EUROPEAN CENTRAL BANK

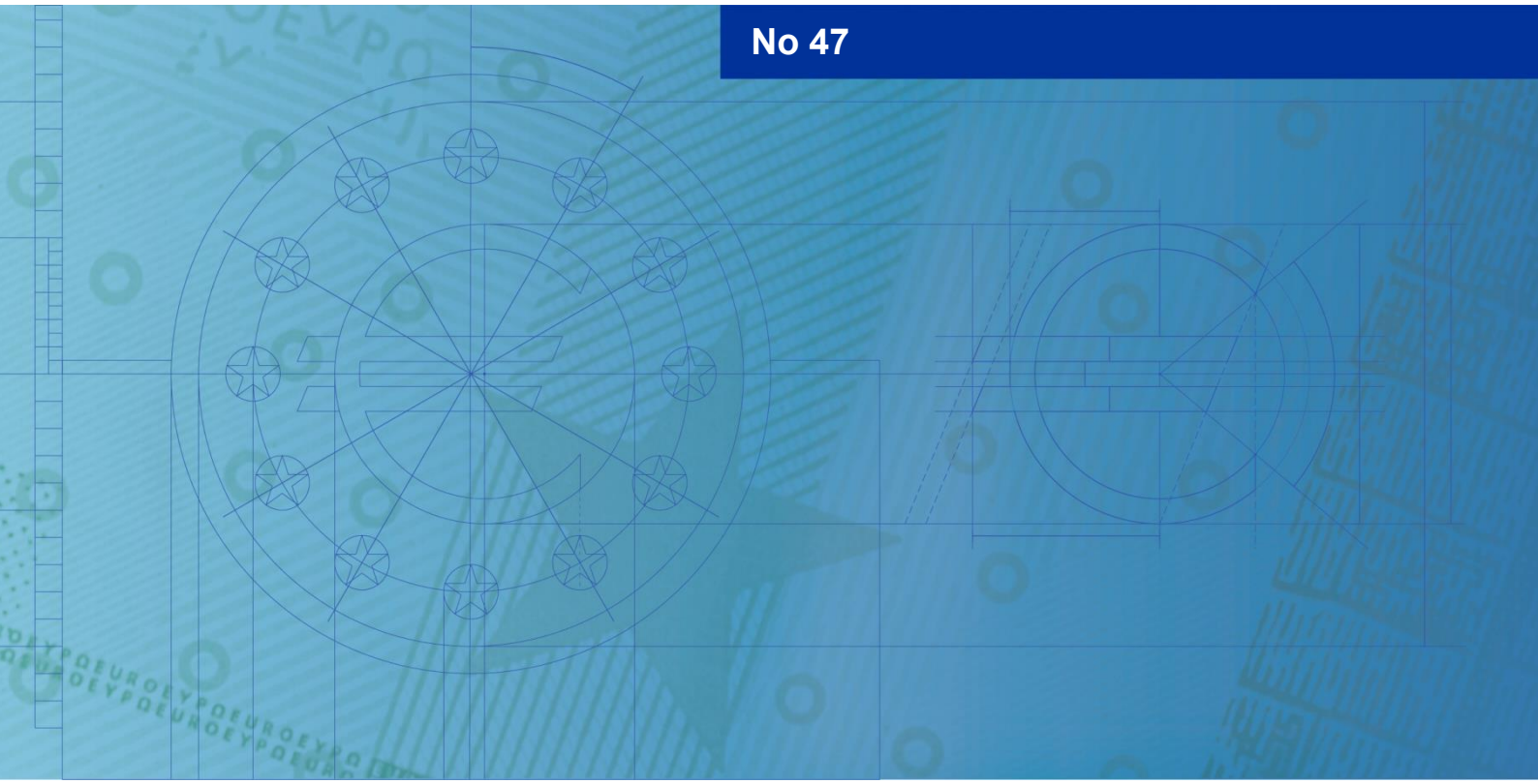
EUROSYSTEM

Statistics Paper Series

Martin Eiglsperger, Ioannis Ganoulis,
Bernhard Goldhammer, Omiros Kouvavas,
Moreno Roma, Aurelian Vlad

Owner-occupied housing and inflation measurement

Revised June 2024



No 47

Contents

Abstract

The Harmonised Index of Consumer Prices (HICP) currently only includes rentals for housing (paid by tenants) and auxiliary housing expenditures (paid by both tenants and owners). The inclusion of an item for owner-occupied housing (OOH) would be desirable for both representativeness and cross-country comparability. This paper reviews the potential options for including OOH in the HICP to derive a new inflation index. We discuss the conceptual and measurement issues involved. Additionally, we present our analytical calculations on the impact and economic properties of this index as compared to the HICP. We show that since 2011 the estimated impact of including OOH in HICP annual inflation, based on either the “net acquisition” approach or the “rental equivalence” approach, would have been within a band of between -1.2 and +0.4 percentage points. The net acquisition approach could result in bigger differences in future, should the fluctuations in the housing market cycles in the euro area be more pronounced and synchronised. The results should be interpreted keeping in mind that the period of observation is relatively short in relation to housing market cycles. In general, the empirical evidence suggests that including OOH based on the rental equivalence approach decreases the cyclicality of the new inflation index, while the net acquisition approach implies a small amplification of its cyclical properties compared to the HICP.

Keywords: Inflation; owner-occupied housing; euro area

JEL Code: C43; E31; E51

Non-technical summary

The inclusion of owner-occupied housing (OOH) in the Harmonised Index of Consumer Prices (HICP) is desirable for reasons of both representativeness and comparability across countries in the euro area. Implementation faces several challenges, however. The decision to buy or sell a dwelling is partly one about consumption and partly one about investment. This dual nature leads to conceptual and methodological challenges. All methods proposed in the literature pose several measurement challenges in terms of implementing them in practice. In this paper, we critically review the main methods and present some analytical calculations for the two main candidates.

The first is based on the "net acquisition" approach. This is methodologically in line with how other durable goods enter the HICP. The price of OOH is based on observed transactions by households buying new houses and flats, but also includes expenditure on maintenance and other ownership-related purchases. Eurostat has published quarterly owner-occupied housing price indices (OOHPIs) for euro area countries since 2016, with the time series starting in 2011. Although it refers (mainly) to new dwellings, changes in the OOHPI can be expected to be closely correlated to movements in the housing market as a whole. This means in turn that a new inflation index that includes OOHPI would reflect concurrent housing market conditions more closely than is the case today.

In some jurisdictions around the world, the cost of OOH is measured based on the "rental equivalence" approach or, alternatively, the "user cost" approach instead. Both estimate a per-period cost for the flow of housing services consumed or produced. Some of the main weaknesses and measurement issues of these approaches come from the assumptions needed for these estimations. The more commonly used rental equivalence approach imputes the opportunity cost of owning a dwelling from the rent of an equivalent rented dwelling in the same or a similar location. A thin rental market makes imputation difficult. Moreover, even when combined with the euro area HICP, it is unlikely that a combined index reflects housing market dynamics in the short-run, as rents in euro area countries are generally "sticky" and subject to regulation. In most jurisdictions they do not show large volatility, even in periods of significant fluctuations in the housing market.[1] As a consequence, the "owner's equivalent rent" (OER) is unlikely to be closely linked to concurrent house market fluctuations in the euro area.

Results from analytical calculations suggest that the difference between the quarterly euro area HICP and the euro area HICP combined with either the net acquisition approach or the rental equivalence approach has remained within a band of between -1.2 and +0.4 percentage points since 2011. However, the period of observation is short relative to the length of housing market cycles, and the deviations observed are larger if one looks at the country inflation indices. The possibility cannot be ruled out that in future housing market cycles the differences between the HICP including and

[1] There are exceptions, however, such as Ireland in recent years.

excluding the OOH will be larger, especially taking the net acquisition approach. Overall, including OOH based on the rental equivalence approach decreases the cyclicality of the resulting index, while including it based on the net acquisition approach implies a small amplification.

1 Introduction

The inclusion of owner-occupied housing (OOH) in official consumer price indices (CPIs) has been a vexing problem for statistical offices around the world for many years. Different approaches have been adopted depending on whether the CPI is primarily designed to represent changes in prices related to the *purchase* of products or changes in the cost of *consumption*/*use* of products, i.e. the "cost of living". Different treatments of OOH in CPIs are also determined by differences in the structure of the various markets, such as the size of the rental market and whether it is representative of the entire residential market. Apart from its statistical ramifications, the issue also has important implications for policymakers. Given the high weight of the OOH in a CPI (typically significantly above 5% and sometimes around 15% or even more, depending on approach and market structure), different statistical approaches can lead to very different dynamics for the combined CPI. This has implications for matters like contract clauses, wage negotiations and monetary policy.

