Box I.2: **Residential construction**

The large and frequent swings of residential construction investment have an important bearing on the business cycle. This box surveys the cyclical pattern of residential construction investment in euro area countries over almost five decades. It attempts to quantify the main drivers of residential construction in the euro area in the short- and medium term in a standard error-correction framework. The box then zooms in on the near-term outlook for residential construction activity. Overall, residential construction in the euro area and Member States appears set to keep growing at a robust pace, thereby contributing to GDP growth in the forecast years.

Residential construction cycles and GDP

Despite its limited weight compared to GDP - residential construction investment represented only about 6% of GDP in the euro area on average in 2000-2017 - the quite pronounced ups and downs in residential construction activity are intimately linked to GDP cycles. The housing boom and bust as one of the triggers of the Great Recession has reinforced the interest in understanding the cyclical mechanics of residential construction and its links to GDP.

Drops of residential construction activity are frequent and often deep. In the 15 'old' EU Member States for which long series of annual data are available, [1] there have been 63 episodes of annual real GDP contracting for at least one year since 1970. This compares to 118 episodes (some of them synchronous across Member States) in which annual residential construction investment decreased for at least one year. The standard deviation of GDP growth in these countries since 1970 is 2.8. It is 11.3 for residential construction. Counted from trough to trough, the average cycle in residential construction lasts 5.8 years (median 5), compared to the average business cycle which lasts 10.7 years (median 10).

There is no one-to-one correspondence of contractions of residential investment and drops in GDP, as the former are far more frequent than the latter. However, half of the 58 episodes between 1970 and the Great Recession when residential construction in a Member State dropped by at least 5% were associated with a drop in GDP and almost all others with a substantial slowdown compared to previous years' GDP growth rates. In 2008-2009,

housing investment dropped by more than 5% in all examined Member States except Austria, and GDP dropped across all these countries in 2009. The length of the upswing in residential construction investment and the length of the subsequent downturn are positively correlated, [2] and downturns can be long-lasting. Following the excessive housing investment in the euro area in the run-up to the 2008 crisis, it took until 2014 before residential construction investment bottomed out.

The literature on the links between residential construction investment and GDP is most developed for the US. It suggests that shocks to residential construction activity propagate in the economy and affect GDP over and above the weight of the residential construction sector due to close interlinkages with other sectors. Input-output tables for the US show that the construction sector buys much more from the rest of the economy than the other way round. [3] Drops in construction demand therefore swiftly spread to other sectors. For the euro area, the ECB [4] stresses both the inputs from other sectors as well as the high labour intensity in the construction sector, which implies relatively large employment effects of construction cycles. On the financing side, developers respond to house price signals and supply more dwellings when prices are rising while banks provide more lending when the collateral is appreciating (financial accelerator). Another possible transmission channel from housing markets to GDP is through wealth effects of housing. However, there is evidence for this channel mainly in the US, but not in the euro area. [5]

For the US, there is broad agreement that the residential construction cycle leads the business

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[1]   i.e. BE, DK, DE, IE, EL, ES, FR, IT, LU, NL, AT, PT, FI, SE and UK.

[2]   This feature is also present in house prices. Cf. Bracke, P. (2013). 'How long do housing cycles last? A duration analysis for 19 OECD countries', *Journal of Housing Economics* 22:3, pp. 213-230.

[3]   Boldrin, M., C. Garriga, A. Peralta-Alva, and J. Sánchez (2013). 'Reconstructing the Great Recession'. *Federal Reserve Bank of St. Louis Working Paper Series* 2013-006.

[4]   ECB (2009). 'The construction industry in the downturn'. *Monthly Bulletin* 5, pp. 61-63 (Box 6).

[5]   Balta, N., and E. Ruscher (2011). 'Household savings and mortgage decisions: the role of the "down-payment channel" in the euro area'. European Commission, *European Economy,* Economic Papers 455, September.

Box (continued)

cycle. [6] For the euro area, the evidence on a leading role for residential construction investment with respect to GDP is less clear cut. [7] Table 1 suggests that quarterly growth of residential construction in the euro area since 1995 is coincident with GDP growth rather than leading it. Residential construction is leading employment, which is considered a lagging variable with respect to GDP. In line with the findings by Álvarez and Cabrero (2010) building permits lead residential construction as well as GDP by two to four quarters, reflecting the time lapse between the authorisation to start building and the registration of the actual construction activity in national accounts. This makes building permits useful for forecasting short-term fluctuations in residential construction and possibly also GDP. Neither the construction confidence indicator from DG ECFIN's business surveys nor its forward-looking components (order books and construction expectations) appear to be leading indicators of residential construction growth. In conclusion, residential construction is not found to lead GDP in the short run in the euro area, but it is still likely to amplify it.

