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ASSESSING EXPECTATIONS OF EUROPEAN HOUSE PRICES

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ABSTRACT

Using a new database of consumers' expectations, this paper examines the nature of house price forecasts across a select sample of European Union (EU) member states for the period 2020 to 2024. Across many EU countries, post COVID-19, house price increases have been apparent. Therefore, understanding the dynamics of house price movements is especially important at this time. In particular, we examine the rationality or otherwise of consumers' house price expectations, and then examine the relationship between the expectations and forecasts of key fundamental determinants of house prices, such as interest rates and income levels. In this way we distinguish our work from most other studies of house price forecasts, which have not examined links between house price forecasts themselves and forecasts of the variables typically assumed to be determining prices. This is particularly relevant as oftentimes house price expectations themselves are influenced by changes in market fundamentals.

1. INTRODUCTION

One of the economic legacies of COVID-19, observed across different countries, is an acceleration in house price inflation. According to the International Monetary Fund's (IMF) Global House Price Index,[1] of the over 60 countries participating in the survey, three-quarters witnessed increases in prices in 2020 with the trend continuing into 2021. Indeed, house prices increased by over 5 per cent for 23 countries of the 60. On a cross-country basis, house prices have not experienced such a sustained increase since the period preceding the global financial crisis (GFC) of 2007–2008. Some of this increase may have been due to the accumulation in savings evident among households across European countries. Fitzgerald et al. (2021), for example, note that when European consumers were similarly rationed during the Second World War, excess savings were subsequently converted into physical assets in the housing market.

Consequently, given the prominent role of the housing market in credit and asset price cycles, as well as the link between housing finance and the 2007–2009 GFC (Brunnermeier, 2009; Duca et al., 2010 and 2011), assessing the sustainability of current house price movements is of acute interest from a policymaker's perspective.

Typically, the housing literature assumes that, in the long run, house prices are determined by movements in key fundamental variables; for example, a standard approach in the literature is to adopt an inverted housing demand function such that the dependent variable is the house price, as opposed to the quantity of houses. Applications can be found in Peek and Wilcox (1991), Muellbauer and Murphy (1997), Meen (1996), Meen (2000), Cameron et al. (2006), Kelly and McQuinn (2014) and Cronin and McQuinn (2021a); in all these, the model generally assumes that house prices are positively related to income levels and negatively related to the cost of capital.[2]

The interrelationship between the housing market and the real economy was particularly evident following the GFC in 2007–2008. A robust housing market often signals a strong economy, as increased home sales and rising property values boost consumer wealth, leading to higher consumer spending and investment. This, in turn, stimulates economic growth through increased demand for goods and services, construction, and related industries. Conversely, a downturn in the housing market can have a ripple effect, leading to decreased consumer confidence and spending, reduced construction activity, and potential job losses,

1 See https://blogs.imf.org/2021/10/18/housing-prices-continue-to-soar-in-many-countries-around-the-world/.
2 House prices are also generally assumed to be negatively related to the per capita housing stock.

thereby slowing economic growth. Additionally, housing prices and availability impact affordability and mobility, influencing labour market dynamics and overall economic productivity. Case et al. (2005), for example, find that increases in housing wealth significantly boost consumer spending, more so than increases in stock market wealth, while Leamer (2007; 2015) argues that housing is a leading indicator of business cycles, with downturns in residential investment often preceding broader economic recessions. The construction sector, which is closely tied to housing investment, generates significant employment and drives demand for materials and services, thus magnifying its impact on the economy. Mian and Sufi (2009) demonstrate how housing market collapses can lead to severe banking crises, as falling home prices reduce collateral values, leading to a credit crunch. They emphasise the role of excessive mortgage lending and financial leverage in exacerbating economic downturns.

While increases in house prices can initially arise due to a particular shock or change in a key economic variable, consumer expectations of future price movements can themselves become an important dynamic in the market. As noted by Duca et al. (2021), house price booms are usually:

> *set in motion by shifts in fundamentals (e.g. in interest rates, income and credit standards) whose dynamic effects interact with supply conditions and can be magnified by a tendency for households to form house price expectations that are very different from the rational expectations associated with efficient markets.*

Therefore, the interaction of house price expectations and the fundamental determinants of house prices is of particular interest – i.e., to what extent are consumers' expectations of house prices linked to or associated with their expectations for the key determinants of house prices? To date, however, this relationship does not appear to have been examined in much detail. Much of the literature is concerned with examining the rationality or otherwise of house price forecasts, and when this hypothesis is usually rejected, other dynamics underpinning house price expectations are considered, such as backward looking, extrapolative ones. Few, if any, studies examine the degree to which house price expectations are influenced by consumers' expectations of key underlying fundamental variables, such as income levels and interest rates. Using new survey data on consumer sentiment regarding this issue, which was collated and published by the European Central Bank (ECB)[3], we now address this issue. Among other variables, the ECB survey publishes consumers' expectations for house

3 For more information on the survey, see https://www.ecb.europa.eu/stats/ecb_surveys/consumer_exp_survey/html/index.en.html.

prices, household income and mortgage interest rates. This allows us to compare the forecast errors for house prices with those of the key fundamental determinants of house prices in the short run; namely, income levels and interest rates.

Rational expectations theory has significant implications for economic forecasts, as it posits that individuals and firms form their expectations about future economic variables (such as inflation, interest rates and output) based on all available information, including the likely effects of current policies. This means that if economic agents are rational and markets are efficient, forecasting errors should be random rather than systematic, since individuals would already anticipate the predictable effects of policies or trends. Consequently, policymakers may find it difficult to impact the economy through monetary or fiscal policies if these actions are anticipated. It also implies that traditional macroeconomic models that do not account for rational expectations may overestimate the effectiveness of policy interventions, as individuals will adjust their behaviour to offset the anticipated effects.