Table 1 below provides an overview of the main approaches used in different jurisdictions. The table distinguishes between cases where the index in question is also used in monetary policy or only for other purposes. Detailed descriptions of these approaches can be found in the literature.[2] In this paper, the issue of including OOH in the inflation index is revisited with respect to the Harmonised Index of Consumer Prices (HICP), the current monetary policy reference index in the euro area. From inception, the HICP has not fully included changes in the prices related to OOH. It only covers owners' expenditure on maintenance and minor repairs and other running costs.[3] However, it neither covers what homeowners paid to buy their dwelling nor the full costs (including imputed/opportunity elements) related to consumption of dwelling services. Major maintenance work that may have substantially changed the quality and quantity of the housing services provided by a dwelling is not included either.

The exclusion of OOH from the HICP has long been recognised as one of the HICP's possible shortcomings and was one of the issues considered in detail in the ECB Monetary Policy Strategy Review (MPSR).[4] Its incorporation into the HICP is desirable for reasons of both representativeness and comparability across countries in the euro area. Housing markets are currently represented unevenly in HICPs,

2 See Diewert et al. (2020), Eiglsperger (2006), Eiglsperger and Goldhammer (2018) and Hill et al. (2020); also International Monetary Fund et al. (2020). For completeness, Table 1 includes the "payments" approach, though to our knowledge this is not used in the context of monetary policy and is therefore not dealt with below. The payments approach refers to the outlays actually made by households over the period a consumer good is used, including mortgage interest payments and repayments, as well as own funds used for acquiring a dwelling. OOH price indices compiled according to the payments approach may result in very different price trajectories as compared to the net acquisition or rental equivalence approaches. The main component driving the index is related to bank lending interest rates. From a monetary policy point of view, this approach suffers in this respect from similar limitations to those discussed below for the user cost approach.

3 These costs include water supply, refuse collection, sewage collection, electricity, gas, other fuels and housing-related insurances. On the rental side, the HICP also covers changes in the cost of rental accommodation, including actual rents for secondary residences and garages.

4 See Work stream on inflation measurement (2021).

since only expenditure on actual rentals is included. Coverage of housing markets in HICPs therefore depends on the size of the rental market, which differs substantially across euro area countries. As a result of these considerations the ECB recommended to the European Commission and the European Statistical System a roadmap, with the final objective of including OOH in the HICP using the net acquisition approach.[5] As a follow-up to the recommendation the European Statistical System (ESS) mandated a Task Force to look into the potential methods of treating OOH in the context of the HICP. The Task Force concluded that there are significant differences in the results of the experimental calculations between the various methods. In view of the need to respect the comparability requirements of the HICP framework regulation, these findings imply that a harmonised approach to include OOH in the HICP would require the selection of a single method of inclusion of OOH in the HICP. At the same time, opinions differ within the ESS with respect to the best method to include OOHPI into the HICP and on various conceptual questions. Further analysis is foreseen and a concrete research agenda being prepared by Eurostat.[6]

The focus of this paper is statistical compilation and methodology. The calculations have been designed to come as close as possible to an index that would emerge were HICPs officially combined with OOH price indices (OOHPIs) or with "owner rental equivalent" cost. However, weights for combining OOH with HICPs are not published. This paper estimates these weights and generally uses only publicly available data. Hence, the combined indices presented below should be treated as ECB estimates. The actual indices, were these to become available at some point in time, are likely to deviate from what is contained in this paper, though the direction of the outcomes and the main conclusions of this paper are expected to still hold. The paper also reflects some of the long discussed statistical issues of the various approaches to OOH and provides associated descriptive statistics that may contribute to the discussion on how best to include OOH in the HICP.

The rest of the paper is organised as follows: Section 2 discusses the net acquisition approach; Section 3 presents the "use" approaches to treating OOH in consumer price indices (the user cost and rental equivalence); Section 4 accounts for the key features of an HICP combined with the OOHPI and imputed rents, and Section 5 concludes.

5 See the ECB's website.

6 See Eurostat (2023).

Table 1

Treatment of owner-occupied housing in the CPIs of selected countries

Method	Considered for monetary policy purposes*	Available for other purposes
User cost of capital	Canada, Iceland, Sweden (CPI with a fixed mortgage interest rate)	Canada, Iceland, Sweden
Rental equivalance approach	Japan, Norway, Switzerland, United States (Personal Consumption Expenditures Price Index)	Denmark, Germany, Cyprus, Japan, Netherlands, Norway, Switzerland, United Kingdom, United States (Personal Consumption Expenditures Price Index and CPI)
Net acquisition	Czech Republic, Australia**, New Zealand**	Euro area countries (HICP – separate OOH price indices), Czech Republic, Australia**, New Zealand**, Finland-
Payments approach		Ireland, Austria (for flats, until 2019)
Not included	**Euro area, United Kingdom**	**Most national CPIs in Member States not mentioned above, Austria (as of 2020) and many other countries**

Source: Work stream on inflation measurement (2021), p. 49, with adaptations due to new information on Austria and the Czech Republic.
Notes: * Where EU Member States are mentioned explicitly, the reference is to the national consumer price index, not the HICP.
** Consumer price indices provided with a quarterly frequency.
*** Updated monthly with a proxy index.

2 Net acquisition approach

A CPI measures changes in the prices of a basket of goods and services that are either bought by the household sector (acquisition approach) or used by it (consumption approach) during a certain period. The payments approach is a third option.[7]

The timing of purchases, payments and actual consumption are usually different for durable goods. When referring to the purchase as the relevant event, durable goods are treated in a CPI in the same way as non-durable goods. To take the example of cars, the price index is constructed based on the prices of cars purchased by the household sector in the reference period, regardless of how many years the car may be in service subsequently. This has the advantage that prices recorded refer to the point in time when the transaction takes place, and a transaction price can be recorded. The expenditure weight of cars in the consumer basket is based on total expenditure for newly bought cars by the household sector in the reference period, not on car services consumed (which would refer to the used stock of cars). Second-hand prices related to transactions of used cars between households are not covered in the HICP.[8]

The same logic applies to housing when using the net acquisition approach. The relevant price index in this approach is that of dwellings acquired for the first time by the household sector (mostly newly built dwellings bought from developers and self-built houses). The expenditure weight is determined by the value of the transactions for dwellings newly bought by the household sector, while transactions in the "secondary" housing market, where households buy dwellings from other households, are disregarded – even though the secondary housing market is much bigger than the primary one.

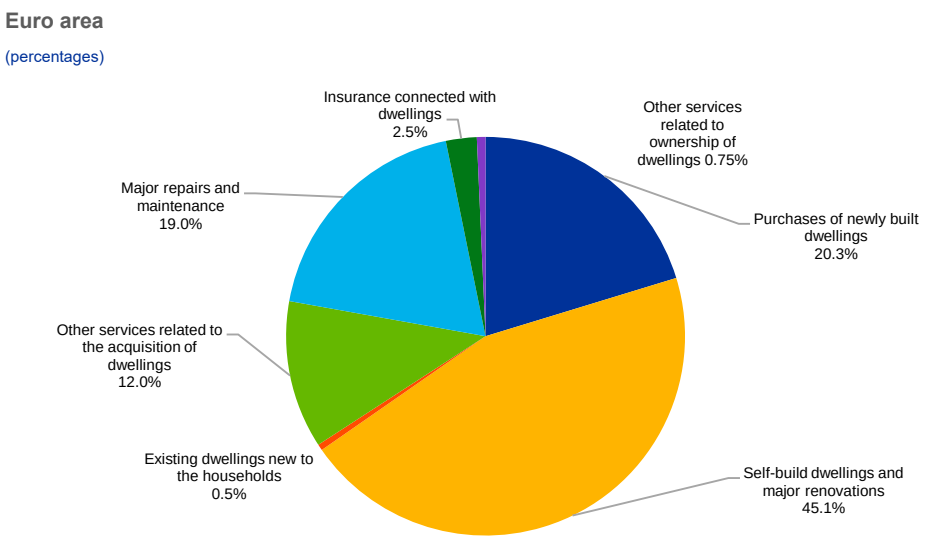
The owner-occupied house price indices available in the EU comprise two key elements. First, prices and expenditure related to the acquisition of dwellings. This includes purchaser prices of new dwellings, prices for self-built dwellings and major renovations, and for existing dwellings new to the household sector; transaction-related expenditure, e.g. taxes and charges by real estate agents, is covered as well. Second, they include prices and expenditure related to the ownership of the dwelling. This refers to expenditure for major repairs and maintenance, insurance connected with the dwelling, and other expenditure. For a detailed breakdown of the relative weightings, see Chart 1.

7 For fundamental CPI concepts such as "acquisition", "consumption" and "payments", see International Labour Organization et al. (2020), pp. 3-4.

8 In an economy with a household sector on the one hand and all other sectors on the other, transactions of used cars between households are disregarded in HICPs (since both the buyer and the seller belong to the household sector), while those bought from car dealers (or another non-household sector) are part of the basket.

Chart 1

Weighting of OOHPI components, 2023



Source: Eurostat.