Table 1:

Correlations in quarterly growth rates

Target	Indicator	Leads					
		t-5	t-4	t-3	t-2	t-1	t
GDP	RC	0.09	0.26	0.31	0.40	0.40	**0.63**
	permits	0.24	**0.40**	0.39	**0.40**	0.36	0.31
E	RC	0.22	**0.39**	0.23	0.26	0.17	0.24
RC	conf	0.15	0.26	0.27	0.34	0.41	**0.45**
	exp	0.12	0.26	0.25	0.23	0.34	**0.42**
	permits	0.30	0.42	0.30	**0.48**	0.30	0.38

RC: residential construction; E: employment; conf: constr. confidence; exp: constr. expectations

[6] E.g. Leamer, E. (2014). 'Housing *really is* the business cycle: What survives the lessons of 2008-09?'. *Journal of Money, Credit and Banking* 47:1. Gjerstad, S., and V. Smith (2010). 'Household expenditure cycles and economic cycles, 1920-2010'. Chapman University, *Economic Science Institute Working Papers* 10-02.

[7] E.g. Musso, A., S. Neri, and L. Stracca (2011). 'Housing, consumption and monetary policy: How different are the US and the euro area?'. *Journal of Banking and Finance* 35:11, pp. 3019-41; Álvarez L., and A. Cabrero (2010). 'Does housing really lead the business cycle?' *Banco de España Documentos de Trabajo* 1024; Kydland, F., P. Rupert, and R. Šustek (2016). 'Housing Dynamics Over the Business Cycle', *International Economic Review* 57:4, pp. 1149-77.

Drivers of residential construction investment

In view of the large swings in residential investment and their influence on GDP, there is an obvious interest in understanding the drivers of residential construction. Broadly following Carnot et al (2011), a limited set of drivers of residential investment are examined in an error-correction framework. [8] It includes demographic developments, household incomes and real interest rates as the potential determinants of housing demand in the long run. Over a shorter time horizon, house prices are considered, as higher prices increase the value of a house as an asset as well as the supply of houses. The cost of credit affects affordability, as most households have to incur debt to acquire a house. Moreover, the unemployment rate is considered as a proxy of the uncertainty of households' future income.

Data are taken from the AMECO database for 1960 to 2017, except the house price index, which is taken from the database constructed by Philiponnet and Turrini (2017). [9] The panel estimation is based on the six largest euro area Member States. Country fixed effects account for structural heterogeneity across them.

The upper part of table 2 shows the retained long-run drivers. 'RC' stands for real residential construction investment, 'RDIPC' for disposable income per capita deflated with the private consumption deflator; 'dummy 92' is a variable with value 1 from 1992 on and zero before. It was added to cater for any instability in the coefficients introduced by German reunification. C is a constant that adds to zero with the country fixed effects that are not displayed here. The lower part shows the short-run relationship. It links the annual growth rate of residential investment to the rate of change in the long-run determinants and their lags, the lagged residual of the long-run relationship (l-r res) and additional explanatory factors: dU - the change of the unemployment rate; dHPI - house price

[8] Carnot, N., V. Koen, and B. Tissot (2011). 'Economic forecasting and policy'. Springer. Cf. Piazzesi, M., and M. Schneider (2016). 'Housing and macroeconomics'. *Handbook of Macroeconomics* 2B, pp. 1547-1640, who survey the literature that deals with the specificities of housing and provide a more comprehensive approach to modelling households' demand for housing and housing supply.

[9] Philiponnet, N., and A. Turrini (2017). 'Assessing House Price Dynamics in the EU'. European Commission, *European Economy,* Discussion Paper 48, May.

inflation deflated with the private consumption deflator and dPOP - population growth.

Table 2:
Estimation outcomes

|	Estimation	
	Direct	**Panel**
Long-run		
C		1.4***
RDIPC	0.97***	0.68***
dummy 92	0.08***	
Short-run		
dRC lag1	0.40***	0.33***
dRDIPC		0.32*
dRDIPC lag1	-0.60**	-0.47***
dU	-1.52***	-1.39***
dHPI	0.67***	0.36***
dPOP		1.23
l-r res	-0.24	-0.14
obs	*39*	*258*
adj. R²	*0.65*	*0.50*
DW	*1.82*	*1.97*
Statistical significance at 1%(***), 2%(**) and 5%(*) levels		

Real disposable income per capita is identified as the major driver of housing investment in the longer run. The real interest rate or demographics are not picked up as long-run drivers of housing investment in the euro area. In the short run, house price inflation is positively linked to housing investment, in other words investment slows down when house prices decelerate or fall. Income uncertainty proxied by the change in the unemployment rate negatively affects residential construction. Improvements in the labour market appear to make households more confident to undertake a major investment and take out a mortgage. According to the panel estimation, residential construction also responds positively to population developments in the near term but the estimated coefficient is not statistically significant.

