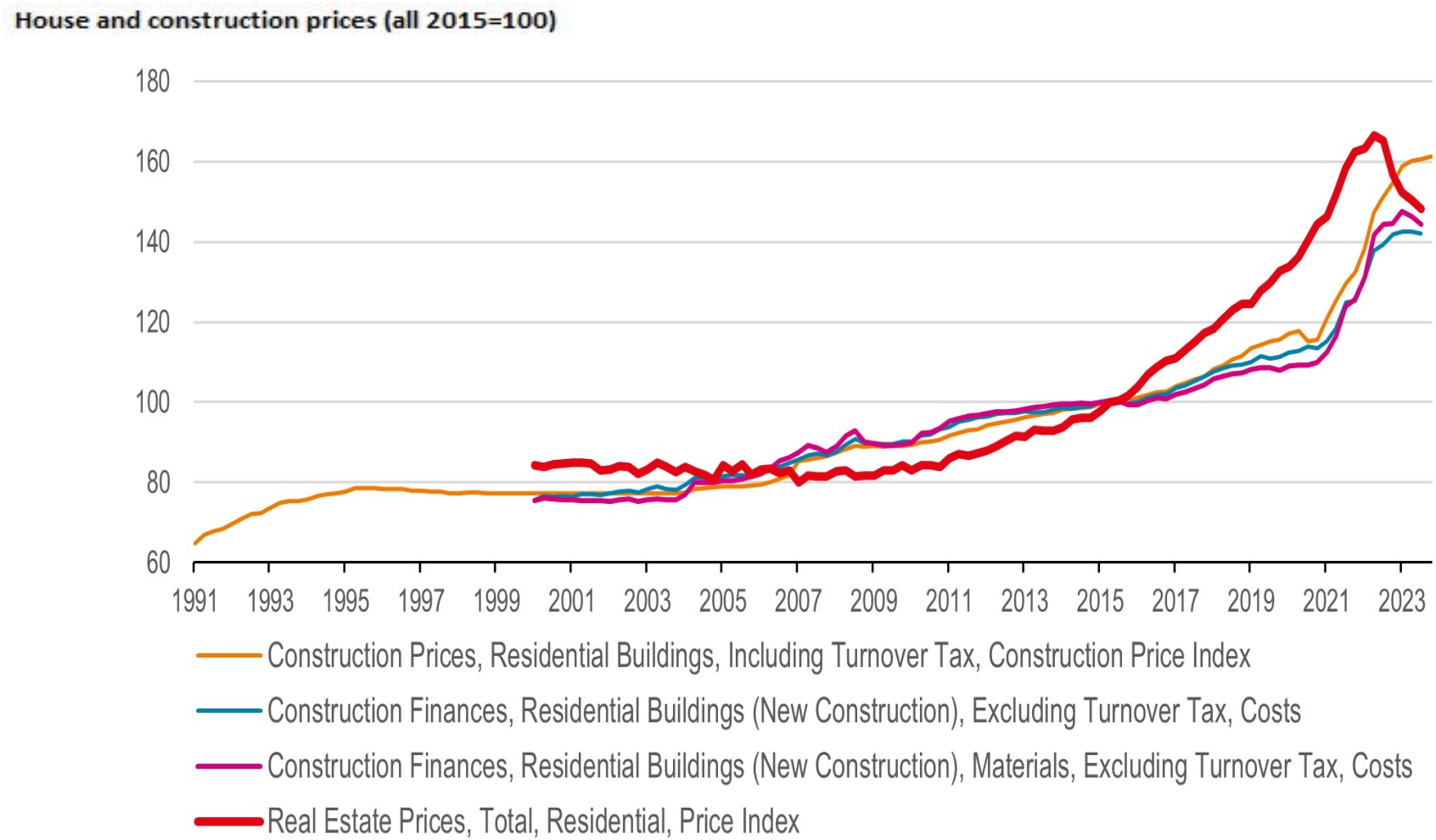
Construction sector condition change II



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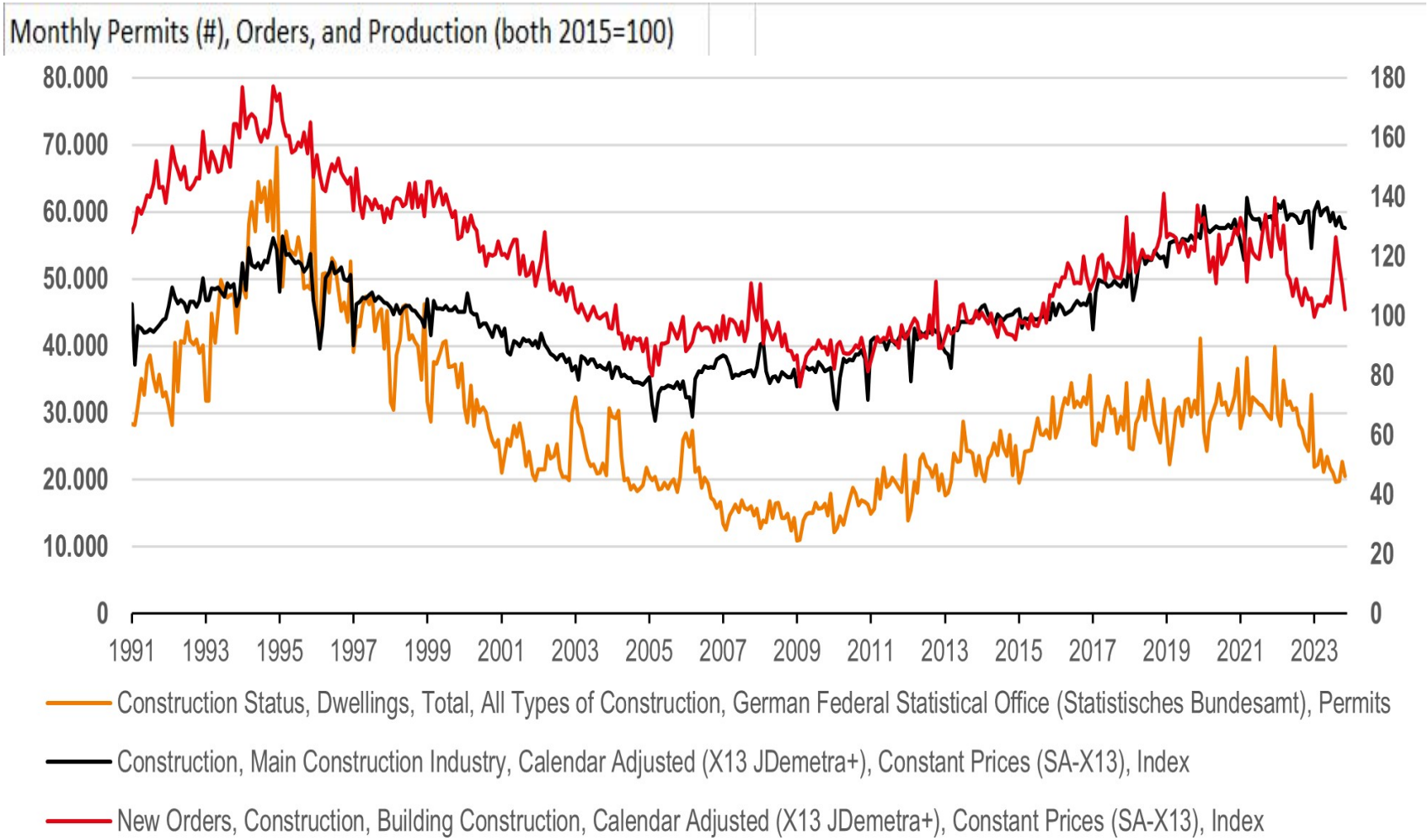
Construction sector real economic consequences