A common critique of the net acquisition approach to OOH is that a component of investment is included. In theory, this should be removed before integrating OOH in a CPI. However, there may be several views as to what the OOH investment component is, some of them incompatible. The point is often made that a newly acquired dwelling is expected to deliver housing services over a number of years, hence providing the potential for consumption in the future. In this respect OOH is no different from any other durable good. They all deliver services over more than one period and can be seen as partly consumption and partly investment. One reason dwellings are usually singled out may be their extremely long service life, coupled with the large weight housing has in the consumer basket compared to other items with similarly long service lives, say jewellery or art. This extremely long service life also means the second-hand market for houses is much bigger than the market for new ones, which makes it unusual.

It has been suggested that one way of removing the investment component is by excluding the cost of the land from house prices, given that land is the longest serving (and least depreciable) component of housing.[9] This argument is not uncontroversial. Even if land value were to be excluded, arguably a large part of the remaining housing expenditure goes on building structures and so also contain an investment component with a long lifecycle. Indeed, expenditure on housing structures is classified in national accounts as gross fixed capital formation. It is also not clear why a good like land, which depreciates very little if at all, does not offer current consumption services. From the point of view of consumers, the volatility in land prices is clearly reflected in their purchases of new dwellings, irrespective of

9 "One approach is to regard the cost of the land as representing the investment element and the cost of the structure as representing the consumption element. The rationale for this is that, while the structure may deteriorate over time and hence be 'consumed,' the land generally remains at constant quality." International Labour Organization et al. (2020), p. 252.

whether the land depreciates or not. On the other hand, an argument in favour of excluding the land price is that construction land is often, but not always, purchased from another household. Intra-household transactions are generally excluded from HICPs.[10]

Even if one were to assume that it is methodologically desirable to remove the land cost from the house price, in practical terms this raises some complex measurement issues when land is not bought separately by the household, i.e. in the case of self-built houses. In the short to medium term, the buildings and the underlying land are effectively bundled goods; the prices cannot easily be separated, other than in specific cases such as self-built houses. In practice, therefore, approaches to disentangling the land and structure components of prices for turn-key ready houses are scarce.[11] One alternative is to estimate the OOHPI for the purchase of new dwellings directly from construction producer prices, to which the sellers' profit margins (and VAT) have to be added, thus leaving the land element aside.[12] Such an index would typically reflect changes over time in expenditure for a pre-defined newly constructed house from the perspective of a builder. This may not fully coincide with that of the consumer.[13] All in all, it is not clear that excluding land cost from house prices is either methodologically desirable or practically feasible without reverting to some type of estimation technique.

House price volatility and potential implications for monetary policy

Just as important as consumption-investment considerations and measurement questions is the issue including OOHPIs in the HICP raises for monetary policy, especially the volatility housing markets may exhibit.[14] Supply of new dwellings typically reacts very sluggishly to demand shocks, as it is fairly inelastic in the short to medium term. As a result, house prices (and to a degree also OOHPIs) may deviate substantially from their long-term equilibrium and for long periods. This will depend of course on the nature of the demand shock, as housing markets are deep, but also geographically segmented. Including the OOHPI in the reference inflation rate for euro area monetary policy would imply that housing market dynamics are able to send strong signals through the measure of inflation. As long as the cycles of local housing markets are not in sync, overall inflation in the euro area would be less

10 Note in this respect that in the OOHPI purchaser prices of new dwellings include the price of land, while price indices of self-built houses do not as they are often derived from construction output price indices.

11 Burnett-Isaacs et al. (2019) applied the "builder's model" (Diewert et al., 2017) to data for one Canadian city using a regression-based approach. This relies on large data collections on the characteristics of the dwellings. However, the approach has not yet been tested to see if it could be used to regularly compile and report official statistics.

12 The Australian Bureau of Statistics uses two main methods of achieving this goal. First, it collects information on the change in prices of standard buildings/structures from building companies and, second, it estimates changes in selling prices of non-standard apartments, starting from the producer price indices. Both approaches remove the effect on dwelling market prices of both land and location.

13 Data from construction output price indices are used in OOHPIs for the self-built houses segment. A general caveat against using these output price indices is that they do not include the profit margins of developers ("clients" of construction companies). See Eurostat (2006), p. 76. Construction output price indices are typically compiled from survey data, currently conducted once per quarter.

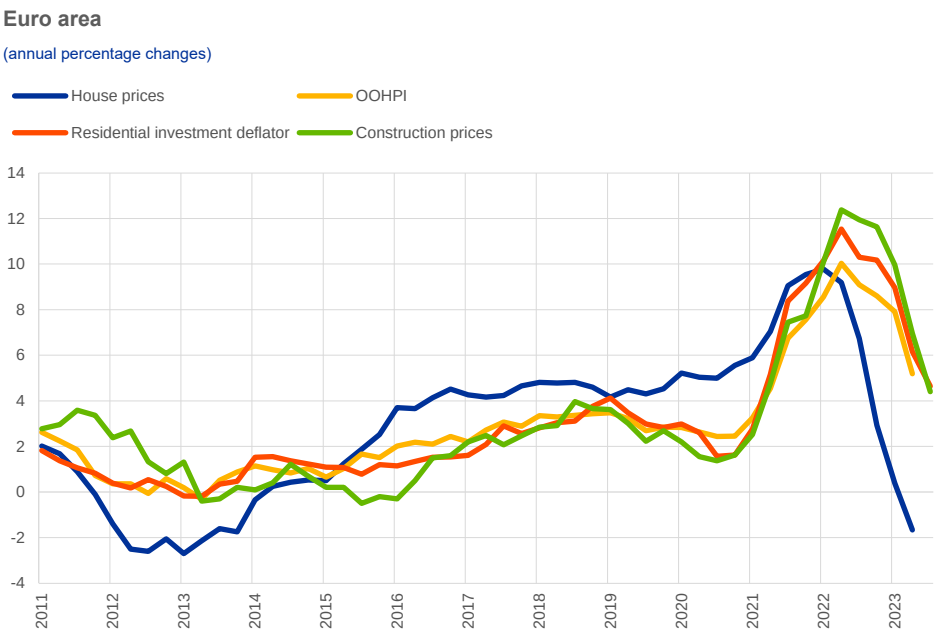
14 The volatility house prices may exhibit needs also to be considered from the point of view of HICP compilation requirements, i.e. chain-linking over December or the fourth quarter. Very high or low values in linking periods have the potential to substantially impact the data resulting from the chain-linking. When expenditure shares (weights) are also volatile, as they may be due to volatile transaction data, statistical issues related to chain-linking and annual weight updating can become even more pronounced, especially when looking at year-on-year rates of change.

affected, since idiosyncratic movements cancel out to some extent in an aggregate index.[15]

Though the observation period is relatively short, Chart 2 gives an idea of the different dynamics for various price indices of dwellings in the euro area. The blue line is the house price index reflecting transactions in both existing and new dwellings, with the former comprising more than 80% of the total HPI for the euro area. The orange line is the estimated index where the purchase subindex covers only new dwellings, but ownership-related costs are also covered. The other two lines show the euro area residential investment deflator and the construction price index. The residential investment deflator represents changes in prices purchasers of residential real estate are paying; it is mainly driven by construction prices and is similar in concept to the acquisition price index as calculated by the Australian Bureau of Statistics in its implementation of the net acquisition approach.

Chart 2

House prices, OOHPI, residential investment deflator and construction prices



Sources: ECB calculations, Eurostat.

Between 2011 and early 2021 fluctuations in the OOHPI for the euro area were relatively contained, albeit correlated with house price changes. Thereafter, it increased sharply until mid-2022, mainly on account of the acquisition of dwelling component. Although changes in house prices then moderated, OOHPI inflation remained high, partly reflecting high construction prices, which particularly impact prices of self-build dwellings.

Overall, in the period for which data are available, the euro area OOHPI has fluctuated within a band from around 0 to approximately 10%. If these data were combined with the HICP with a weight of approximately 10% (see below), the

[15] Bryan et al. (2002) provide a general model that mitigates idiosyncratic movements.

difference in percentage points between the annual rates of change in the quarterly HICP combined with OOH and the HICP (without OOH) would be within a band of -0.2 to 0.4. Recently, the difference between the HICP and the HICP combined with the OOHPI has been relatively small because HICP inflation has also showed a sharp increase.

Over this admittedly short observation period, at first sight there seems to be no reason to believe that including OOHPI would dominate and destabilise the dynamics of combined HICP. That said, two caveats are needed. First, the observation period since 2011 is too short when dealing with housing market cycles.[16] We cannot rule out the possibility that a higher-amplitude cycle for OOHPI in future would have a bigger impact on combined HICP in periods of more stable CPI, especially if euro area country housing cycles turn out to be more synchronised than in the past. Second, even if the OOHPI cycle for the euro area were not more volatile, national and regional housing markets could still experience much higher fluctuations (see the charts in the Annex).