The near-term outlook

Graph 1 plots the residuals of the long-run regression extended with the spring 2018 forecast data. The residual graph clearly displays housing overinvestment in the decade preceding the crisis followed by a sharp and protracted drop with a trough in 2015. By 2017, residential construction was well on the recovery path, and the gap between the current level of residential investment and the level implied by real disposable income is now rapidly closing.

Graph 2 illustrates the contributions of the different drivers of residential construction investment. The falling unemployment rate and house prices that increase faster than consumer-price inflation have contributed positively since 2014.

Graph 1: **Residuals of long-run regression, euro area**
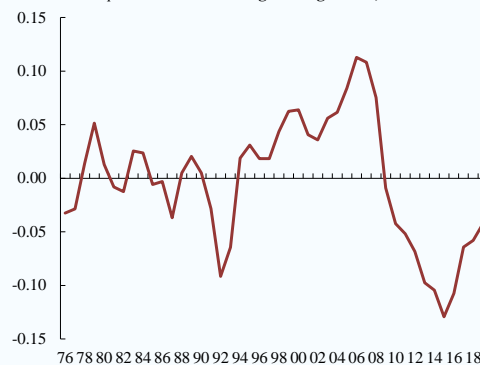
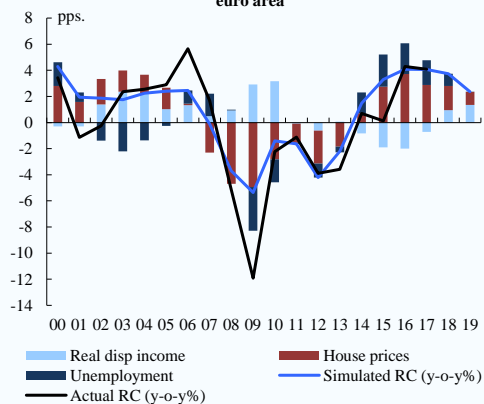*Source: AMECO, own calculations.*

The cyclical drivers identified above suggest a continued expansion of residential construction. The short-run regression can be used to produce a conditional forecast of residential construction into which enters the spring-forecast projection of disposable incomes and the unemployment rate as well as an assumption on house-price inflation. As house prices are not covered in DG ECFIN's macroeconomic forecasts, the analysis of residential construction is based on assumptions and scenario analysis. In 2017, residential construction in the euro area expanded at a rate of 3.9%. Assuming real house prices continue increasing at a rate of 2.3% as in 2017 would yield a conditional forecast of residential construction growth of 3¾% in 2018 and 2½% in 2019. Assuming a stagnation of house prices for 2018 and 2019 would yield conditional forecasts of 2% in 2018 and ½% in 2019. Were real house prices to increase by 5% annually, the conditional residential investment forecast would be 5½% in 2018 and 4½% in 2019.

Assuming constant house price inflation, model-based conditional projections for the larger Member States would suggest a moderation of residential construction growth in Germany, and a slowdown from high growth in the Netherlands. For France and Spain, model projections point to a continuation of robust residential construction at a slightly slower pace, and for Italy a continuation of more modest growth. These model-based conditional projections are illustrative and not necessarily identical with the forecasts entering construction investment in table 10 of the statistical annex.

Box (continued)

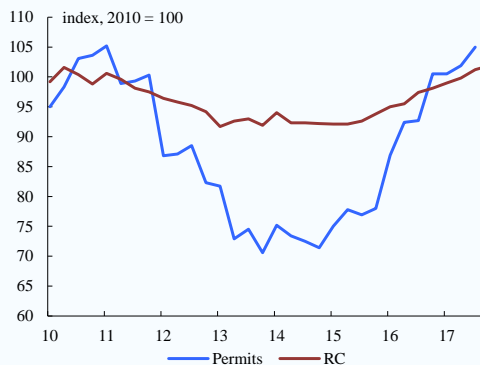*Graph 2:* **Residential construction growth and contributions, euro area**

(see section I.3). Acute deleveraging pressures on households have receded. Mortgage credit expanded by 3½% yoy in January and February 2018.

In 2017 compared to 2016 the delivery of new permits in the euro area has slowed down but remains at a high level.

Graph 3: **Residential construction and building permits, euro area**

Source: Eurostat. Permits for residential construction expressed in m².

Higher-frequency data that could not be included in the model for lack of long time series also point to a continuation of robust growth in residential construction in the euro area. Confidence in the construction sector is high, having picked up sharply since 2014. At 5.2 points in March 2018, construction confidence stands 1½ standard deviations above its long-term average since 1985 pointing to continued strong momentum in the first quarter. Business managers in construction also indicate a backlog of orders slightly above average and a strong flow of incoming orders. Financing conditions are ample and expected to remain so

Taken together, conditional model projections and high-frequency data point to a continuation of robust residential construction investment growth in the euro area.