Our results reveal that, in accordance with the previous literature, we can reject the null hypothesis of rationality among European households in terms of house price expectations. This is important in terms of the mechanisms regarding house price expectations that are adopted in different housing, and more broadly macroeconomic, models. In turn this can have implications for conclusions reached about the presence of housing bubbles or periods of irrationality among consumers in terms of their attitudes to house price developments. We also find an important distinction between the role played by actual and expected changes in real interest rates. It appears that households are more influenced by expected changes in real interest rates than in changes in the actual rate. Finally, our results suggest that variations in changes in real income expectations have significant implications for expectations regarding real house price changes. Therefore, it would appear that it is consumers' expectations concerning the general economy that is of most importance in shaping their beliefs about the future housing market.

The rest of the paper is structured as follows. In the Section 2, we review the literature on house price expectations. The data and empirical methodology adopted are then discussed in the Section 3, following which the results of our analysis are presented, in Section 4. Section 5 offers some concluding comments.

2. LITERATURE REVIEW

Given the importance of consumers' price expectations mechanisms, in their review paper Duca et al. (2021) contend that this 'suggests that regular surveys of house price expectations should have been a high priority before the boom and bust of the mid-2000s, [yet] surveys are sparse and intermittent'. Kuchler et al. (2022) provide a summary of studies of house price expectations. In the case of the US residential market, while the Michigan Survey of Consumers has provided information on the housing market since 1960, data on point estimates for house price expectations have only been available since 2007.

Case and Shiller (1989), based on their 1988 survey, contended that people seemed to base their expectations on house prices on past house price movements rather than expectations of key market fundamentals. In 2013, in light of the financial crisis, the Federal Reserve Bank of New York launched the monthly Survey of Consumer Expectations (SCE), which every month contains questions on respondents' expectations of house prices. Fannie Mae's National Housing Survey (NHS) has surveyed US households since 2010 on expectations about housing markets. In addition, between 2003 and 2012, Case et al. (2012) conducted surveys of recent home buyers in four US counties that experienced significant price appreciation prior to 2008.

On a European wide basis, information on house price expectations, income levels, interest rates and credit standards has only become available with the initiation by the ECB of the Consumer Expectations Survey (CES) with data available from 2020. Eurozone member central banks, such as the Bundesbank, the Bank of Spain and the Bank of Italy, conduct country-level surveys, which include questions on the housing market. However, the CES is the only survey available for a number of Eurozone countries. The CES is an online panel survey of consumers, and is carried out on a monthly basis. The microdata for the CES are collected through a survey of a panel of eurozone consumers, which is currently conducted by Ipsos Public Affairs on behalf of the ECB. The countries included since the beginning of the survey are: Belgium, France, Germany, Italy, the Netherlands and Spain. In 2022, the sample was extended to cover five additional countries: Austria, Finland, Greece, Ireland and Portugal.

In comparing variations in the house price expectations of the Michigan Surveys of Consumers and actual house price movements, Kuchler et al. (2022) note two stylized facts among the data: house price expectations tend to be more optimistic after recent periods of actual house price appreciation; and the time-series variation in expectations is actually smaller than the time-series variation in the movement of actual prices.

One of the earlier assessments of the role played by house price expectations was conducted by Abraham and Hendershott (1996). Here, these authors outline the manner in which expectations can interact with market fundamentals. In the context of an equilibrium correction model, they also discuss the concept of positive 'bubble-builder' effects on house prices – from recent rises in house prices – and negative 'bubble-burster' effects – from high levels of real house prices relative to fundamentals. The bubble-builder effect arises if many agents base their expectations of future price movements on the basis of recent gains, thereby increasing housing demand. However, eventually house prices will fall if they increase more than what key market fundamentals such as incomes, mortgage rates and the housing stock would suggest. In the latter case, if agents' expectations are extrapolative, then a series of positive shocks can ultimately lead to house prices overshooting their long-run equilibrium levels.

In terms of the expectations mechanisms adopted by consumers, most of the surveys and analysis conducted suggest that the concept of rationality is rejected. For example, Capozza and Seguin (1996) and Clayton (1997) find evidence to refute the rational expectations hypothesis, while studies such as De Stefani (2021), Niu and van Soest (2014), Armona et al. (2019) and DeFusco et al. (2017) find evidence to suggest customers adopt extrapolative expectations in terms of future house price movements.

The exact nature of customers' expectations is particularly important in a housing context given the importance and popularity of models such as the user cost of capital. In understanding the stability or otherwise of house price movements, a key relationship well established within the housing literature is that between the house-price-to-rent ratio and the user cost of capital. Variants of this framework applied to housing markets can be found in: Blackey and Follain (1995), Murphy (2005), Campbell et al. (2006), Gallin (2008), Diaz and Luengo-Prado (2012), Duca et al. (2011), Browne et al. (2013) Cronin and McQuinn (2016) and Monteiro et al. (2021).

Central to the user of capital concept is the role played by house price expectations; however, the user cost model is itself neutral on how these expectations are formulated. In a well-known contribution, Glaeser and Gyourko (2007) use the relationship between the user cost of capital and the house-price-to-rent ratio to outline the contrasting impact rent levels could have in models of house prices. The relationship between the price–rent ratio and future house price movements depends on the manner in which house price expectations, central to the user cost model, are formulated. For example, a forward-looking mechanism would imply that a higher price–rent ratio would result in future house price

growth. All else being equal, if house prices increase relative to rents, the cost of renting versus buying falls, and homeowners must expect capital gains to be indifferent between renting and buying. In this context, according to this efficient market view, houses are neither overvalued nor undervalued, and this is also the case regarding expectations. By contrast, an alternative, backward-looking view of residential real estate prices contends that elevated levels of the price–rent ratio should be associated with future price declines. In such a case, if home ownership looks more expensive relative to renting than it has in the past, house prices should correct downwards.

Other areas where forecasts of key economic variables have been examined include those that concern traditional economic growth indicators and key fiscal metrics, such as government expenditure and the general government balance – Cronin and McQuinn (2021b) provide a review of this literature.[4]

3. DATA AND METHODOLOGY

The data for this study comes from 2 sources for 11 European countries over the period Q2 2020 – Q4 2023. The first set of data is taken from the ECB's Consumer Expectations Survey (CES) for 11 European countries. The CES is an online panel survey of consumers that has been carried out on a monthly basis since January 2020. Information on consumer expectations is collected across four different areas: inflation; labour markets and economic growth; household income and consumption; and housing and credit access.[5]

In terms of our overall assessment, we restrict our sample based on the sample country and period available in the survey. For our analysis, we employ aggregate data at the country level from April 2020 to December 2023 for European countries covered in the survey.[6] These countries include Austria, Belgium, Finland, France, Germany, Greece, Italy, Ireland, the Netherlands, Portugal and Spain.[7] We take a quarterly average of the survey data to bring it to the same level of frequency as additional macroeconomic variables used in this study. We use four quantitative variables based on the following four survey topics:

4 Cronin and McQuinn (2021c) also review the relationship between official forecasts of economic growth and the corresponding official forecasts of key fiscal indicators.