Again, excluding land has been proposed as a possible way of mitigating the high volatility of house prices.[17] The reasoning is that land is one of the most inelastic and location-specific components in the supply of dwellings; therefore, land prices are more prone to react to demand shocks, even local ones.[18] In Chart 2, the closest estimate to a price index excluding land is the residential investment deflator. As can be seen, this is no less volatile than the OOHPI. If the volatility and long cycles of OOHPIs are a concern, it is not obvious why replacing the dwelling purchase component of the OOHPI with an index that approximates the investment deflator should be preferable. Removing land prices also removes much of the effect location has on prices and may miss some of the fundamental factors affecting the cost of house purchases.[19] An important price signal and information are therefore lost.

If volatility and long housing cycles are issues that have to be addressed when including house prices in an inflation index, other methods of dealing with volatility and persistent cycles could be explored instead, including statistical ones. By way of example, statistical offices that rely on the user cost approach also use very long (25-year) moving averages of house prices; these remove much of the volatility. Similarly, as mentioned below, the rental equivalence approach uses rents from old contracts, thus smoothing the cycle in new rent dynamics. If these and other methods are acceptable in the user cost or rental equivalence approach, they could also be used in the net acquisition approach if needed. Alternatively, if the idea were

16 On the length of housing price cycles see, e.g., Girouard et al. (2006), p. 7, Goodhart and Hofmann (2008), p. 25, and Corradin and Fontana (2016), p. 29.

17 “Further, as the land (or location element) accounts for most of the variation in observable prices for otherwise identical dwellings sold at the same point in time, the exclusion of land values may also be seen as an attempt to exclude asset price inflation from the CPI” International Labour Office et al. (2004), p. 184.

18 A different argument concerns the exclusion of construction land expenditure from the combined HICP weights, as is current practice in OOHPI compilations by EU statistical offices. This has the advantage that the latter can be consistently derived from national accounts data (where land is excluded because is not producible). In this approach, the weight of owner-occupied housing may be primarily derived from household expenditure on residential fixed capital (Eurostat 2017).

19 See Knoll et al. (2017).

instead to separate “fundamentals” from the more “speculative” dynamics of OOHPI, a model-based approach may be more appropriate.

Conclusion

The net acquisition approach is based on a consistent methodological framework also applied to other durable goods in the HICP. It has a clear advantage over other approaches because it reflects the actual and measurable price that the household sector pays each period for non-rented accommodation. However, because of the long service life of dwellings, it raises long-debated and still-unresolved methodological issues concerning the investment component of housing. In addition, there are measurement issues which compilers of consumer price indices have long wrestled with.

3 "Use" approaches to treating OOH in consumer price indices

Many statistical offices around the world opted for a different approach for OOH than for other durable goods, primarily on conceptual grounds, but also in view of the technical complexities of implementing the net acquisition approach. Rather than introducing the acquisition price of OOH into the CPI, they estimate the flow cost of the housing services consumed in a given period ("consumption or use approach").[20] The basic intuition behind the use approach is that households have a dual role. As house owners, they are "producers" of housing services, but they are also the consumers of these same services. They own the house they live in. There is therefore only a shadow price for the housing services produced/consumed, just like with housekeeping services produced by family members.[21] The method for imputing this shadow price/cost is a very important element in these approaches, and often a source of critique. Conceptually, theoretical construction of household "producers" and household "consumers" sidesteps the issue of intra-household payments and explains why actual rents paid from one household to another are included in the consumer inflation price index, contrary with what is typically done with other goods and services.

3.1 The user cost approach

The user cost approach takes the point of view of the "household-producer". One way of calculating the costs a producer/investor would occur for producing OOH services is to assume a dwelling is bought at the beginning of a period and sold at the end.[22] In broad terms, this will include the financial cost (mortgage interest and the opportunity cost of equity), the cost of physical depreciation and other costs of owning a house (such as maintenances and taxes), minus/plus the capital gain/loss due to the difference between the house price at the end and the start of the period. In theory, fully-fledged user costs also cover opportunity costs of foregone profits which could have been made by an alternative investment.

---

20 International Labour Organization et al. (2020), p. 246.

21 The fact that housekeeping services produced by family members are not included in CPIs, but they are in national accounts, shows that use/own-account production approaches are coherent with the national accounts concept of valuing production, but less so with the CPI concept of purchasing power.

22 This interpretation of the user cost approach is based on an arbitrage condition applicable at the start of the period for the individual household. If a household expects that the user cost will be lower (higher) than the expected rental cost, i.e. the value of the housing services, in that period, it will delay the purchase (sale) of the dwelling. Arbitrage hence results in expected user costs being identical to the hypothetical rental cost of the same property, under perfect market conditions. In this vein, Diewert et al. (2020), p. 236, point out that ex ante user costs "should approximate a market rental rate". The same authors introduce the "opportunity cost approach", with opportunity cost defined as the per-period maximum of user costs and imputed rents. A different interpretation of the user cost could be based on a market equilibrium condition, namely that prices and the user cost adjust to clear the market throughout the period. In this case, the user cost could be seen as an ex post measure of cost/return for the buyer/seller involving no expectations.

Taking the point of view of the household-producer or investor can give rise to some rather counter-intuitive results. For example, capital gains are thought to reduce the user cost of capital. Thus, for a household-producer/investor accelerating house prices are no doubt a "good thing". From the point of view of the household-consumer, however, accelerating inflation in the house market can only reasonably be seen as a welfare loss. It would be very curious if policy makers were to receive the signal that the cost of living is falling when house prices are accelerating.

From a monetary policy point of view, there is additionally the problem that the financial cost component of OOH user costs (the mortgage payments and opportunity cost) is in principle directly and positively related to the central bank policy rate. Other things being equal, therefore, an increase in policy rates will almost automatically translate into a rise in OOH user costs and the corresponding CPI that includes these user costs. The opportunity cost element of a fully-fledged OOH user cost index captures the return that could be generated by the equity owned if this were invested by its owner elsewhere. This "outside option" may also exhibit some direct correlation with policy rates.

Similar to the net acquisition approach, the user cost approach implies that a component with asset-like price dynamics and volatility becomes part of the corresponding CPI, as the house price index is incorporated in the user cost formula. The weight of OOH user costs is also likely to fluctuate significantly[23] where housing and financial cycles play a role.

Measuring OOH user costs every month on a timely basis requires timely monthly house price/valuation data – for the entire OOH stock – and in principle also data with and without land for the financing and depreciation components. In many cases these are not readily available.

The user cost approach in practice

Implementations of OOH user costs differ substantially from the theoretical concept, but retain the idea that the cost of OOH services should be based on house prices. Canada, Iceland and Sweden exclude the capital loss/gains term on the grounds that this is an investment, not consumption.[24] A rationale for this would be that for the purposes of national accounts an owner/investor/producer would treat as an expense in "households' own account production" only the part of the user costs that excludes capital gains and losses and opportunity costs.[25]

In practice the opportunity cost of equity is typically excluded, on the grounds that it is part of the investment decision. The CPI provided by Statistics Sweden for the Riksbank's use as the inflation target for Sweden replaces actual interest rates (past and present) in the financial cost variable in OOH user costs with a fixed interest rate (the Consumer Price Index with a Fixed Interest Rate: CPIF). In Canada, the interest rate component is derived from vintages of mortgage contracts, thus reducing the

23 See also Hill et al. (2020).

24 See Eiglsperger and Goldhammer (2018).

25 This accounting idea is put forward as an explanation for Statistics Canada's user cost approach (see Eiglsperger and Goldhammer (2018).

direct impact of current policy rates on the financial cost component of OOH user costs.[26]

OOH user costs in both Sweden and Canada use long-term moving averages of house prices in their financing cost components, which effectively mitigates short- and medium-term fluctuations in house prices. In Canada, the financial cost of OOH user costs (price-induced mortgage costs) is estimated with moving averages over 25 years.[27]

User costs that exclude capital gains and fix the interest rate tend to approximate a house price index (multiplied by a constant[28]) which is included in its financing cost and replacement cost component. In practice, therefore, though starting from a very different point of view, the user cost approach tends to give a price measure similar to that of the net acquisition approach. One important difference is that OOH user costs also account for houses and flats bought at different points in the past. Hence the weight of OOH user cost in a CPI is usually significantly higher than the weight of an OOH net acquisition index.

Chart 3 shows the various components of Statistics Canada's cost of shelter; this includes OOH according to their user cost approach ("Owned accommodation"), actual rents and running costs ("Water, fuel, electricity"). Canada's OOH user cost index has a different profile than the rent index, in both the short and the long run. Sabourin and Duguay (2015) show that the OOH index in Canada grew by close to 35% over the period from 2000 to 2015, while an estimated index of equivalent rents grew in cumulative terms by around 20%. The cyclical pattern has also been different in many cases. . In general, OOH cost indices that include house prices, as in the net acquisition approach and the user cost approach, tend to be more cyclical and have different growth rates than rent-based indices, even over extended periods.

