

Lessons from forecast averaging residential investment*

By Carlos Cañizares Martínez (National Bank of Slovakia),
Gabe de Bondt (European Central Bank), and Arne Gieseck (formerly European Central Bank)

Keywords: Residential investment, forecast averaging, Tobin's Q.

JEL codes: C32, C53, E22.

This policy brief summarises three key lessons for policymakers, modellers, and forecasters from recent work on forecasting real housing investment (Cañizares Martínez et al., 2023a and 2023b). Our study offers a new approach to conditionally forecast residential investment in the largest euro area countries and the euro area. We estimate many models using a wide set of determinants and select the 50 best performing models. This forecast averaging approach addresses considerable model uncertainty in the case of residential housing investment.

*This policy brief is based on Cañizares Martínez et al. (2023a and 2023b). The views expressed here are those of the authors and do not necessarily represent the views of the National Bank of Slovakia, European Central Bank or the EuroSystem.

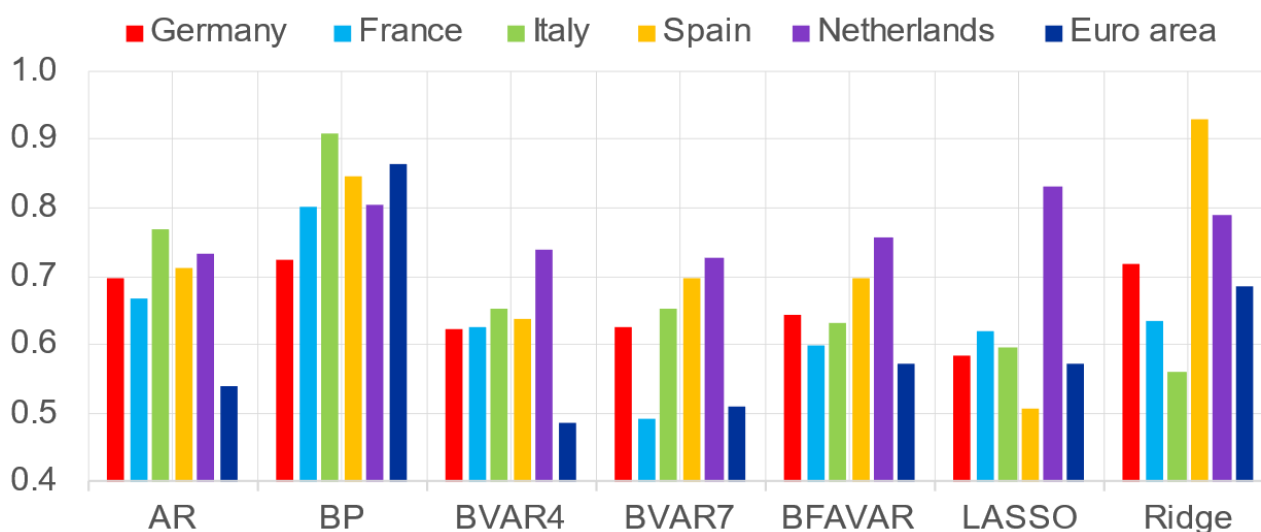
Methodology

In a nutshell, our forecast averaging approach is based on selecting among many model equations the best performing ones in terms of four in- and out-of-sample selection criteria. The first selection criterion is the existence of a co-integration relation between residential investment and three long-run drivers: Tobin's Q, income, and credit. All three long-run drivers can be measured in different ways, and we therefore consider three to five different measures of each. A novelty is that among the income measure we also consider a housing affordability index, which combines the joint impact of income, house prices, and mortgage rates in one variable. This results in 119 long-run equations of which we only keep those that show a cointegration relationship. As potential short-term drivers we not only consider the earlier mentioned three categories, but also four other groups: mortgage interest rates, macroeconomic variables, demographic and wealth series, and unemployment rate and uncertainty. Again, various measures of each group are considered, in total 15 series. To further select among the more than 100,000 potential equations, we apply an autocorrelation test as a general model misspecification test (second selection criterion), the individual significance of Tobin's Q and income long-run coefficients (third selection criterion or restrict them to one in an alternative restricted model specification we consider), and at least a 10% out-of-sample forecast outperformance of an AR benchmark (fourth selection criterion). Three lessons emerge from our forecast averaging tool.