5 Full details of the survey can be obtained at https://www.ecb.europa.eu/stats/ecb_surveys/consumer_exp_survey/html/index.en.html.

6 While individual, consumer level data is available across countries, we use the aggregated country level data.

7 Five countries – Austria, Finland, Greece, Ireland and Portugal – are included in the survey in 2022.

- home price expectations 12 months ahead (percentage change) as a proxy for expected house price growth;
- mortgage interest rate expectations 12 months ahead (percentage) as a proxy for expected nominal interest rate;
- household income expectations 12 months ahead (percentage change) as a proxy for expected household income growth; and
- inflation expectations over the next 12 months (percentage change) as a proxy for expected inflation.

The second set of data we use is taken from Eurostat. These variables include actual realised data for house price growth, interest rates, inflation rates and housing supply. In all our analysis we use real variables where the difference between nominal variables and inflation is calculated.

3.1 EMPIRICAL STRATEGY

In our empirical specifications we estimate a series of panel data fixed effect models to examine the relationship between house price expectations and expectations of variables typically taken to be determinants of house prices. As outlined previously, a review of the house price literature clearly establishes income levels and interest rates as two of the main determinants of house prices in the short run, across both time and countries (Duca et al., 2021). In the appendix to this paper, Figures A1–A4 plot both the actual and expected values of the different variables used in the analysis on a cross-country basis.

Initially, we estimate the relationship between the actual values of the different variables and then we examine the relationships between the expectations of the same variables. Finally, we examine the relationship between the forecast error for the main demand-side determinants of house prices (income and interest rates) and the forecast error for house prices themselves.

To test the basic premise that income levels and real interest are important determinants of house prices, we regress the change in actual house prices on the change in actual income levels and the change in the actual real interest rate:

$$\Delta P_{it} = \alpha_i + \beta_1 \Delta Y_{it} + \beta_2 R_{it} + u_{it} \quad (1)$$

where t refers to current quarter. Real house price growth (ΔP_{it}) is calculated as the difference between nominal house price growth and actual inflation. Real income growth (ΔY_{it}) is calculated as the difference between nominal income

growth and actual inflation. The real interest rate (R_{it}) is calculated as the difference between nominal interest rate and actual inflation.

Next, to see if the same relationship holds between the expected values of these variables, we regress the expected change in house prices (ΔP_{it}^{E}) on the expected change in income $\left(\Delta Y_{it}^{E}\right)$ and the expected real interest rates (ΔR_{it}^{E}):

$$\Delta P_{it}^{E} = \alpha_i + \beta_1 \Delta Y_{it}^{E} + \beta_2 R_{it}^{E} + u_{it} \quad (2)$$

where t refers to the time of survey data collection. Expected real house price growth is calculated as a difference between expected house price growth and expected inflation. Expected real income growth is calculated as the difference between expected income growth and expected inflation. The expected real interest rate is calculated as the difference between expected interest rates and expected inflation. Therefore, we are using the expectations of the nominal variables, house prices, income and interest rates, and the expectations of inflation rates as contained in the ECB's CES.[8]

In our third set of estimates, we test for the issue of rationality in house price expectations. In that context we estimate the following panel data model:

$$\Delta B_{it} = \alpha_i + \beta_1 \Delta B_{it}^{E} + u_{it} \quad (3)$$

where actual ΔB_{it} refers to real house price growth, real income growth and real interest rate growth, and ΔB_{it}^{E} is the expected value of the equivalent variable.

To test for bias in the forecasts based on panel data models, two separate tests are used here. First, according to Keane and Runkle (1990) and Bonham and Cohen (2001), two conditions must hold in order for expectations in forecasting to be deemed rational. When ΔB_{it} is regressed on ΔB_{it}^{E}, the coefficient on the regressor must be significantly different from one, and the country dummies must be insignificantly different from zero. A second test of rationality follows the recent approach of Croushore and Van Norden (2018); it tests whether the forecast error (the difference between ΔB_{it} and ΔB_{it}^{E}) is statistically different from zero.

8 We also include housing supply growth in equations (1) and (2) to control for supply-side factors that could play a role in the formation of house price expectations. Supply-side constraints in the housing sector could lead to higher house price expectations in the presence of strong demand.

Finally, to decompose the error in the house price regression, we regress the forecast error of the change in house prices on the equivalent forecast error for income levels and for real interest rates:

$$\Delta P_{it}^{EF} = \alpha_i + \beta_1 \Delta Y_{it}^{EF} + \beta_2 \Delta R_{it}^{EF} + u_{it} \quad (4)$$

where ΔP_{it}^{EF} is the forecast error for the change in real house prices, ΔY_{it}^{EF} is the forecast error for the change in real income levels and ΔR_{it}^{EF} is the forecast error for the real interest rate.

The results for the different models are summarised in the next section.

4. RESULTS

4.1 House prices and its key determinants

In Table 1, we present the regression results for the determinants of actual real house price growth using a panel fixed effects model with three different specifications. Across three model specifications, real income growth demonstrates a consistently strong, positive and statistically significant impact on real house price growth. In the first model (1), the coefficient for real income growth is 0.64, indicating that a 1 per cent increase in real income growth is associated with a 0.64 per cent rise in real house price growth, holding other factors constant.[9] This relationship strengthens in the second and third specifications, with the coefficients increasing to 0.88 and 0.90, respectively, and both coefficients are significant at the 1 per cent level.