26 See Eiglsperger and Goldhammer (2018).

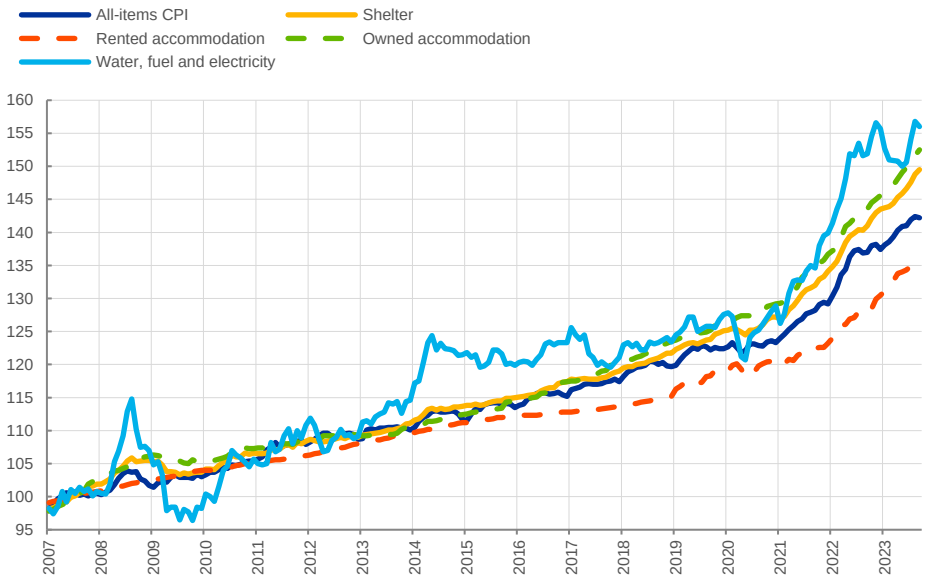
27 Statistics Canada (2019).

28 See Hill et al. (2020).

Chart 3

Consumer price index (CPI) for Canada, all-items and main components of shelter

(index: average 2007 = 100)



Source: Statistics Canada.

Conclusions

The user cost approach is a useful concept, particularly in investment theory, and helpful when analysing the investment decisions of households (or firms). In its fully-fledged version, it is a less obvious choice when looking at households as consumers. Moreover, implementing the user cost approach for the CPI requires a number of auxiliary hypotheses. What is ultimately measured may be only vaguely related to the theoretical concept. The final impact on the HICP including OOH user costs depends heavily on these auxiliary hypotheses, in particular the treatment of capital gains, but also the measurement of financial cost and the approach taken to volatility due to changes in interest rates and house prices.

3.2 Rental equivalence approach

Another way of pricing the flow of OOH services is by looking at what the market rent would be in an equivalent dwelling in the same area (also known as “owners’ equivalent rent” or “OER”). The idea behind this approach seems straightforward at first glance. The approach is already applied in various jurisdictions for national CPIs, as well as at the macro level in national accounts in most euro area countries in order to calculate the output of the residential sector.[29] Conceptually, the rental equivalence approach is based on the same theoretical notion that households, in their role as owner occupiers, consume housing services that they produce

[29] Estonia, Latvia, Lithuania, Malta, Slovenia, Slovakia and Finland apply a variant of the user cost approach to OOH in their national accounts, which basically measure “costs in own production of housing services”.

themselves. However, compared to the user cost of capital, it at least has the advantage that the cost of living is imputed or estimated from the point of view of the household-consumer, not that of the household-producer.

The imputation of the OER relies critically on the hypothesis that OOH and rented accommodation are highly substitutable. This applies to both the type of dwelling and the location. If rented accommodation is not readily available for some types of dwellings or locations, such as single-family houses in rural areas, then the OER for these can only be imputed from wider sample strata, for example information on apartments in the city centre. This implicitly assumes away the effects of some of the most important price characteristics of dwellings, i.e. differences in location and typology.

A second critical point concerns the type of rental information we need to impute the OER. If we want to know the opportunity cost of owning a house in a current period *t*, we are interested in the rent the house owner would have paid had they moved to a dwelling similar to the one they own in an equivalent location at the beginning of time *t*. This is presumably the *going market rent* for such a dwelling at the start of or during period *t* – not the rent on the basis of an older contract with conditions presumably not available to the homeowner at *t*.

If this one-period consideration is taken as our reference, in principle we want the rent of a matched dwelling from a *new or renegotiated* rental contract that reflects housing market conditions at the time of the observation. In practice, sampling new or renegotiated rent contracts for different dwelling typologies in different locations can prove very demanding, particularly in countries with thin rental markets. Many sample strata relevant for OOH may have only very scarce data on new or renegotiated contracts each period, if any at all. In summary, a price index of new rents faces many similar challenges to those encountered by house price indices for new dwellings. Hence statistical offices tend to use the actual rent index, primarily relying on existing contracts, as an approximation. For this reason, it could be argued that what is ultimately measured under the rental equivalence approach is not the same as the initial concept, as was the case with the user cost approach too.

Rental equivalence in practice

At first glance it may seem that the rental equivalence approach is easiest to implement in the EU, given that monthly and timely information on actual housing rentals is already provided in the HICP. This is an oversimplification, though. Simply put, existing sampling of rental units is meant to represent the types and locations where the bulk of the rental accommodation is situated, say apartments in city centres. But what is needed for the imputation of the OER is detailed information on rented accommodation that is representative and can be matched with the bulk of owner-occupied housing stock in each area, say single family houses in rural areas. To implement the OER in the euro area, the statistical offices in each EU Member State would need to have information on owner-occupied dwellings and sufficiently large stratified samples of rented dwellings that can be matched with the characteristics of owned dwelling in each stratum in the same or equivalent location. These approaches can be particularly difficult to implement when the rental market is

thin and segregated. Rent controls may add further complexity. Ptacek and Rippy (2013) describe, for example, the efforts and difficulties faced by the U.S. Bureau of Labor Statistics in collecting and matching a sample of rented units with owner-occupied ones.[30]

In the euro area, these difficulties also mean that the rental equivalence approach may be more suitable for countries with active rental markets, such as Germany, than countries like Spain or Italy where home ownership is much more dominant. This implies that within a country, the OER may be more representative for urban areas and multi-unit dwellings than, say, single-family houses in rural areas, while the latter are usually an important part of owner-occupied housing. Good matching of owner-occupied and rented units becomes even more difficult when housing market conditions vary substantially across locations. If housing market conditions, and hence the cost of housing services, have different dynamics - not just different levels - in different locations, the OER should in principle be imputed on the basis of dwellings in very narrow geographical areas, which requires very granular data. For housing markets that are more geographically homogeneous, the OER may be relatively easier to impute, requiring less sampling strata.

The appropriateness of OER indices may also be affected by the practices used to sample actual rents. In several cases, rental surveys are designed from a quarterly perspective, e.g. rolling sampling or allocating prices to future months when the minimum cancellation period or minimum notification period for rent increases is three months. While being a true measure of purchasing power, price information derived from actual rents may therefore reflect the most recent price dynamics only with a delay. As with the other approaches to OOH, quality adjustment is an additional issue. In cases of replacement, quality adjustment may be applied to rents for new dwellings, while in the case of resampling, rents may be included in the consumer price index without price comparison. An OER will then only partially reflect price differences compared to average market rents.

In conclusion, as with the other approaches to OOH, we can expect significant measurement difficulties in applying the concept of the OER, particularly in countries with thin rental markets.

Rent dynamics and OER

Rents of sitting tenants usually do not vary much over the cycle and in general tend to be very little influenced by housing market conditions, often driven by market regulation. The decoupling of rents from the housing market cycle is not necessarily a problem in itself. We could for instance take the view that ensuring price stability is about long-term plans and therefore long-term rental contracts that shield households from housing market dynamics are the best measure of the shadow price of housing services.[31] However, when changes in prices for rents deviate from

[30] Detailed descriptions of these approaches as applied in consumer price indices for the United Kingdom and the United States are provided in Office for National Statistics (2017) and McCarthy et al. (2010) respectively. The latter authors also review changes in the various approaches to estimating OER in the United States since the early 1980s.

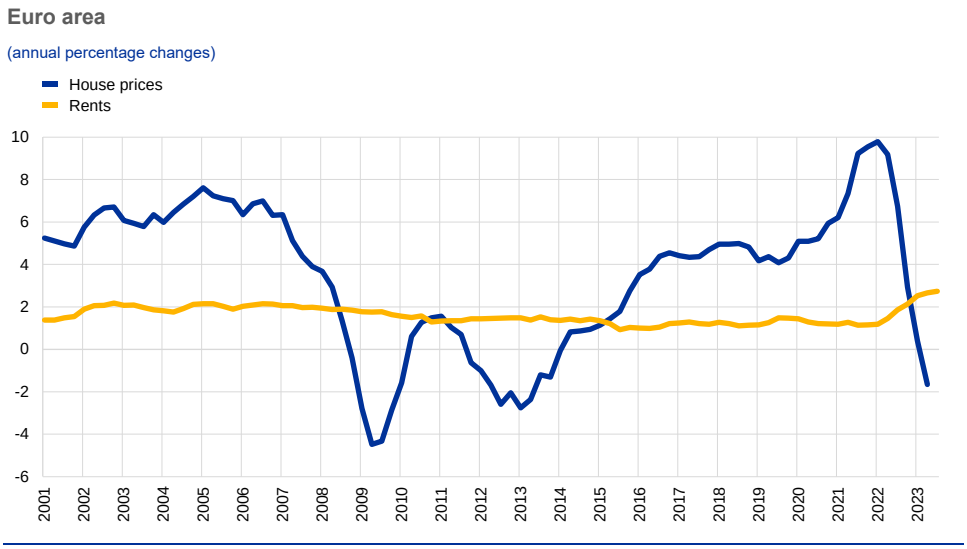
[31] Cecchetti (2017).

house price dynamics over very long periods, say ten years or more, it suggests that house ownership and rental markets may actually be rather different in terms of their dynamics. More generally, OERs as implemented in practice do not usually capture the price dynamics of a meaningful outside option to OOH (what the homeowner would need to pay in reality at any moment in time if they were to move to equivalent rented accommodation).