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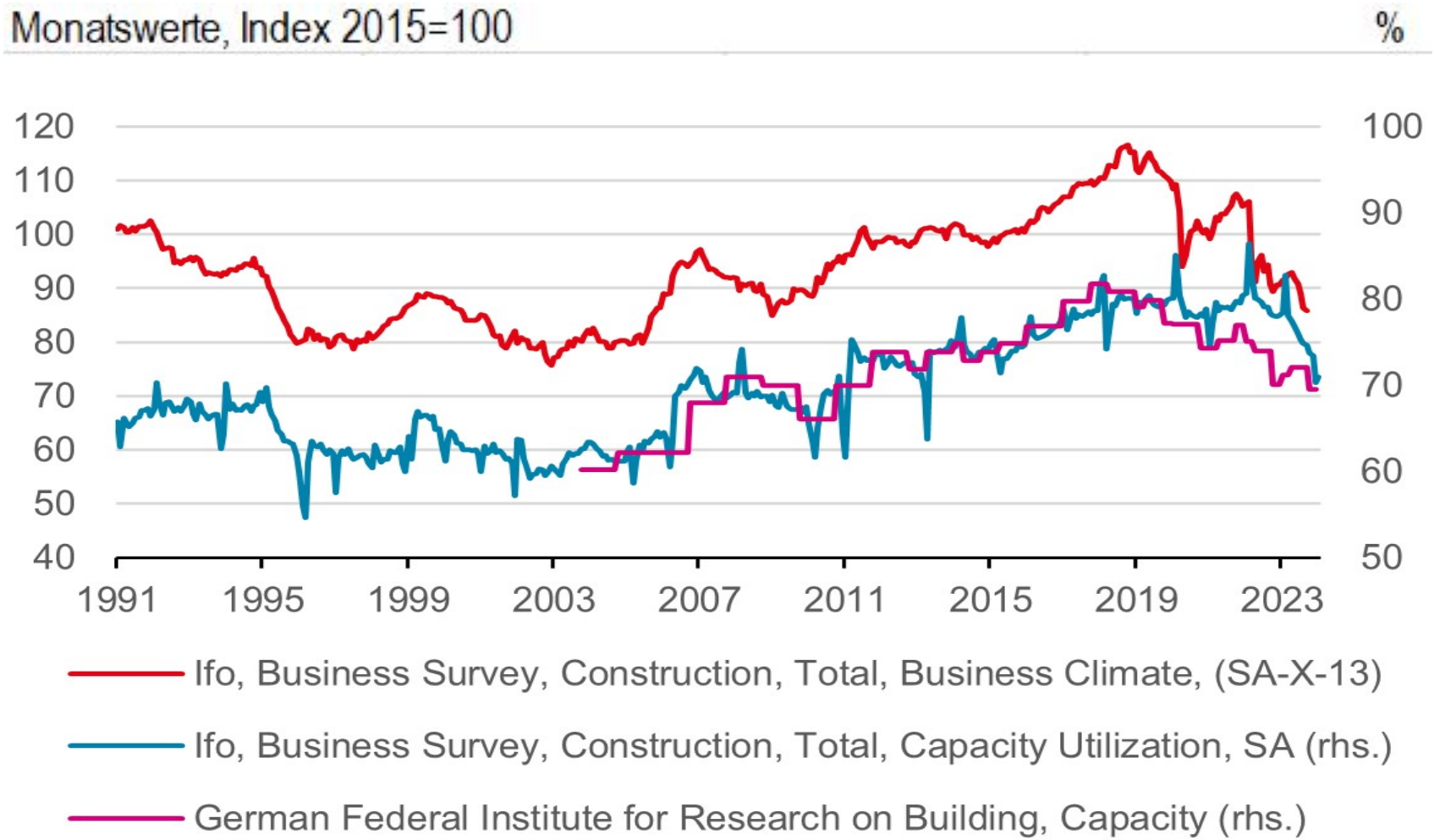
Construction sector capacity



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Housing needs estimated by ARGE Bau (2023)

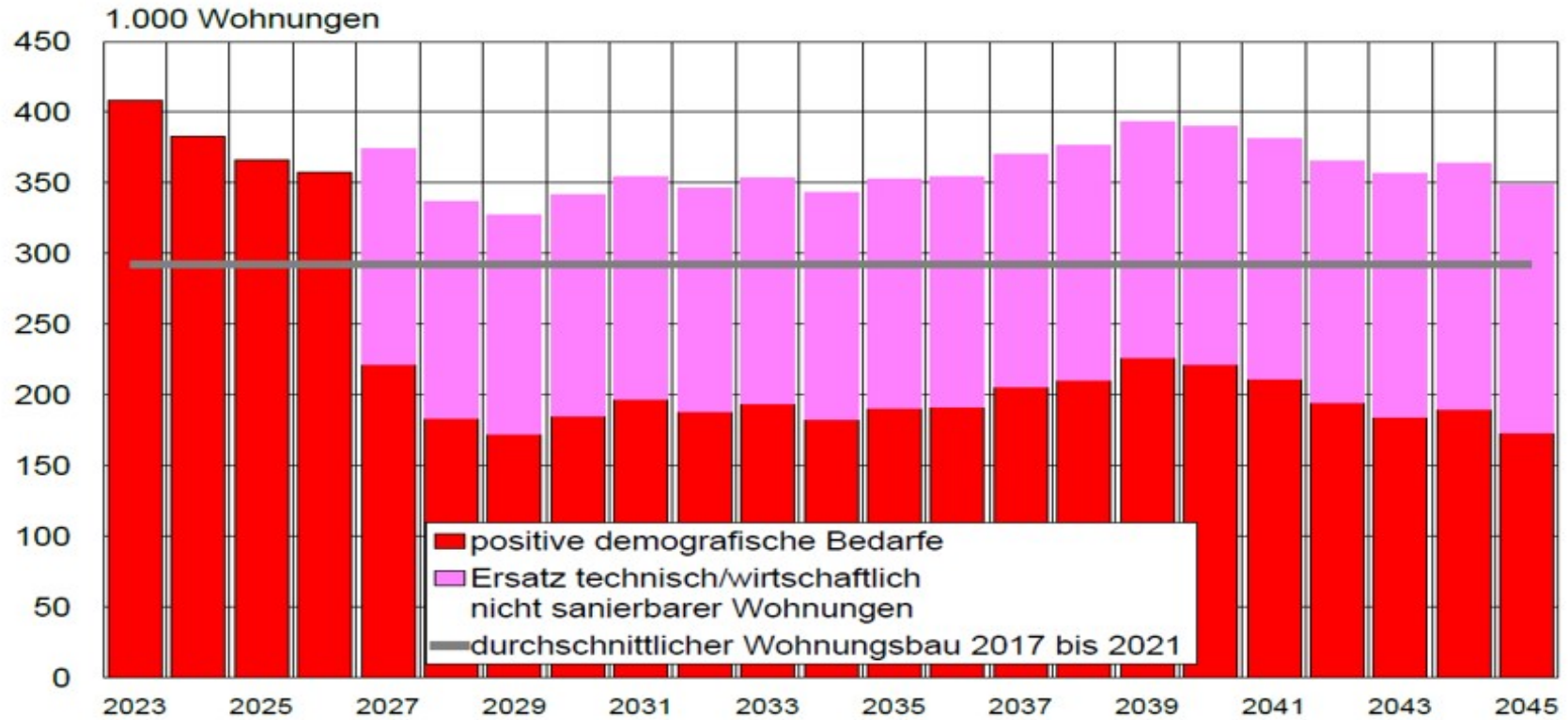

Abbildung 9: Darstellung des Wohnungsbedarfs in Deutschland von 2023 bis 2045 (1.000 Wohnungen); differenziert in positive demografische Bedarfe und den Bedarf aufgrund des Ersatzes technisch/wirtschaftlich nicht sanierbarer Wohnungen
Quelle: [Pestel 2023]