9 This result is in line with that in the literature – see, for example, Harmon (1988) or Liu (2019).

TABLE 1 HOUSE PRICE GROWTH AND ITS DETERMINANTS

	Dependent variable: ΔP_{it}.		
Variable	(1)	(2)	(3)
ΔY_{it}	0.64***	0.88***	0.90***
	(0.10)	(0.18)	(0.22)
ΔR_{it}		-0.44	-0.47
		(0.27)	(0.31)
ΔS_{it}			0.02
			(0.05)
Country fixed effect	yes	yes	yes
R-squared	0.28	0.30	0.28
No of obs.	108.00	108.00	94.00

Note: The table reports the regression estimates, where the dependent variable is house price growth (ΔP_{it}) and the explanatory variables are household income growth (ΔY_{it}), real interest rate ($\Delta R_{)it}$ and house supply growth (ΔS_{it}). Heteroskedasticity robust standard errors are reported in parentheses. Asterisks ($***$, $**$ and $*$) denote statistical significance at 1, 5 and 10 per cent levels.

In contrast, the real interest rate exerts the expected negative but statistically insignificant effect on real house price growth in the second and third specifications, with coefficients of -0.44 and -0.47, respectively. Additionally, we also control for supply-side effects in our models by including house supply growth (ΔS_{it}). This is included in the third specification and has a negligible and statistically insignificant effect, with a coefficient of 0.02, indicating that variations in house supply growth do not significantly influence real house price growth in the short-run. Overall, the analysis underscores the pivotal role of real income growth in driving real house price growth in the short run, while real interest rates and house supply growth appear to have less of an impact.

In the next part of our analysis, we re-estimate the model with expected variables to test for similarities or dissimilarities with the actual house price estimation.

4.2 Expected house prices and determinants

The panel fixed effects regression results presented in Table 2 investigate the factors influencing expected house price growth, again with three distinct model specifications. The results reveal a consistently robust and positive impact of expected income growth on expected house price growth across all models. Specifically, in the first model, a 1 per cent increase in expected income growth is associated with a 0.61 per cent increase in expected house price growth, which is

statistically significant at the 1 per cent level. This positive relationship becomes even more pronounced in the second and third models, where the coefficients rise to 1.07 and 1.11, respectively, maintaining their statistical significance at the 1 per cent level.

However, a significant contrast emerges when considering the influence of real interest rates. In the regression for actual house price growth, the real interest rate has a negative but statistically insignificant effect. In contrast, for expected house price growth, the expected real interest rate has a significantly negative impact, with coefficients of -0.57 and -0.65 where both are statistically significant. This suggests that while actual house prices may not respond immediately to changes in real interest rates, market expectations of future house prices are more sensitive to anticipated changes in interest rates.[10]

TABLE 2 EXPECTED HOUSE PRICE GROWTH AND DETERMINANTS

	Dependent variable: ΔP_{it}^{E}.		
Variable	(1)	(2)	(3)
ΔY_{it}^{E}	0.61***	1.07***	1.11***
	(0.07)	(0.18)	(0.20)
ΔR_{it}^{E}		-0.57***	-0.65***
		(0.20)	(0.23)
ΔS_{it}^{E}			0.01
			(0.01)
Country fixed effect	Yes	yes	yes
R-squared	0.46	0.49	0.50
No of obs.	108.00	102.00	89.00

Note: The table reports the regression estimates, where the dependent variable is house price growth (ΔP_{it}^{E}) and the explanatory variables are household income growth (ΔY_{it}^{E}), real interest rate (ΔR_{it}^{E}) and house supply growth.

4.3 Rationality tests

We now move to analyse the rationality of house price expectations and that of its key determinants – real income and interest rate. Tables 3, 4 and 5 present the rationality tests for house price, income and interest rate, respectively. For each case, we estimate two models, where column (1) describes the estimation result

10 We also conduct a robustness check in this case, using an alternative estimation strategy – dynamic panel GMM – and find similar results (please refer Table A2 in the appendix for the results).

for a panel setup with all countries combined and column (2) captures cross-country variation. In other words, the former tests for the rationality of house price, income and interest rates for Europe as a whole, while the latter tests for the rationality for each country in our sample separately. In column (1) of Tables 3, 4 and 5, we test whether the mean estimate of expected house prices, expected interest rates and expected income are significantly different from 1. Furthermore, in column (2) of each table, we test whether the sum of the mean estimate of the variable of interest (expected house prices, expected interest rate and expected income) and the corresponding country level estimate are statistically different from 1.

For instance, in Table 3, we reject the rationality of Belgium's house prices, as the sum of the coefficient of mean estimate (ΔP_{it}^{E}), 5.22, and country-level estimate BE × ΔP_{it}^{E}, -1.75, is statistically different from 1. Table 3 shows that the coefficient on expected house price growth is 2.49 for the panel setup and 5.22 for the cross-country variation case. The coefficient at the country level in column (2) is such that the combined coefficient of expected house price growth and the respective country's expected house price growth is different from 1, which confirms the rejection of the rationality hypothesis for house prices.

TABLE 3 RATIONALITY TEST: HOUSE PRICE GROWTH

	Dependent variable: ΔP_{it}.	
	(Combined panel)	(Cross-country variation)
Variable	(1)	(2)
ΔP_{it}^{E}	2.49***	5.22**
	(0.31)	(2.37)
BE × ΔP_{it}^{E}		-1.75
		(2.57)
DE × ΔP_{it}^{E}		0.91
		(2.47)
ES × ΔP_{it}^{E}		-5.31*
		(2.82)

FI × ΔP_{it}^{E}		-5.33**
		(2.66)
FR × ΔP_{it}^{E}		-1.98
		(2.57)
IE × ΔP_{it}^{E}		-6.47**
		(2.74)
IT × ΔP_{it}^{E}		-4.27*
		(2.44)
NL × ΔP_{it}^{E}		-2.40
		(2.40)
PT × ΔP_{it}^{E}		-5.37**
		(2.56)
Constant	6.46***	3.74***
	(0.95)	(1.00)
Country fixed effect	yes	yes
R-squared	0.40	0.64
No of obs.	108.00	108.00

Note: The table reports the regression estimates, where the dependent variable is house price growth (ΔP_{it}) and the key explanatory variable is expected house income growth (ΔP_{it}^{E}). The interaction term refers to cross-country variation in the relationship between expected house price and house price growth. Heteroskedasticity robust standard errors are reported in parentheses. Asterisks (∗∗∗, ∗∗ and ∗) denote statistical significance at 1, 5 and 10 per cent levels.