To see this, consider first Chart 4, which shows overall rent and house price inflation for the euro area since 2001.[32] Rent inflation hardly seems to move with the house price cycle, hovering close or below 2% for most of the time.

Chart 4

House prices and rents



Sources: ECB calculations, Eurostat.

The most likely explanation for the "flat" rent inflation is that long-term rental contracts and regulations protect sitting tenants from being adversely affected by fluctuations in housing market conditions. Contractual clauses ensure that rents are indexed to inflation until such time as the contract is renegotiated (or a new tenant moves in with a new contract). The rent increases for sitting tenants (with old contracts) are not in general a very good indication of the rent inflation for new lettings. Rent controls can further contribute to the stickiness of rents.

This is not a phenomenon specific to the euro area. Even in the absence of rent controls and contractual clauses, rent stickiness may simply be due to widespread market practices in different jurisdictions.[33] Whatever the explanation, the stickiness of rents means that the OER is also likely to be sticky, especially if it is imputed largely on the basis of old rental contracts. This is what one observes for example in the United States. Chart 5 shows the OER and the house price index for the United

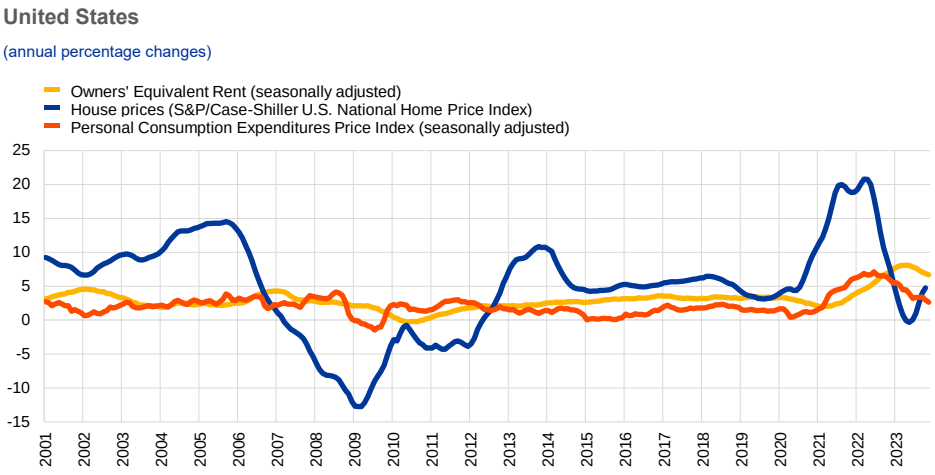
[32] For a discussion, see the box entitled "Rent inflation in the euro area since the crisis", *Economic Bulletin*, Issue 4, ECB, 2019.

[33] For Japan, see Shimizu et al. (2008) and Shimizu et al. (2016).

States since 2001.[34] In the United States the OER is included in the consumer price index and in the Personal Consumption Expenditure Price Index, which is the preferred inflation measure of the Federal Reserve. The OER does not seem to track the housing market cycle. McCarthy et al. (2015) report that the contemporaneous correlation was not statistically different from zero between, on the one hand, tenant rent and OER inflation and, on the other, the rate of change of house prices or house sales in the United States during the period they examine in the 2000s. In the short run an inverse relationship between house sale prices and rents can even be expected, as there may be some substitution between the two markets.

Chart 5

Owners' equivalent rents, house prices and Personal Consumption Expenditures Price Index in the United States



Sources: Federal Reserve Bank of St. Louis, S&P Dow Jones Indices, U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics.

The stickiness of rents means that the introduction of the OER into the HICP is likely dampening variations. If rents move very close with HICP because of indexation, then the introduction of OER is unlikely to have a material effect on the HICP combined with OOH. If rents grow within a narrow band around and mostly below HICP, then the introduction of the OER may introduce a degree of hysteresis and possibly mean reversion to the combined HICP. The eventual result is difficult to predict, not least because the introduction of the OER into the HICP may in turn trigger changes in contractual clauses and rental market practices, perhaps also regulations. Either way, long housing cycles are unlikely to have much of an effect on the inflation index.

Arguably, an OER index based on new (or renegotiated) rents would more reflect closely short- to medium-term changes in housing market conditions. However, the use of only new or renegotiated rent contracts to impute the OER would present additional conceptual and measurement difficulties. In countries with thin rental markets, one would need to rely heavily on specific segments of the market, such as dwellings for students or expatriates, to achieve sufficiently large sample sizes of

[34] In this case, the house price index reflects changes in prices of single-family houses, including purchases for rental purposes.

new or renegotiated rent contracts each period for matching purposes to construct the OER. Furthermore, conceptually, it is arguably unclear why the cost of housing services of long-standing homeowners should be imputed on the basis of short-term and precarious rent contracts. In view of this, it is not surprising that the OER is in general imputed on the basis of all rents, including those paid by sitting tenants, not only new rents.[35]

In terms of the consumer basket, under the rental equivalence approach the overall weight of shelter in the euro area is estimated to be significantly higher than that under the net acquisition approach excluding land (with the caveat that the latter depends on the construction cycle). Using national accounts data on private consumption, the total weight of rents – actual and imputed – in euro area household consumption is approximately 19%, with roughly two-thirds of this attributable to imputed rents for homeowners. Weights can differ significantly from country to country and between urban and rural areas. In the United States, the Bureau of Labor Statistics estimated the weight of rents and the OER in the basket used for compiling the Consumer Price Index (CPI) for All Urban Consumers (CPI-U) over time and in 2023 they stood at 7.6% and 25.6% respectively.

In summary, the combination of market practices, contractual clauses and regulations means that the OER reflects housing market conditions at any given moment very little, if at all, and is therefore largely meaningless as a measure of current opportunity cost of home ownership. Having said that, introducing the OER into the HICP may impact dispersion of inflation across different countries, depending on the structure of national rental markets and the relevant regulations.

Conclusion

The rental equivalence approach is based on the intuitive idea of measuring the opportunity cost of home ownership based on the outside option of the rental market. It differs from the HICP framework, in that it relies on imputed rather than actual expenditures and infra-household transactions. Also, despite its apparent simplicity, it involves some difficult measurement issues. Introducing “owners’ equivalent rent” into the HICP is not likely to clearly reflect concurrent housing market dynamics. In terms of statistical moments, the series may not be significantly affected even in periods of large fluctuations in the housing market.

[35] See, for example, Office for National Statistics (2017) for the United Kingdom and McCarthy et al. (2015) for the United States. Allen-Coughlan et al. (2020) estimate a price index for rents in new contracts in Ireland.

4 The HICP combined with OOHPIs and imputed rents in more detail

4.1 HICP combined with imputed rents in more detail

To combine the HICP and the HICP excluding food and energy or HICPX with the rental equivalence approach ("imputed rents" for OOH), i.e. HICP-R or HICPX-R, we refer to the actual rental component of the HICP. This is represented by subindex 04.1 in the European Classification of Individual Consumption according to Purpose (ECOICOP), "Actual rentals for housing".[36] The weights for combining HICPs with imputed rents for owner-occupied housing are derived from the related imputed expenditure as reported in the national accounts for household consumption.[37]

The legal basis for HICPs lays down that the primary data sources of HICP weights are national accounts data on expenditure from the penultimate year, i.e. *t*-2, which should be reviewed to confirm they are representative of year *t*-1, and finally price-updated to December of year *t*-1.[38] For imputed rentals, our calculations assume that the underlying structure is sufficiently stable over time, as markets for rental housing evolve only slowly. We suppose that NSIs simply use data from *t*-2 and consider them to be representative for *t*-1;[39] these data are then price-updated to December of year *t*-1.

Putting this approach into formulae, first the total expenditure for weighting is calculated:

$$E_{0,t-2} = HFMCE_{t-2} - E_{Na,t-2} + E_{Im,t-2} \qquad (1)$$

where $HFMCE_{t-2}$ is household final monetary consumption expenditure[40] in year *t*-2, $E_{Na,t}$ the consumption expenditures excluded from the scope of the HICP[41] and

[36] The more narrowly defined HICP subindex "Actual rentals paid by tenants", ECOICOP 04.1.1, only starts in December 2016.