Lessons

The first lesson is that forecast averaging is powerful. It steers forecasters and is evidencing the accuracy of forecast averaging in practice in the face of modelling uncertainty. This lesson confirms previous successes of forecast averaging that date back decades ago (Wang et al., 2022). Our forecast averaging approach consistently beats a battery of ambitious benchmark models (see Figure 1). The root mean squared errors (RMSE) of the averaged forecasts across the top 50 restricted equations relative to the RMSE of benchmarks is in all cases clearly below one. Among the benchmark models the model using building permits as only leading factor is performing comparatively well. Keeping an eye on building permits developments might thus be insightful for the residential investment outlook.

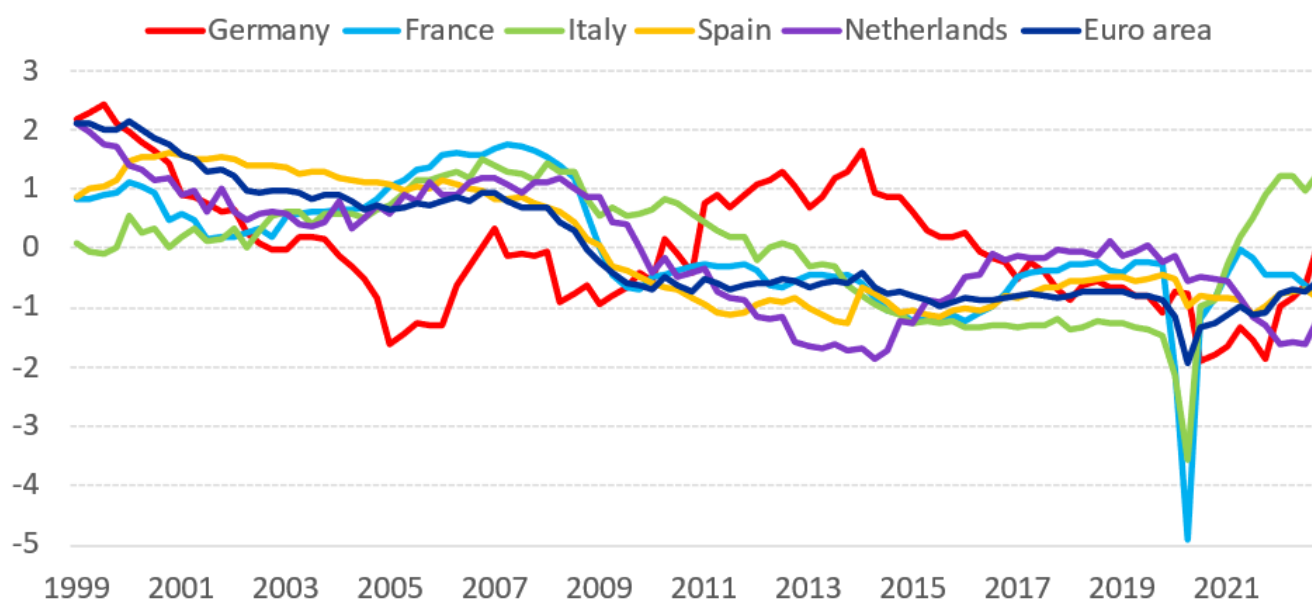
Figure 1: Superior out-of-sample forecast performance of our forecast averaging tool



This figure plots the RMSE of the averaged forecasts across the top 50 selected restricted equations relative to the RMSE of benchmarks. A value lower than 1.0 indicates that the forecast averaging tool outperforms the benchmark. AR = autoregressive; BP = building permits-based model; BVAR = Bayesian Vector Auto Regression with 4 and 7 indicating the total number of variables in the model; BFAVAR = Factor augmented BVAR; LASSO = Least Absolute Shrinkage and Selection Operator. The source is Table 6 in Cañizares Martínez et al. (2023a).

The second lesson is that long-run restrictions can help in enhancing forecasts of residential investment. This lesson of the usefulness of long-run restrictions should please forecasters as it improves the narrative of residential investment projections. The long-run restrictions of Tobin's Q and income to one result for all countries in a much larger number of equations that fulfils the four selection criteria. The long-run restrictions also substantially improve the residential investment forecasts for Spain and the Netherlands. In those two countries real residential investment did not behave like a normal distribution, reflecting a boom-bust pattern in the sample. Figure 2 plots the long-run misalignment of real residential investment according to Tobin's Q and real disposable income both restricted to one for the largest euro area countries and the euro area. Most notable is a steep increase in the Italian misalignment, following the introduction of the Italian Superbonus scheme in July 2020 (Financial Times, 2023; Ruggieri et al., 2023).