We find similar results in the case of real income as shown in Table 4. The coefficient on expected house price growth is 1.90 for the panel setup and -0.62 for where cross-country variation is allowed for. Moreover, the coefficient at the country level is such that the combined coefficient of the expected house price growth and the respective country's expected house price growth is significantly different from 1.

TABLE 4 RATIONALITY TEST: REAL INCOME

	Dependent variable: ΔY_{it}.	
Variable	(Combined panel)	(Cross-country variation)
ΔY_{it}^{E}	1.90***	-0.62***
	(0.23)	(0.00)
BE × ΔY_{it}^{E}		6.84***
		(0.00)
DE × ΔY_{it}^{E}		3.27***
		(0.00)
ES × ΔY_{it}^{E}		4.76***
		(0.00)
FI × ΔY_{it}^{E}		2.44***
		(0.00)
FR × ΔY_{it}^{E}		3.05***
		(0.00)
IE × ΔY_{it}^{E}		1.24***
		(0.00)
IT × ΔY_{it}^{E}		2.62***
		(0.00)
NL × ΔY_{it}^{E}		3.91***
		(0.00)
PT × ΔY_{it}^{E}		2.12***
		(0.00)
Constant	4.19***	7.11***
	(1.17)	(0.00)
Country fixed effect	yes	yes

R-squared	0.42	0.67
No of obs.	108.00	108.00

Note: The table reports the regression estimates, where the dependent variable is household real income growth ($\Delta Y_{it}^{\square}$) and the key explanatory variable is expected household real income growth (ΔY_{it}^{E}). The interaction term refers to cross-country variation in the relationship between expected household real income growth and household real income growth. Heteroskedasticity robust standard errors are reported in parentheses. Asterisks ($***, **, *$) denote statistical significance at 1, 5 and 10 per cent levels.

Lastly, drawing from Table 5, we reject the rationality hypothesis in the case of the real interest rate. Based on this, we consistently reject the rationality hypothesis across both model specifications for house prices, interest rates and income, as we find the coefficient of expected house prices, expected income and expected real interest rate is statistically significant and different from 1 on average and in the case of each individual country.

TABLE 5 RATIONALITY TEST: REAL INTEREST RATE

	Dependent variable: ΔR_{it}.	
Variable	(Combined panel)	(Cross-country variation)
ΔR_{it}^{E}	1.67***	0.63**
	(0.14)	(0.26)
BE × ΔR_{it}^{E}		2.83***
		(0.47)
DE × ΔR_{it}^{E}		1.59***
		(0.49)
ES × ΔR_{it}^{E}		3.01***
		(0.54)
FI × ΔR_{it}^{E}		0.51
		(0.39)
FR × ΔR_{it}^{E}		1.51**
		(0.62)
IE × ΔR_{it}^{E}		0.41
		(0.41)

IT × ΔR_{it}^{E}		0.80**
		(0.34)
NL × ΔR_{it}^{E}		2.83***
		(0.46)
PT × ΔR_{it}^{E}		0.54
		(0.39)
Constant	-0.74**	-0.42*
	(0.30)	(0.22)
Country fixed effect	yes	yes
R-squared	0.60	0.81
No of obs.	102.00	102.00

Note: This table reports the regression estimates, where the dependent variable is real interest rate ($\Delta R_{it)}$ and the key explanatory variable is expected real interest rate (ΔR_{it}^{E}). The interaction term refers to cross-country variation in the relationship between the expected real interest rate and real interest rate. Heteroskedasticity robust standard errors are reported in parentheses. Asterisks (∗∗∗, ∗∗ and ∗) denote statistical significance at 1, 5 and 10 per cent levels.

Rejecting rationality for expectations of house price growth, real income and real interest rates is not unexpected, and indeed it correlates with the literature mentioned previously, which has tended to reject the hypothesis of rationality particularly in the context of house prices. The findings indicate that markets for housing, income expectations and interest rates may not be efficient, likely due to behavioural biases, information asymmetries and other market frictions. This inefficiency highlights the need for tailored interventions to stabilise housing markets and address speculative bubbles. These results also imply that models based on rational expectations may not accurately forecast future movements for house prices.

To understand the non-rationality of house price growth, we next examine house price forecast error, and analyse the role of income forecast error and interest rate forecast error in explaining the variation in this.

4.4 House price forecast error and its determinants

As we examine the role of household income and interest rate as key determinants of house price, we aim to understand the extent to which the forecast error in the former can contribute to the forecast error of the latter. As shown in columns (1) and (2) of Table 6, we find that forecast errors for the growth rate of income have a significant positive association with house price forecast errors, indicating that

inaccuracies in income predictions lead to larger errors in house price forecasts. However, it appears to be inconclusive regarding the impact of interest rate forecast errors; while the coefficient is negative in one column, suggesting a decrease in the forecast error for house prices is associated with a higher rate of forecast error for interest rates. The relationship is not statistically significant.

TABLE 6 HOUSE PRICE FORECAST ERROR, INTEREST RATE FORECAST ERROR AND INCOME FORECAST ERROR

	Dependent variable: ΔP_{it}^{EF}	
Variable	(1)	(2)
ΔY_{it}^{EF}	0.66***	0.72***
	(0.11)	(0.22)
ΔR_{it}^{EF}		-0.13
		(0.39)
Constant	2.56***	2.07***
	(0.43)	(0.77)
Country fixed effect	Yes	yes
R-squared	0.28	0.29
No of obs.	108.00	102.00

Note: This table reports the regression estimates, where the dependent variable is the house price forecast error (ΔP_{it}^{EF}), and the explanatory variables are the income forecast error (ΔY_{it}^{EF}) and the real interest rate forecast error (ΔY_{it}^{EF}). Heteroskedasticity robust standard errors are reported in parentheses. Asterisks ($***$, $**$ and $*$) denote statistical significance at 1, 5 and 10 per cent levels.