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Interest rate results from semi-structural macro-models

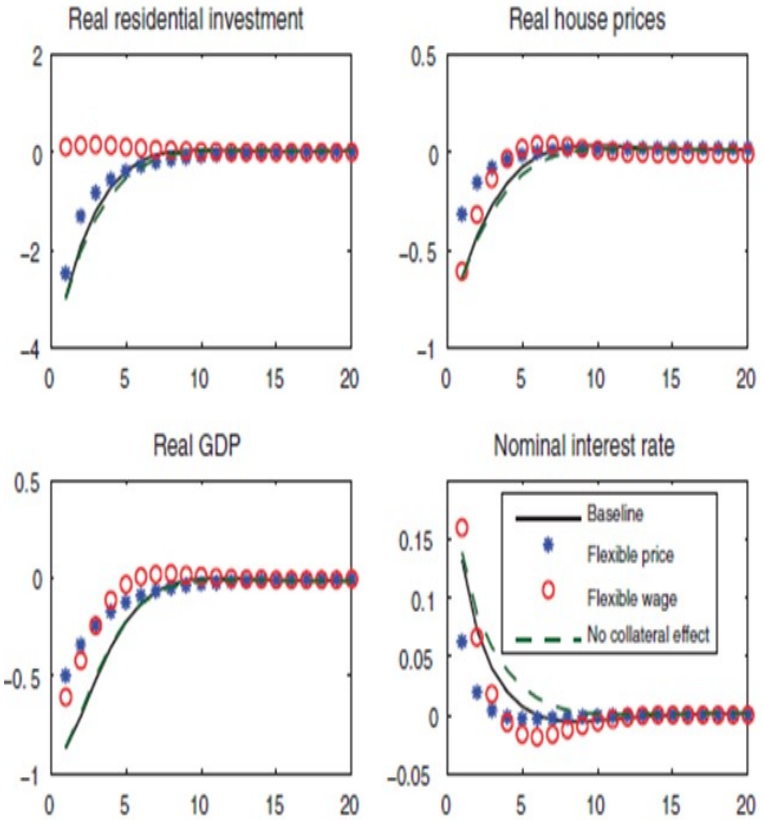
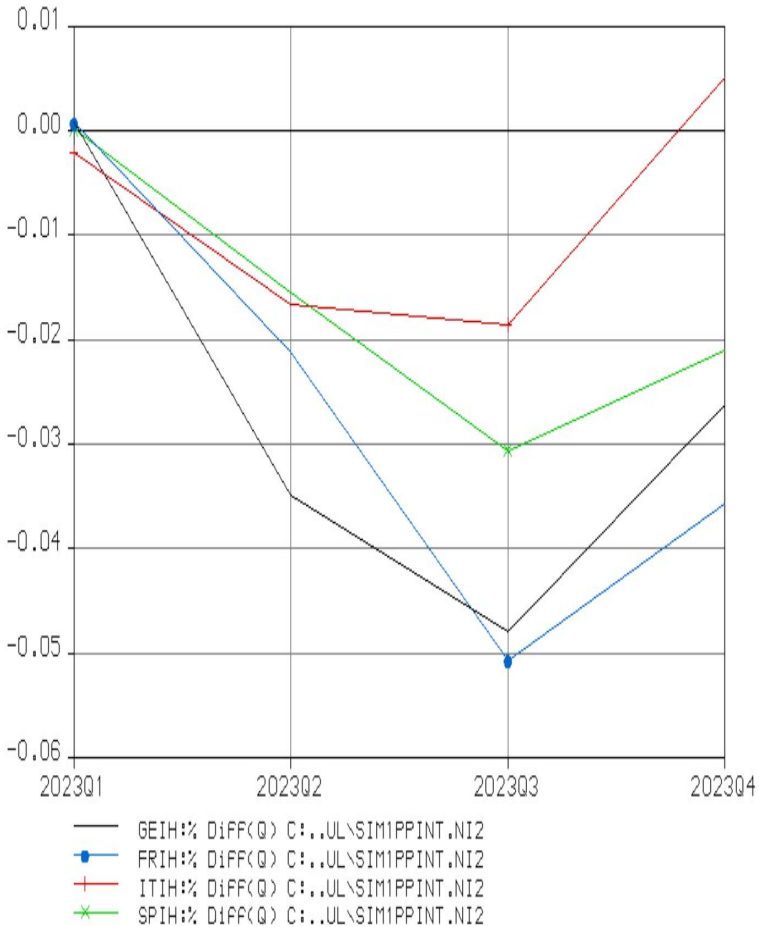


FIGURE 3. IMPULSE RESPONSES TO AN INDEPENDENTLY AND IDENTICALLY DISTRIBUTED MONETARY POLICY SHOCK: BASELINE ESTIMATES AND SENSITIVITY ANALYSIS



IMK lhs: Iacoviello and Neri (2010), rhs: NiGEM v323

(Cumulative) interest rate semi-elasticities

- An Internet search along the lines of Havránek et al. (2020) was used to identify **187 estimates from 41 empirical studies** for which standard errors are available in addition to the estimated interest rate sensitivities.
- The interest rate coefficients are **standardized to indicate the percentage change in construction activity in response to a one-percentage-point increase in interest rates** for all studies.
- To account for lag structures in different empirical models (the typically lagged effect of monetary policy), the **cumulative effect of interest rate changes is considered after up to 4 quarters**, $c = \frac{\sum \Delta y_t}{\sum \Delta int_t}$ (Gechert and Rannenberg, 2018)