[37] The data can be found in Eurostat's database in the table nama10_co3_p3, selecting COICOP 04.2 "imputed rentals for housing".

[38] The prescribed procedure is the same for both HICP and OOHPI. For the HICP, see Article 3 of Commission Implementing Regulation (EU) 2020/1148 of 31 July 2020 laying down the methodological and technical specifications in accordance with Regulation (EU) 2016/792 of the European Parliament and of the Council as regards harmonised indices of consumer prices and the house price index (OJ L 252, 4.8.2020, p. 12); for the OOHPI, a similar provision is foreseen for the upcoming Implementing Regulation on HPI and OOHPI.

[39] It should also be mentioned that at the time of the weight calculations, consumption data from *t*-2 is the latest data available at the required detail of breakdown.

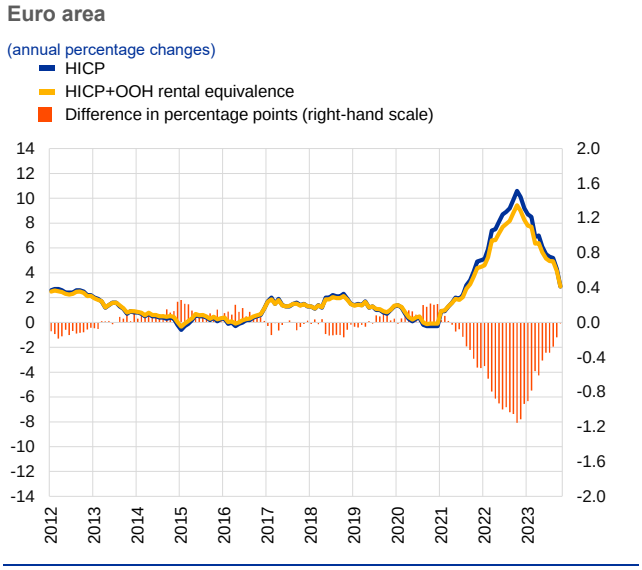
[40] This is the point at which the only difference between the calculations of HICP and HICPX combined with imputed rents occurs; for the HICPX, the expenditure for food and energy is subtracted from HFMCE.

[41] Consumption expenditure for narcotics and prostitution are excluded from the scope of the HICP. Games of chance are also excluded, but data on expenditure on them are not published in national accounts. Financial services are included in the HICP, but "financial intermediation services indirectly measured" (FISIM) are not. Since FISIM data are not available in published national accounts data, "Other financial services" are excluded entirely.

$E_{Im,t}$ the estimated consumption expenditure on imputed rentals. In the second step, expenditure shares v_i^{t-2} for the HICP-R are calculated:

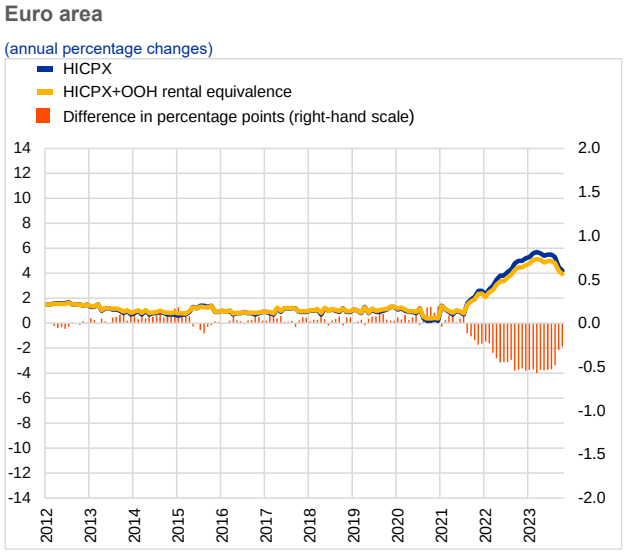
$$v_{HICP}^{t-2} = \frac{E_{0,t-2} - E_{Im,t-2}}{E_{0,t-2}};\ v_{Im}^{t-2} = \frac{E_{Im,t-2}}{E_{0,t-2}}; \qquad (2)$$

Chart 6
HICP and HICP + OOH rental equivalence



Sources: ECB calculations, Eurostat.

Chart 7
HICPX and HICPX + OOH rental equivalence



Sources: ECB calculations, Eurostat.

From these expenditure shares, the weights are calculated by price-updating with the HICP and the rent index change respectively from the annual average of year *t*-2 to December of year *t*-1:

$$w_{HICP}^{0t,b} = v_{HICP}^{t-2} \cdot \frac{p_{HICP}^{12,t-1}}{\bar{p}_{HICP}^{t-2}};\ w_{Im}^{0t,b} = v_{Im}^{t-2} \cdot \frac{p_{0411}^{12,t-1}}{p_{0411}^{t-2}} \qquad (3)$$

where $p_{HICP}^{12,t-1}$ refers to the HICP value in December of year *t*-1; $p_{0411}^{12,t-1}$ refers to the rental component of the HICP (ECOICOP class 0411). The indices of the weights show that they refer to the price reference period $0t$ (December of year *t*-1) and are based on expenditure data from year b (which in the case of the rental equivalence approach is year *t*-2).

With these weights, the HICP and the rental index, we can calculate the HICP-R. As the HICP is a chained Laspeyres-type index with December as the linking month, only the rates of change with reference to last December can be aggregated in a consistent manner.[42] The rate of change of the HICP-R to December of *t*-1 $P^{0t,mt}$ is given by

[42] Eurostat (2018), pp. 178-179. This is also the difference to the calculation shown in Work stream on inflation measurement (2021), p. 60, where a weighted average of annual change rates was used as a proxy calculation.

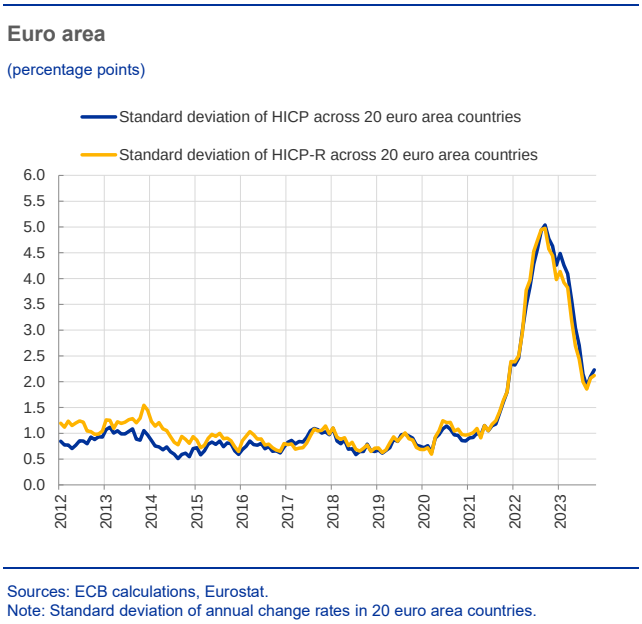
$$P^{0t,mt} = \frac{p_{HICP}^{mt}}{p_{HICP}^{0t}} \cdot w_{HICP}^{0t,b} + \frac{p_{0411}^{mt}}{p_{0411}^{0t}} \cdot w_{Im}^{0t,b} \qquad (4)$$

In (4) the calculation of changes within the year *t* refers to the linking month December. Our formula therefore considers the linking month, the 12th month of year *t*-1, to be "month zero" of year *t*. The value for this linking month is calculated with the weights of year *t*-1.

The HICP-R index of month *mt* is calculated by multiplying $P^{0t,mt}$ with the index value of December of the previous year:

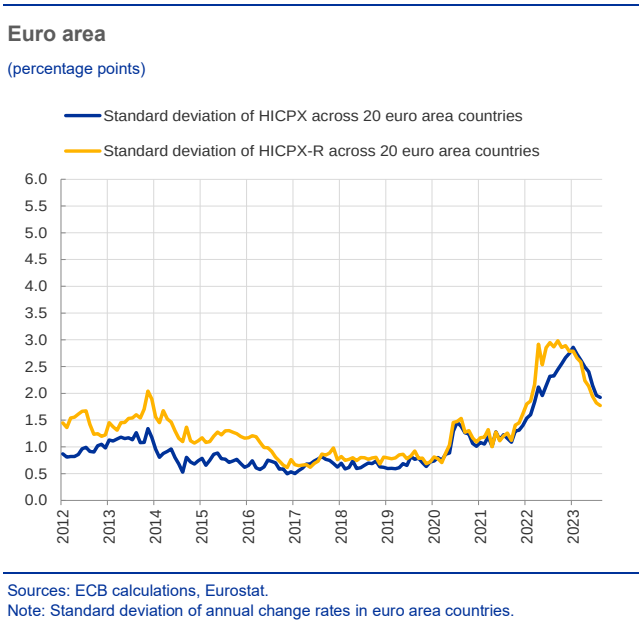
$$I_{HICP-R}^{mt} = I_{HICP-R}^{0t} \cdot P^{0t,mt} \qquad (5)$$

Chart 8
Standard deviation of HICP and HICP-R



Sources: ECB calculations, Eurostat.
Note: Standard deviation of annual change rates in 20 euro area countries.