Overall, while forecast errors for income levels strongly influence the corresponding errors for house prices, the effect of interest rate forecast errors is not significant. The results suggest that, in the context of forecasting house prices, accurate predictions of income play a crucial role. When income forecasts are inaccurate, it leads to significant errors in predicting house prices. This finding aligns with the broader economic understanding that household income is a key determinant of housing demand and affordability. Therefore, any inaccuracies in income projections could have substantial implications for housing market dynamics, affecting areas such as housing affordability, demand–supply dynamics and, ultimately, overall market stability.

On the other hand, the inconclusive relationship between interest rate forecast errors and house price forecast errors is somewhat surprising, given the pivotal role of interest rates in shaping borrowing costs and mortgage rates, which in turn influence housing demand and affordability. While expectations of real interest

rates do appear to impact house price forecasts, the same relationship does not pertain for the forecast errors of both variables.

5. CONCLUDING THOUGHTS

Studies of house price expectations have generally been somewhat limited by the absence of data on the issue. This is despite the fact that expectations themselves have been demonstrated to comprise an important factor in terms of impacting market developments. Therefore, the availability of the European Central Bank's (ECB) Consumer Expectations Survey (CES) is particularly welcome, coming as it does at a time when house prices have started to increase following an increase in household savings, which has been evident since the COVID-19 pandemic.

We believe our results in assessing house price expectations have a number of interesting implications. First of all, as noted by much of the literature that has assessed this issue, in the context of house prices, we fail to find evidence to support the rational expectations hypothesis. The tendency for households to have house price expectations that are different from rational expectations, which are often associated with efficient markets, can exacerbate the variability of house price movements. Periods of significant house price appreciation, which are maybe initially due to variations in fundamental variables in the housing market, can then be amplified by alternative house price expectations among consumers.

Our estimates suggest that while actual movements in real interest rates do not appear to significantly impact changes in house prices, expected changes in real interest rates do have a significant effect on expectations of future house price movements. This underscores the importance of the signalling of monetary policy and, in particular, the growing body of literature that focuses on central bank communications (see Casiraghi and Pio Perez (2022) for more on this). It would appear this communications channel can have a significant impact on the housing market in terms of guiding consumers' expectations.

Finally, in terms of the impact on house prices, our results confirm overall the importance of consumers' expectations regarding the general economy, given the significance of the household income variable. By changing households' perceived potential affordability levels, expectations about the general economy is demonstrated to have the most pertinent impact on the housing market. This bears out the well-established relationship between the housing market and the general economy, and identifies the expectations channel as another means by which developments in the latter can have significant implications for the former.

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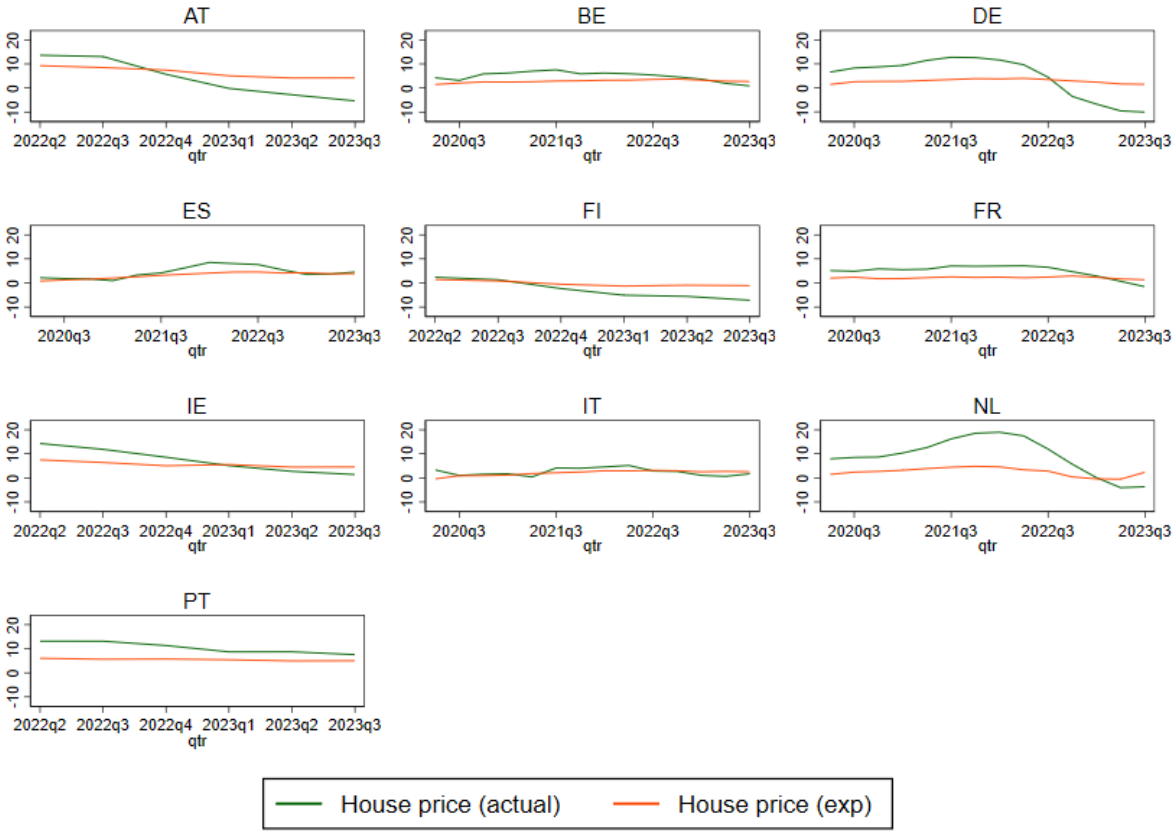
APPENDIX

TABLE A1 SUMMARY STATISTICS: MACROECONOMIC VARIABLES AND HOUSEHOLD EXPECTATIONS

	Observation	Mean	Std. dev	Min	Max
House price growth (real)	108	-0.23	6.57	-16.52	13.84
Real income growth	108	-4.98	5.22	-16.94	6.28
Real interest rate	108	-2.94	3.45	-11.50	2.39
House supply growth	94	3.02	11.49	-26.69	39.00
Expected house price growth	108	-2.69	2.18	-9.27	1.13
Expected income growth	108	-4.83	2.40	-11.33	-1.40
Expected real interest rate	102	-1.47	1.83	-7.10	1.23