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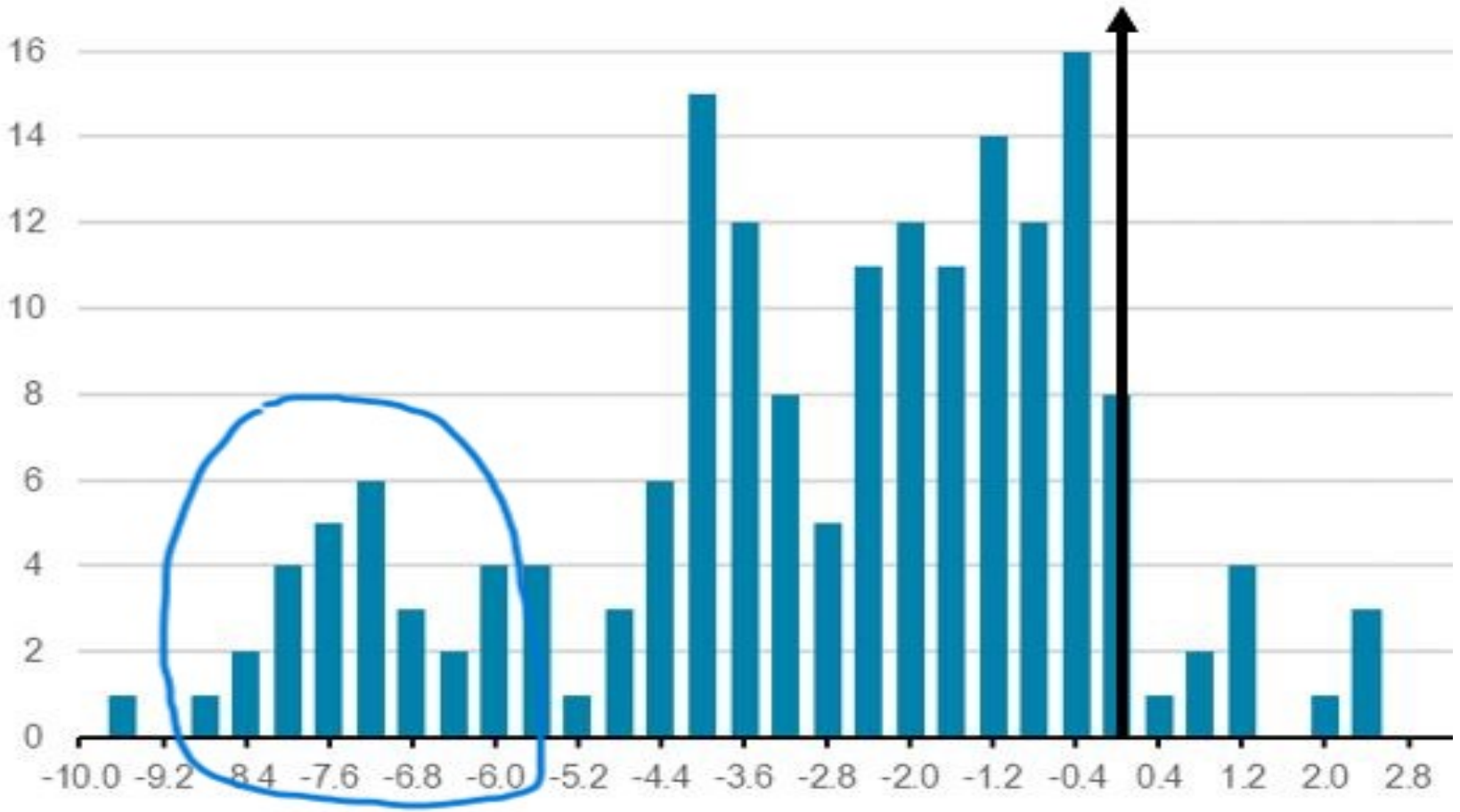
Interest rate semi-elasticities (descriptive results)



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Meta-regression results for semi-elasticities

Dependent: Estimated percentage change in construction activity in response to an interest rate increase by 1 percentage point

Variable		Koeffizient	Standardfehler	t-Statistik
Schätzmethode: Ordinary Least Squares (OLS)				
Konstante		-3,092	0,736	-4,20
Schätzmethode: Weighted Least Squares (WLS)				
Konstante	(= genuiner Effekt)	-0,102	0,192	-0,53
Standardfehler	(=Publikationsverzerrung)	-2,693	0,566	-4,76
Adjustiertes R^2		0,347		
Schätzmethode: Weighted Least Squares with Bias Correction (WLS-PEESE)				
Konstante	(= genuiner Effekt)	-0,577	0,187	-3,09
Standardfehler	(=Publikationsverzerrung)	-0,816	0,356	-2,29
Adjustiertes R^2		0,146		
Beobachtungen		187		

Source: Calculations of the IMK.

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(Simple) Estimation & Risk-based Forecast Approach

- Restrict to parsimonious linear single (equation) co-integration specifications with demand and supply side factors on the explanatory side (real_disp_inc, unempl, interest, rel_prices)
- Estimate ARDL (with automatic (BIC) lag selection) and/or FMOLS for new orders, residential investment, new housing
- Test co-integration relation with standard residual integration test (Phillips/Ouiliaris, 1990)
- Use IMK forecast (assumptions) for future exogenous values
- Evaluate forecast against the background of potential shortcomings (mostly tilted upwards $\Leftrightarrow$ risk-based forecast)

▸ Econometric Background

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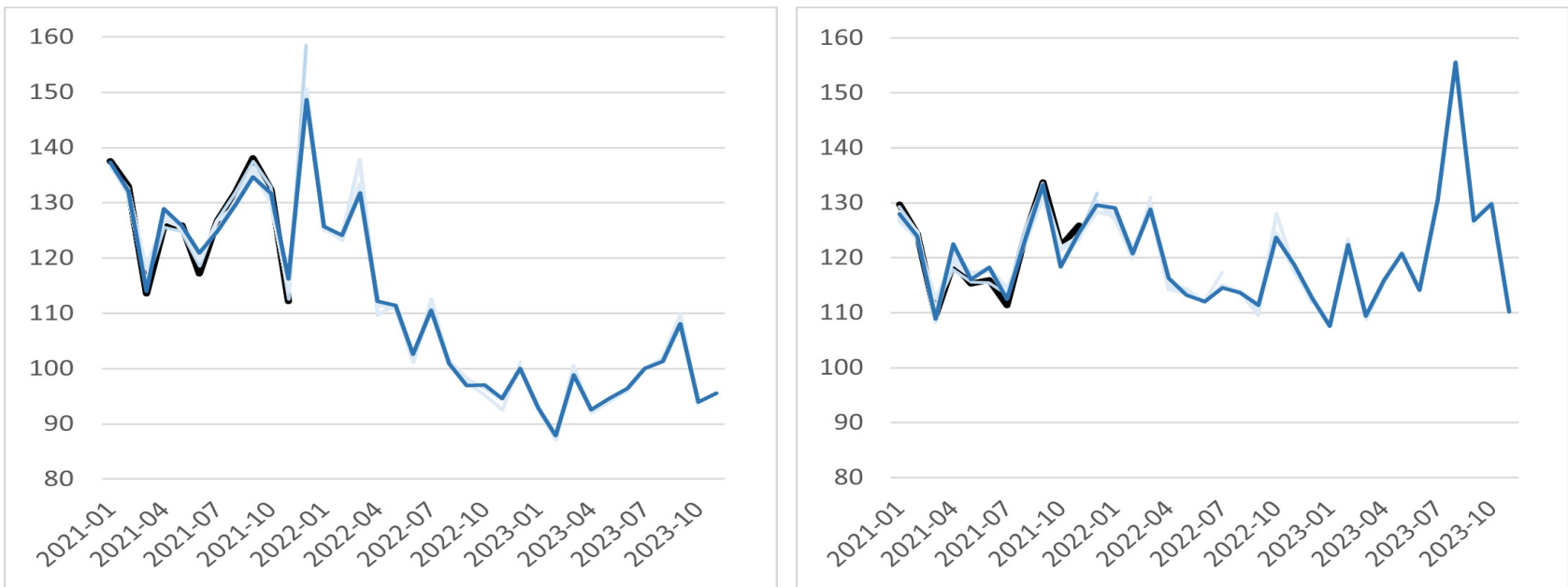
What's new?* What's real-time?