Figure 2: Residential investment misalignment according to a long-run coefficient of one for Tobin's Q and disposable income



This figure plots the long-run misalignment of residential investment according to a long-run coefficient of one for Tobin's Q and real disposable income. The misalignment is normalised over 1999Q1-2022Q4. Misalignment is the natural logarithm of real residential investment minus Tobin's Q and minus household real disposable income. For France and Italy disposable income is only found to be relevant. For more details, see Table 4 in Cañizares Martínez et al. (2023a). Tobin's Q is calculated as the ratio between house price and residential investment deflator.

The third lesson is that country heterogeneity is key for modelling and thus forecasting residential investment. This lesson helps policymakers on implementing country-specific housing market policies and guides modellers on improving housing investment models. In fact, marked country heterogeneity in the drivers of residential investment exists. For example, Tobin's Q is not cointegrated with residential investment in France and Italy. Moreover, housing affordability as income measure is especially relevant in Spain and the Netherlands. The estimated long-run credit sign also varies across countries. A negative long-run credit coefficient as found for Germany and Spain might be a signal of debt overhang. At the same time, short-run credit effects have been positive. Changes in mortgage interest rates are significantly adversely affecting residential investment growth in France and Italy. The finding of cross-country diversity in the drivers of residential investment is consistent with well-known structural differences across European housing markets. A broader implication of this lesson is that residential investment modellers and forecasters should not assume that another institution's housing model or block will easily fit their modelling purposes. Instead, country-specific modelling approaches are needed. ■

References

- Cañizares Martínez, C., de Bondt, G.J., and A. Gieseck (2023a) Forecasting housing investment. *Journal of Forecasting*, 42(3): 543-565.
- Cañizares Martínez, C., de Bondt, G.J., and A. Gieseck (2023b) Forecasting housing investment. *ECB Working Paper* 2870.
- Financial Times (2023). Italy weans builders off Superbonus 'drug' after boom, 20 March.
- Ruggieri, G., Andreolli, F., and P. Zangheri (2023). A policy roadmap for the energy renovation of the residential and educational building stock in Italy. *Energies*, 16(3): 1319.
- Wang, X., Hyndman, R.J., Li, F., and Y. Kang (2022). Forecast combinations: An over 50- year review. *International Journal of Forecasting*, 20 December, in press.

About the authors

Carlos Cañizares Martínez is a Senior Economist in the Economics and Monetary Analysis Department at the National Bank of Slovakia. Before joining the NBS, he was a PhD trainee at the European Central Bank and Visiting Researcher at the National Bank of Hungary. He holds a PhD from the University of Milano-Bicocca. His research focuses on forecasting, recession dating, monetary policy, and the housing market.

Gabe de Bondt is employed as Senior Lead Economist in the Business Cycle Analysis Division of the European Central Bank (ECB). Prior to joining the ECB in 2000, he was Economist at De Nederlandsche Bank. He holds a PhD from the University of Amsterdam. His research interests are in the field of business cycle (leading) indicators and surveys, monetary economics, and financial markets.

Arne Gieseck, now retired, has most recently worked as an adviser in the Business Cycle Analysis Division of the European Central Bank (ECB). Prior to joining the ECB in 1999, he worked as a senior economist at Standard & Poor's DRI and holds a doctorate degree (Dr. rer. pol.) from University of Essen. His research activities range from the economics of protectionism, the impact of immigration, business cycle analysis to the economics of uncertainty.

SUERF Publications

Find more **SUERF Policy Briefs** and **Policy Notes** at www.suerf.org/policynotes

SUERF

The European Money
and Finance Forum

SUERF is a network association of central bankers and regulators, academics, and practitioners in the financial sector. The focus of the association is on the analysis, discussion and understanding of financial markets and institutions, the monetary economy, the conduct of regulation, supervision and monetary policy.

SUERF's events and publications provide a unique European network for the analysis and discussion of these and related issues.

SUERF Policy Briefs (SPBs) serve to promote SUERF Members' economic views and research findings as well as economic policy-oriented analyses. They address topical issues and propose solutions to current economic and financial challenges. SPBs serve to increase the international visibility of SUERF Members' analyses and research.

The views expressed are those of the author(s) and not necessarily those of the institution(s) the author(s) is/are affiliated with.

All rights reserved.

Editorial Board

Ernest Gnan
Frank Lierman
David T. Llewellyn
Donato Masciandaro
Natacha Valla

SUERF Secretariat
c/o OeNB
Otto-Wagner-Platz 3
A-1090 Vienna, Austria
Phone: +43-1-40420-7206
www.suerf.org • suerf@oenb.at