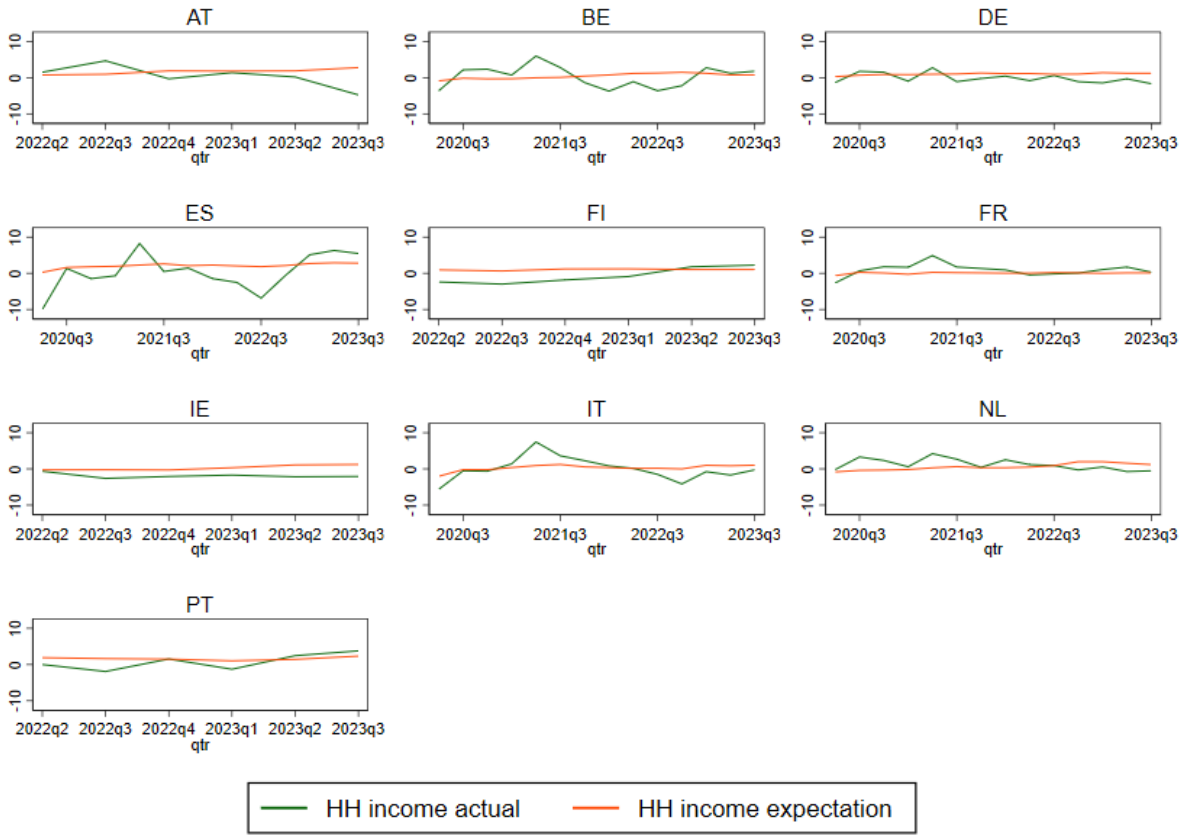
Source: Eurostat, ECB Consumer Expectation Survey, both waves.
Note: This table reports summary statistics of macroeconomic and household expectation variables for the period 2020–2022 for 11 sample European countries.

FIGURE A1 ACTUAL HOUSE PRICE AND EXPECTED HOUSE PRICE: CROSS-COUNTRY COMPARISON



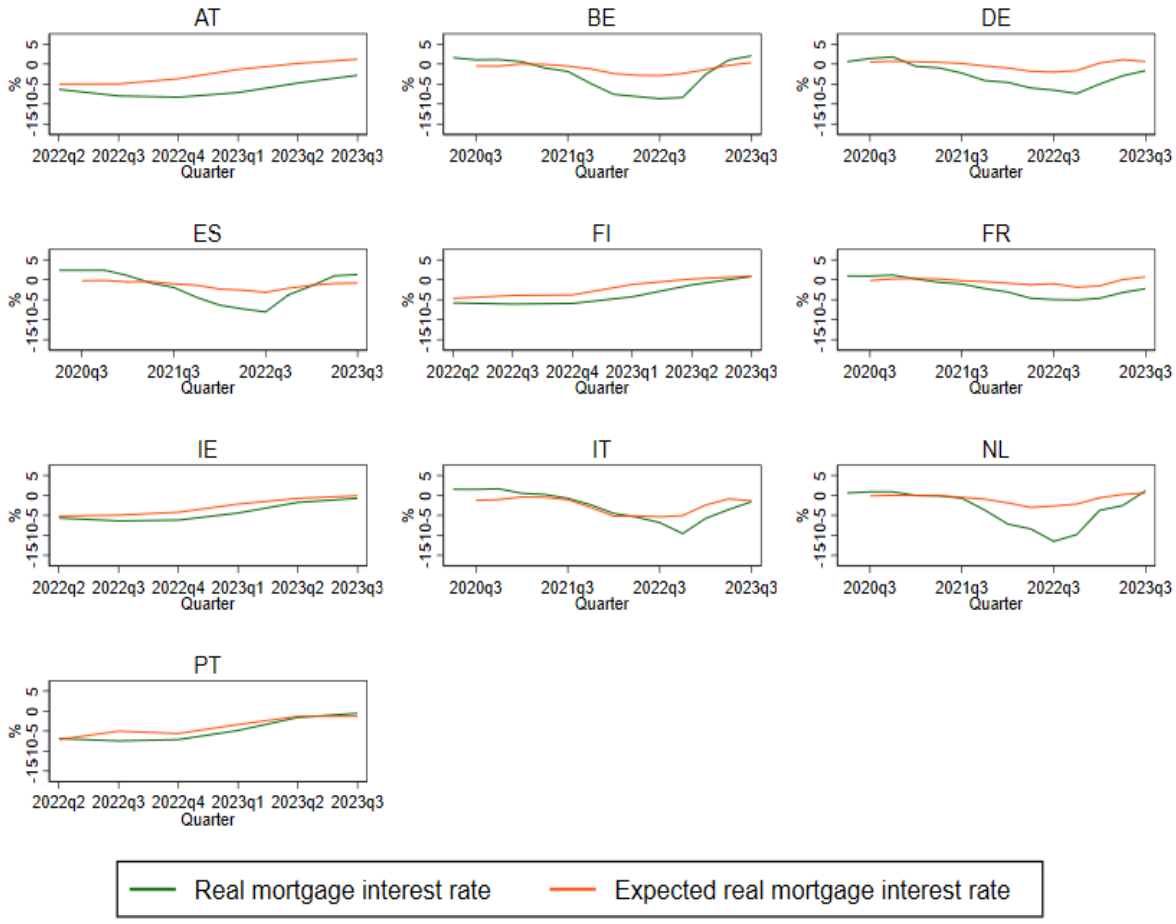
Note: The figure illustrates trends for actual house prices growth and expected house price growth for 11 sample European countries for the period 2020–2022.