- (pseudo) real-time estimation starting with in-sample 1991M1 - 2022M12, out-of-sample (. . . -2024M12)
- specific consideration of data w.r.t. residential investment, see the difference between building **above** (lhs.) and **below** (rhs.) the ground level (here new orders):



black: 1st release, light colour: in between releases, dark colour: last release
new construction **orders** each 2015=100, *with respect to Jonas et al. (2023)

Baseline estimation*

b) Dependent: Change log new orders in construction sector (sample 1991M1 - 2021M12).
Estimation method: autoregressive distributed lag (ARDL) with automated model selection (SIC).

Variable	Coefficient	Standard error	t-statistic
log new orders (-1)	-0,0699	0,022	-3,169
log real disposable income	0,2949	0,159	1,857
unemployment rate (-1)	-0,0097	0,003	-3,737
effective interest rate for new real estate business	-0,0123	0,004	-3,240
△ log new orders (-1)	-0,5661	0,052	-10,877
△ log new orders (-2)	-0,2440	0,051	-4,797
△ unemployment rate	-0,0886	0,021	-4,242
constant	-0,8564	0,679	-1,261
trend	-0,0007	0,000	-3,669
adjusted R^2	0,290		
Log-Likelihood	633,806		
Schwarz-Information Criterion (SIC)	-3,282		
Durbin-Watson-Statistic	2,027		
p-value Phillips-Ouliaris Z-Statistic (H_0: Time series are not cointegrated)	0,029		

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Robustification*

a) Dependent: Change log new orders in construction sector (sample 1991M1 - 2021M12).
Estimation method: autoregressive distributed lag (ARDL) with automated model selection (SIC).

Variable	Coefficient	Standard error	t-statistic
log new orders (-1)	-0,0538	0,022	-2,467
log real disposable income	0,2396	0,160	1,498
unemployment rate (-1)	-0,0058	0,002	-2,487
△ log new orders (-1)	-0,5607	0,053	-10,642
△ log new orders (-2)	-0,2326	0,051	-4,526
△ unemployment rate	-0,0797	0,021	3,800
constant	-0,8163	0,688	-1,187
trend	-0,0003	0,000	-2,128
adjusted R^2	0,285		
Log-Likelihood	633,504		
Schwarz-Information Criterion (SIC)	-3,269		
Durbin-Watson-Statistic	2,009		
p-value Phillips-Ouliaris Z-Statistic (H_0: Time series are not cointegrated)	0,017		

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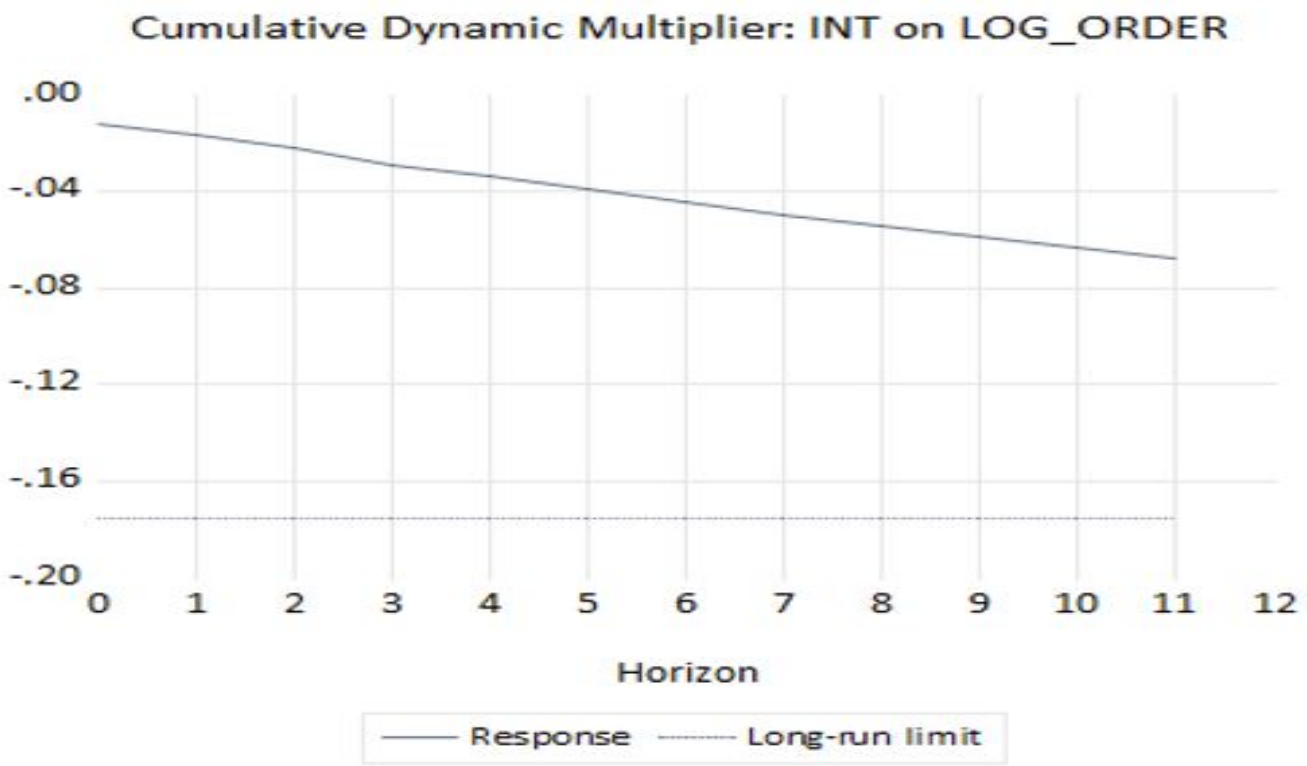
Dynamic Multiplier*,**



**among the lower 15% of the sensitivities from the literature

$\Rightarrow$ risk-based approach

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Stepwise procedure*

b) Dependent: log real residential investment (sample 1991M1 - 2021M12).
Estimation method: Fully Modified Least Squares (FMOLS).

Variable	Coefficient	Standard error	t-statistic
log new orders	0,521	0,053	9,829
Constant	0,059	0,262	0,224
Trend	0,001	0,000	7,708
Adjusted R^2	0,697		
p-value Phillips-Ouliaris Z-Statistic	0,023		

c) Dependent: change log new apartments (construction completion, sample 1970 - 2021).
Estimation method: Ordinary Least Squares (OLS).

Variable	Coefficient	Standard error	t-statistic
△ log new apartments (-1)	0,348	0,066	5,248
△ log real housing investment	1,409	0,165	8,567
Constant	0,011	0,005	-2,568
Adjusted R^2	0,640		
Durbin-Watson-Statistic	2,199		

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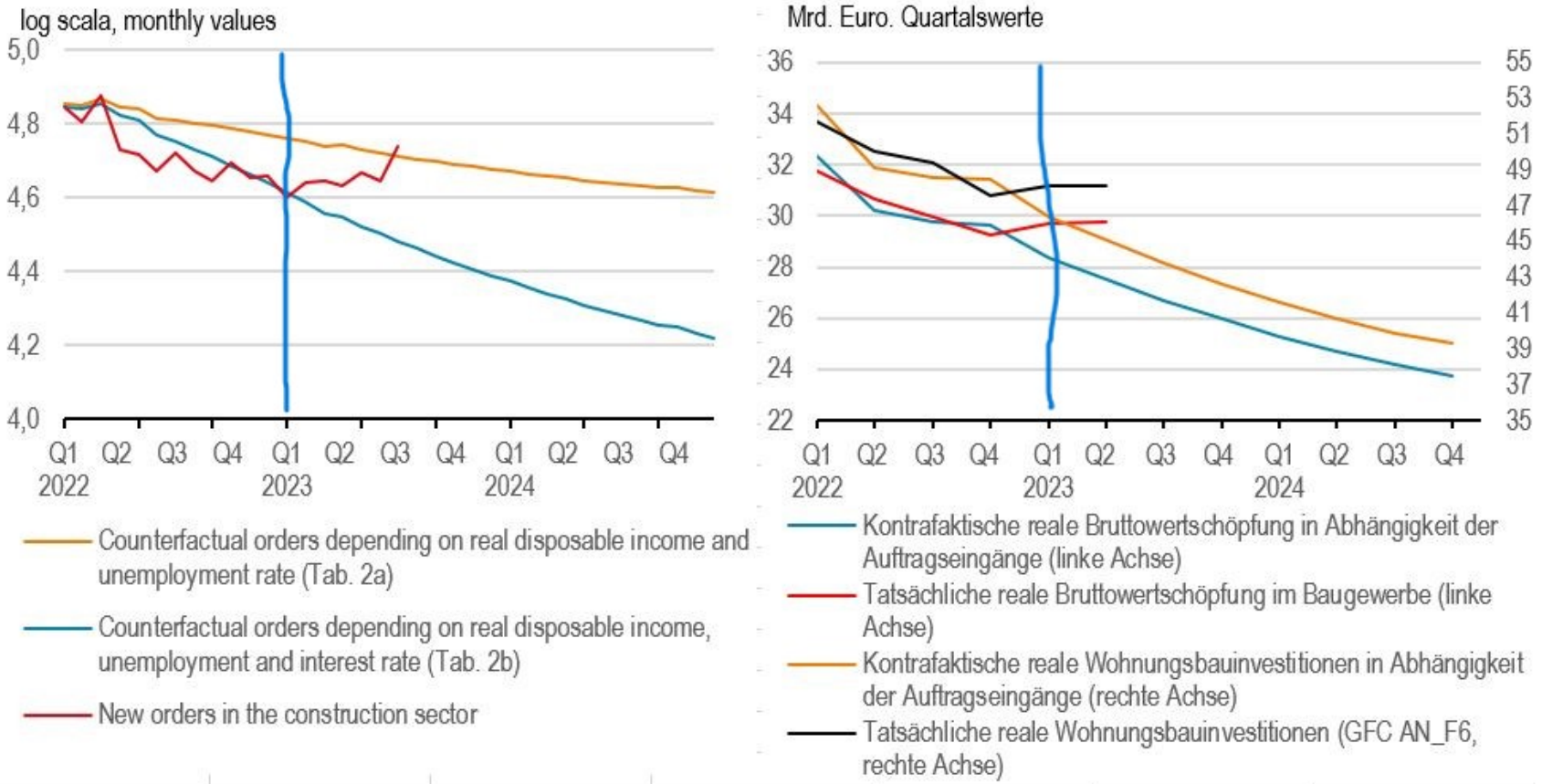
Initial actual & counterfactual for orders & investment



Für die Schätzung wird die eigentlich nur auf Quartalsbasis verfügbare, reale Bruttowertschöpfung im Baugewerbe per Random-Walk-Variante der Chow-Lin-Methode auf die Monatsfrequenz konvertiert, wobei berücksichtigt wird, dass die Summe der Monatswerte dem Quartalswert entspricht.

Quellen: DeStatis, Eurostat, Eigene Berechnungen.

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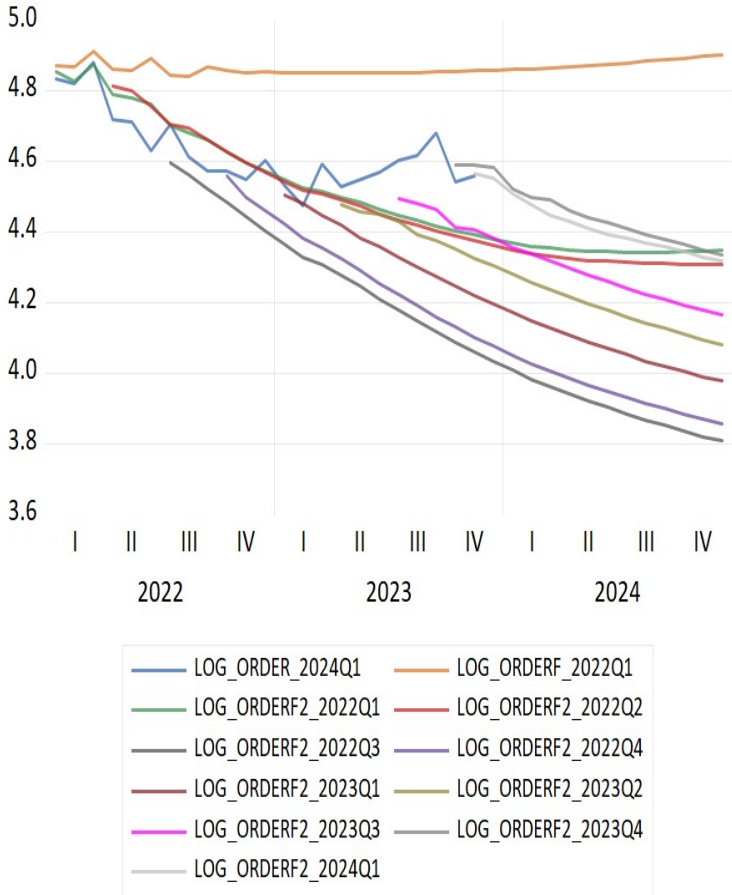
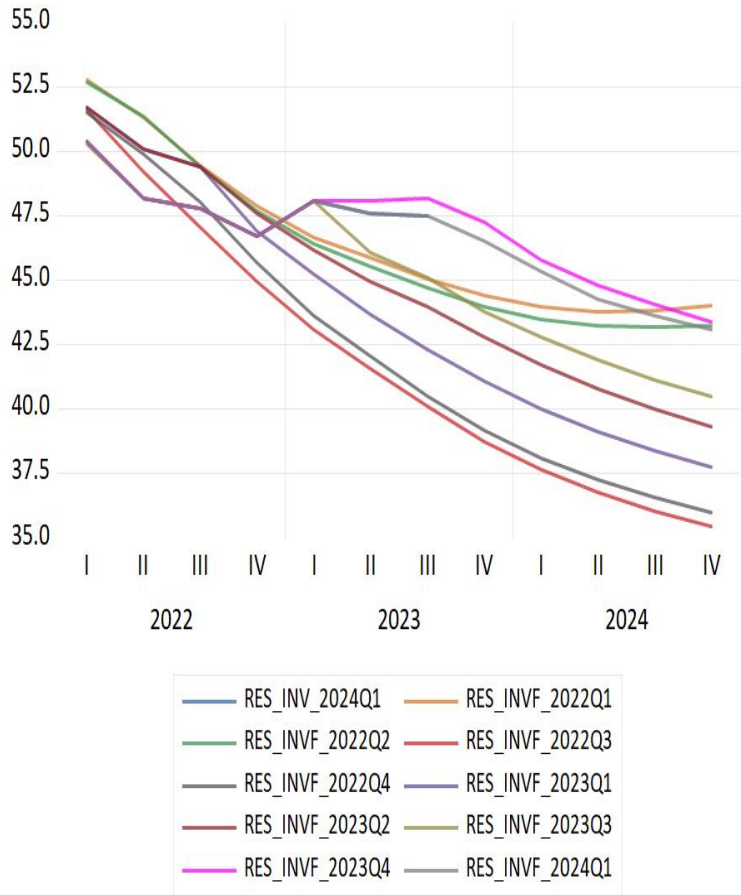
New actual & counterfactual for orders & investment