FIGURE A2 ACTUAL HOUSEHOLD INCOME AND EXPECTED HOUSEHOLD INCOME: CROSS-COUNTRY COMPARISON



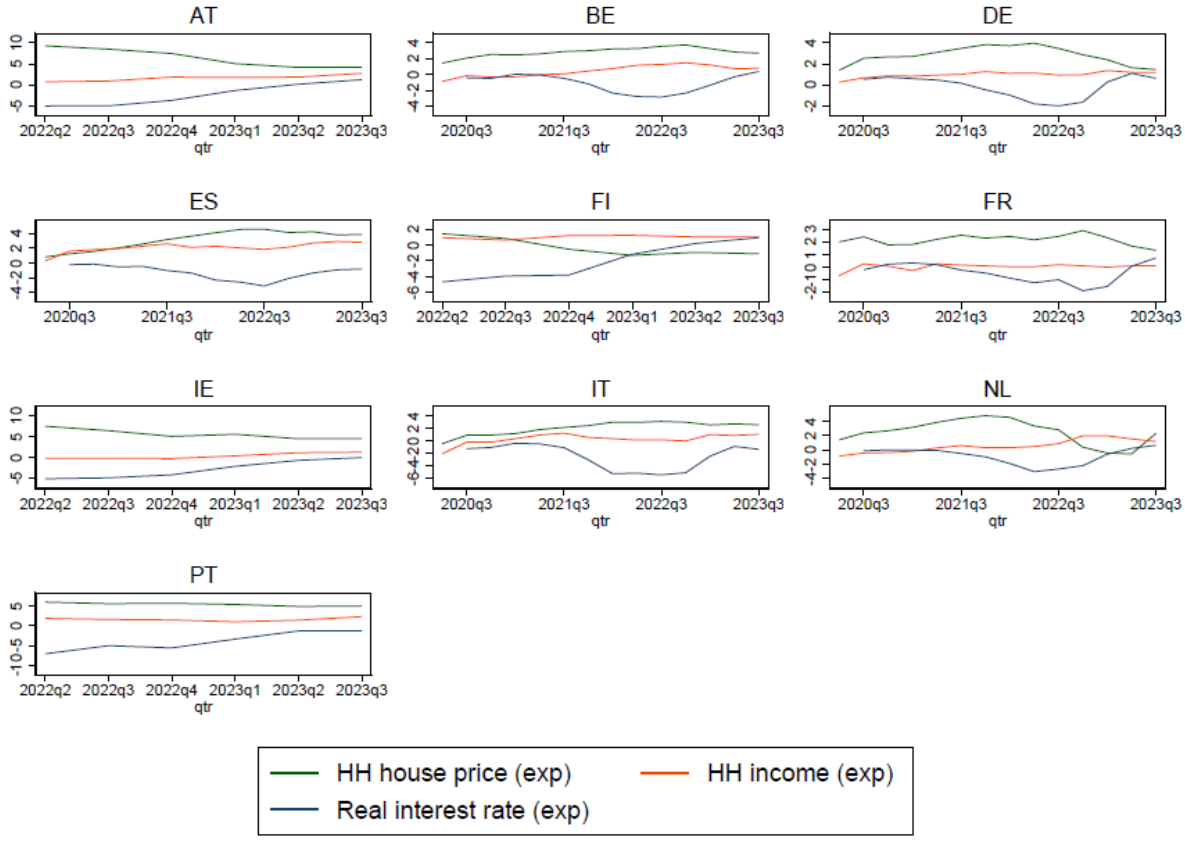
Note: The figure illustrates trends for actual household income growth and expected household income growth for 11 sample European countries for the period 2020–2022.

FIGURE A3 REAL INTEREST RATE AND EXPECTED REAL INTEREST RATE: CROSS-COUNTRY COMPARISON



Note: The figure illustrates trends for real interest rate and expected real interest rate for 11 sample European countries for the period 2020–2022.

FIGURE A4 HOUSE PRICE EXPECTATIONS, INCOME EXPECTATIONS AND INTEREST RATE EXPECTATIONS: CROSS-COUNTRY COMPARISON



Notes: The figure illustrates trends for household forecast error, income forecast error and real interest rate forecast error for 11 sample European countries for the period 2020–2022.

TABLE A2 DYNAMIC PANEL GMM ESTIMATION FOR HOUSE PRICE EXPECTATIONS AND ITS DETERMINANTS

	(1)	(2)	(3)
Expected house price growth			
L1. Expected house price growth	0.511***	0.345*	0.358***
	(3.33)	(1.87)	(2.80)
Expected income growth	0.512***	0.990***	0.918***
	(7.86)	(4.57)	(4.28)
Expected real interest rate		-0.491**	-0.472**
		(-2.40)	(-2.32)
House supply growth			0.003
			(0.29)
P value Hansen statistic	0.981	0.944	0.982
Observations	98	98	85
p value of AR(1)	0.233	0.382	0.212
p value of AR(2)	0.501	0.391	0.444

Note: GMM refers to generalised method of moments.