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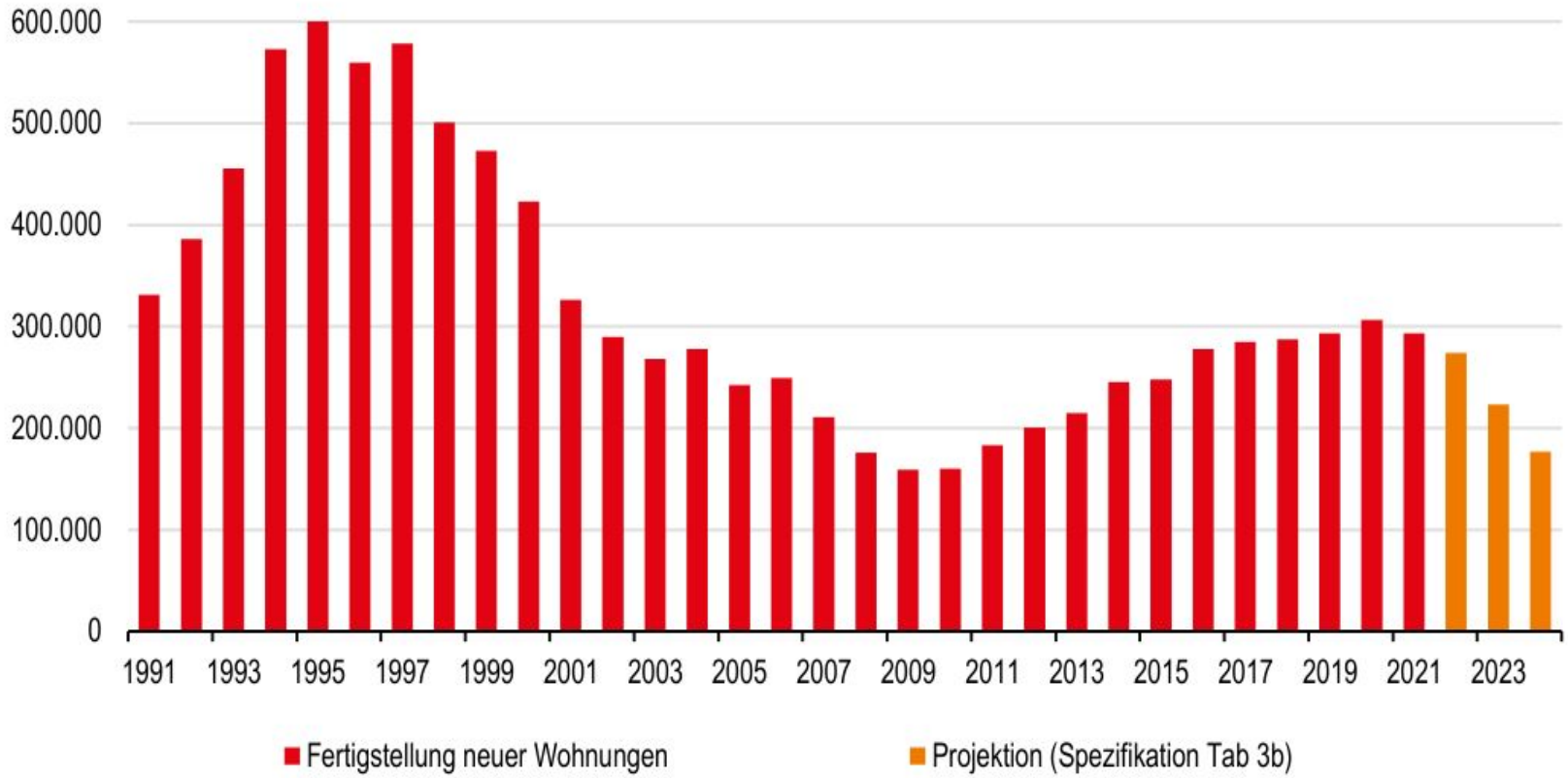
1. ⇑ due to refined estimation, 2. ⇓ due to worser exogenous data
3. ⇑ due to better endogenous data

Initial projection for the number of new dwelling units

Figure 7: Number of new apartments (construction completions) including projection 2022-2024



Sources: Destatis, IMK calculations.

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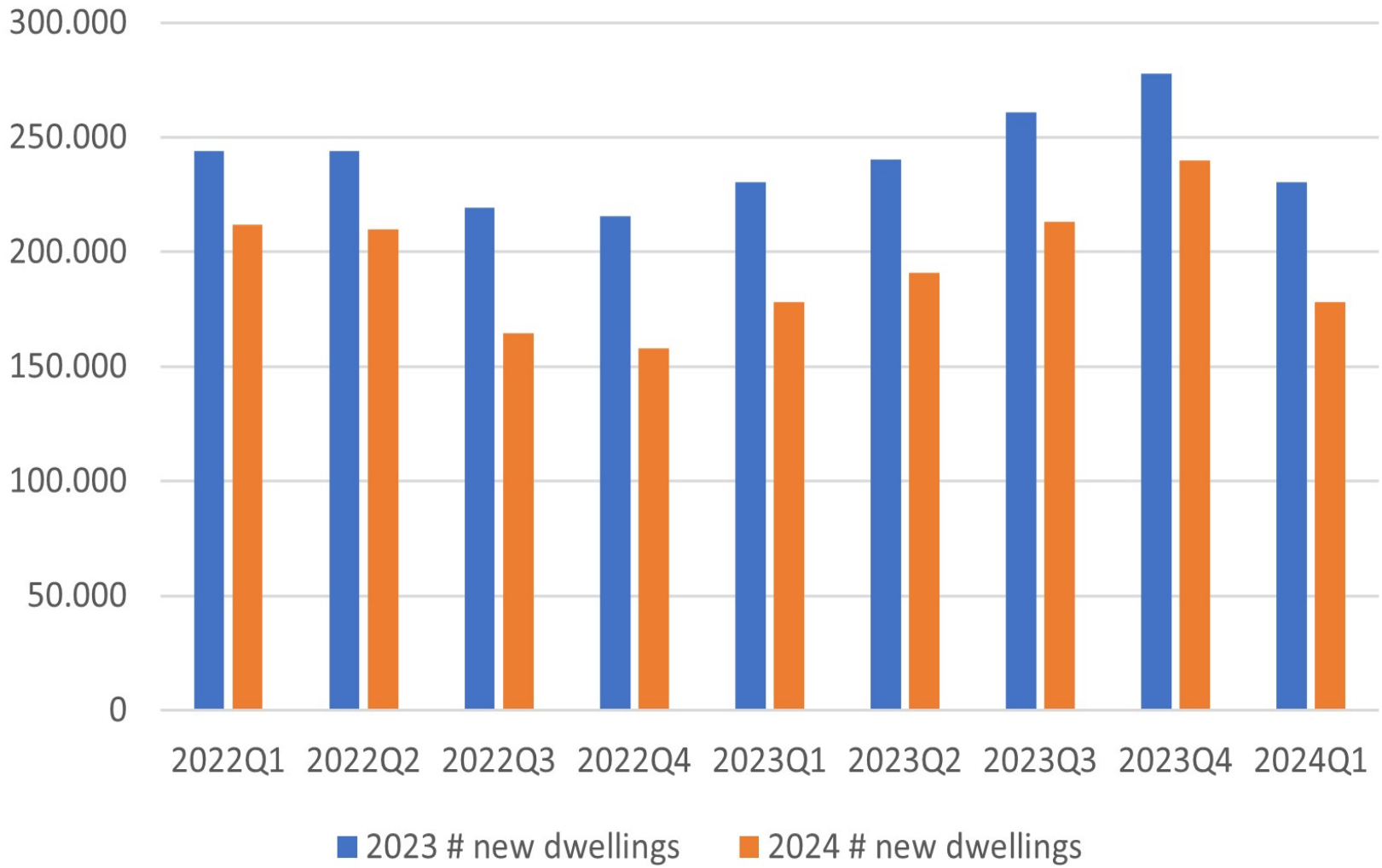
IMK 2022: 290' new dwellings were built, while only 270' were predicted.

Real-time projection for the number of new dwellings



IMK Initial (last) forecast for 2023 is 223' (230') and for 2024 is 177' (178')

Potential shortcomings

- One concern is about the **stability of cointegration relationships** that account for a deterministic trend and the question of whether construction activity would not be better specified in a system of variables (with mixed frequencies).
- According to DIW's construction volume calculation, **about 2/3 of the recorded residential construction investment volume is attributable to modernizations of the existing stock** and only about 1/3 to new construction (Gornig and Pagenhardt 2024).
- Discretionary **interventions are not reflected** in the present estimates (14-Punkte-Plan Bundesregierung +3 Mrd. EUR).

$\Rightarrow$ risk-based forecast or *worst case scenario*

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Conclusions I

- Construction sector activity shows long waves (depending on demand and supply side factors).
- A literature review (and semi-structural macro-models) suggest an average interest rate sensitivity of construction activity of about 3 % to 4 % ,
- while (from a risk perspective)a non-neglectable proportion of studies shows a value almost twice as high.
- On the deductive side, (simple) meta-regressions suggest only small effects.
- Also on the deductive side, (simple) co-integration regressions support results from a risk perspective.

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Conclusions II

- From an economic policy perspective, results suggest an expansion of public housing
  - to maintain capacity / to avoid future constraints (given transformation needs and those for additional (urban) living space).
- Among several possible measures,
  - direct interest rate reduction for the private sector builders by KfW programs seems less promising than
  - direct public housing investments, especially social housing.*

* In 2021, more than twice as many dwellings per year have lost the social commitment status than were newly built.

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References I

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References II

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- Jonas, L., Martin, C. and Theobald, T. (2023), Mehr öffentlicher Wohnungsbau zum Erhalt der Kapazitaeten, *IMK Policy Brief* ***155****, 1-22*.
- Gornig, M. and Pagenhardt, L. (2024), Bauvolumen dürfte erstmals seit der Finanzkrise nominal sinken, *DIW Wochenbericht* ***24-1****, 1-13*.

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Econometrics

an Autoregressive Distributed Lag model (ARDL):

$$y_t = c_0 + c_1 t + \sum_{i=1}^{p} \alpha_i y_{t-i} + \sum_{j=1}^{3} \sum_{l=0}^{q_j} \beta_{j,l} x_{j,t-l} + \varepsilon_t$$

The FMOLS estimator employs preliminary estimates of the symmetric and one-sided long-run covariance matrices of the residuals. Let $\hat{u}_{1t}$ be the residuals obtained after estimating Equation (28.1). The $\hat{u}_{2t}$ may be obtained indirectly as $\hat{u}_{2t} = \Delta\hat{\epsilon}_{2t}$ from the levels regressions

$$X_t = \hat{\Gamma}_{21}' D_{1t} + \hat{\Gamma}_{22}' D_{2t} + \hat{\epsilon}_{2t} \tag{28.4}$$

or directly from the difference regressions

$$\Delta X_t = \hat{\Gamma}_{21}' \Delta D_{1t} + \hat{\Gamma}_{22}' \Delta D_{2t} + \hat{u}_{2t} \tag{28.5}$$

Let $\hat{\Omega}$ and $\hat{\Lambda}$ be the long-run covariance matrices computed using the residuals $\hat{u}_t = (\hat{u}_{1t}, \hat{u}_{2t}')'$. Then we may define the modified data

$$y_t^+ = y_t - \hat{\omega}_{12} \hat{\Omega}_{22}^{-1} \hat{u}_2 \tag{28.6}$$

and an estimated bias correction term

$$\hat{\lambda}_{12}^+ = \hat{\lambda}_{12} - \hat{\omega}_{12} \hat{\Omega}_{22}^{-1} \hat{\Lambda}_{22} \tag{28.7}$$

The FMOLS estimator is given by

$$\hat{\theta} = \begin{bmatrix} \hat{\beta} \\ \hat{\gamma}_1 \end{bmatrix} = \left(\sum_{t=2}^{T} Z_t Z_t' \right)^{-1} \left(\sum_{t=2}^{T} Z_t y_t^+ - T \begin{bmatrix} \hat{\lambda}_{12}^{+\prime} \\ 0 \end{bmatrix} \right) \tag{28.8}$$

where $Z_t = (X_t', D_t')'$. The key to FMOLS estimation is the construction of long-run covariance matrix estimators $\hat{\Omega}$ and $\hat{\Lambda}$.

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Back

Econometrics II

In contrast to the Engle-Granger test, the Phillips-Ouliaris test obtains an estimate of ρ by running the unaugmented Dickey-Fuller regression

$$\Delta \hat{u}_{1t} = (\rho - 1)\hat{u}_{1t-1} + w_t \tag{28.20}$$

and using the results to compute estimates of the long-run variance ω_w and the strict one-sided long-run variance λ_{1w} of the residuals. By default, EViews d.f.-corrects the estimates of both long-run variances, but the correction may be turned off. (The d.f. correction employed in the Phillips-Ouliaris test differs slightly from the ones in FMOLS and CCR estimation since the former applies to the estimators of both long-run variances, while the latter apply only to the estimate of the conditional long-run variance).

The bias corrected autocorrelation coefficient is then given by

$$(\hat{\rho}^* - 1) = (\hat{\rho} - 1) - T\hat{\lambda}_{1w}\left(\sum_t \hat{u}_{1t-1}^2\right)^{-1} \tag{28.21}$$

The test statistics corresponding to Equation (28.18) are

$$\begin{aligned} \hat{\tau} &= \frac{\hat{\rho}^* - 1}{sc(\hat{\rho}^*)} \\ \hat{z} &= T(\hat{\rho}^* - 1) \end{aligned} \tag{28.22}$$

where

$$sc(\hat{\rho}^*) = \hat{\omega}_w^{1/2}\left(\sum_t \hat{u}_{1t-1}^2\right)^{-1/2} \tag{28.23}$$

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