Chart 9
Standard deviation of HICPX and HICPX-R



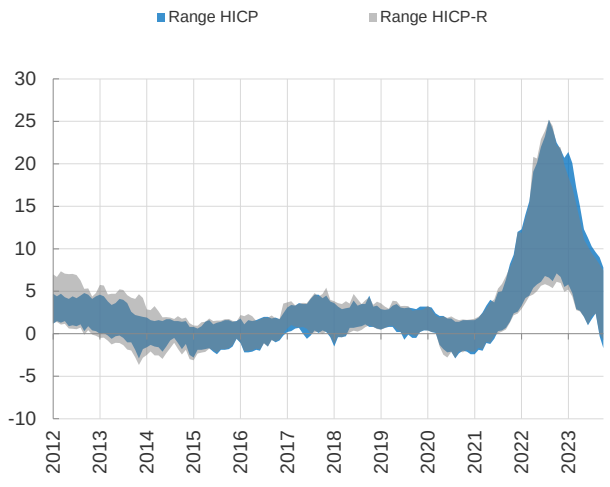
Sources: ECB calculations, Eurostat.
Note: Standard deviation of annual change rates in euro area countries.

Euro area HICP-R and HICPX-R from January 2012 to October 2023 are presented in Charts 6 and 7. The data show that HICP-R and HICPX-R do not have much larger averages or volatility compared to the official series, i.e. HICP and HICPX. For the averages, HICP stands 0.1 percentage points lower than HICP-R at 1.3%; the averages of HICPX and HICPX-R differ by 0.2 percentage points, with HICPX-R being on the higher side, i.e. 1.3%.

Combining HICP with imputed rents increases inflation dispersion across countries, mainly in the years from 2012 to 2014, but for the HICPX in 2015 and 2022 as well. In these years the standard deviation of the HICP-R series is significantly higher than for the HICP, especially for HICPX-R (Charts 8 and 9). Also, the dispersion in terms of the min-max range of country results for the combined HICP series is larger than for the official series (Charts 10 and 11). These results reflect the heterogeneity of the rental housing markets across euro area countries, in terms of both rent developments and tenure status.

Chart 10
Min-max range for HICP and HICP-R

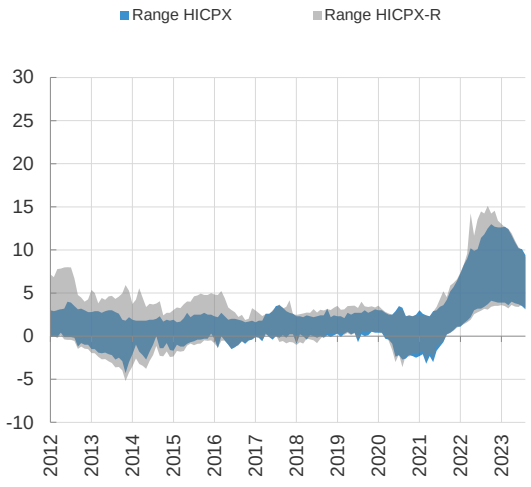
Euro area
(annual percentage changes)



Sources: ECB calculations, Eurostat.

Chart 11
Min-max range for HICPX and HICPX-R

Euro area
(annual percentage changes)



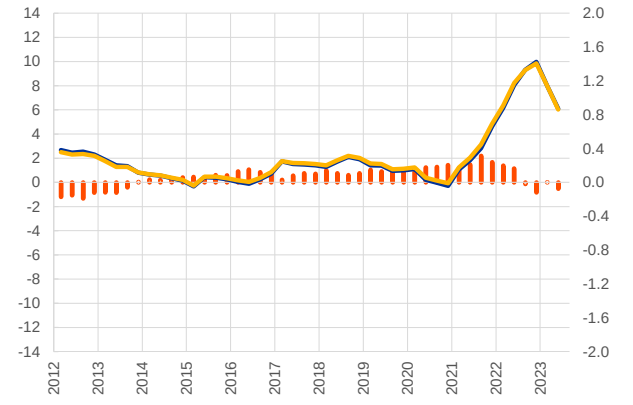
Sources: ECB calculations, Eurostat.

These calculations give only a rough impression of how an HICP-R would look. The methodology used just "scaled up" the weight of the rental component. For a fully-fledged HICP-R, it would be important to make the rental sample used for the OOH component representative of its structure, i.e. have dwellings with similar characteristics and locations as those where owner-occupiers live (see Section 3.2 for a discussion). This can be a complex and costly endeavour, especially in countries with thin rental markets for certain dwelling types and in certain regions.

4.2 HICP combined with OOHPI in more detail

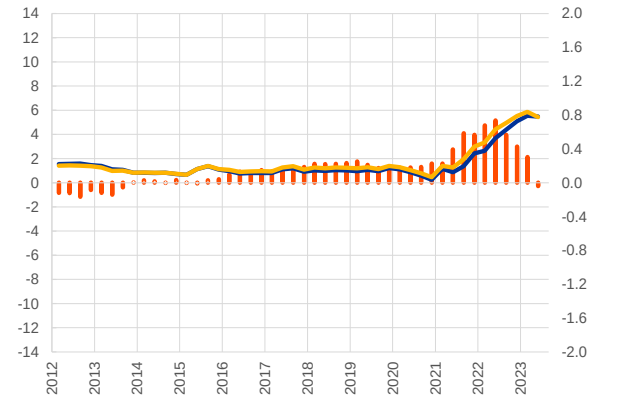
For the calculation of HICPs to which OOHIPs are added, the official OOHPIs are used; the methodology applied is in line with HICP standards, but applied to data with a quarterly reporting frequency. The weights OOHPI expenditure have when combined with HICPs are primarily derived from gross fixed capital formation (GFCF) for new dwellings as reported in the national accounts. However, using GFCF for residential dwellings as published by national accounts to combine HICPs and OOHPIs has an important shortcoming; GFCF reflects investments in the construction of all new dwellings, whether intended for own occupancy or renting, by companies and households. Some adjustments are necessary to derive adequately approximated OOHPI weights from this expenditure. Unfortunately, fully adequate auxiliary information does not yet exist. Hence, a proxy approach is applied which scales the total expenditure according to

Chart 12
HICP and HICP+OOHPI



Sources: ECB calculations, Eurostat.

Chart 13
HICPX and HICPX+OOHPI



Sources: ECB calculations, Eurostat.

home ownership rates.[43] Then the publicly available OOHPI item weights in parts per thousand, *w*, are used to infer the nominal weights of the items and the total given the condition below:

$$E_t^{OOHPI} = (GFCF_t \cdot OR_t) \cdot \frac{1}{w_t^{OOHPI(ND+O)}} \qquad (6)$$

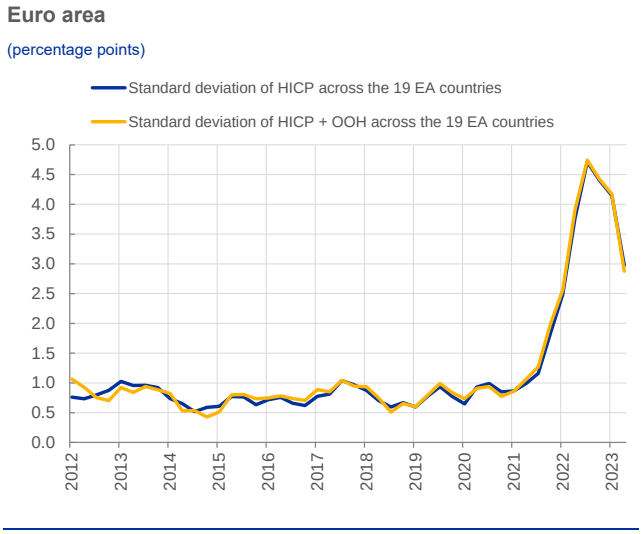
where overall nominal expenditure on all OOHPI items is equal to the scaled gross fixed capital formation multiplied by the ownership rate in time *t* (*OR*). The scaling is done according to the relative weight of OOHPI items included in the GFCF, which are (1) purchases of new dwellings, (2) self-built houses, (3) major maintenance and repair and (4) other services related to the acquisition of dwellings.

Then the weights for both the HICP and the OOHPI component are calculated. We assume that national statistical institutes make an extra effort to ensure weights are representative for year *t*-1, while for the rental equivalence approach we assume that *t*-2 is the weight reference period. Since GFCF may fluctuate substantially over time, the use of more recent expenditure weights is likely to have a significant impact. Using data from year *t*-1 (rather than *t*-2, as for the rental equivalence approach) total expenditure for OOHPI weighting is calculated as follows:

$$E_{0,t-1} = HFMCE_{t-1} - E_{Na,t-1} + E_{t-1}^{OOHPI} \qquad (7)$$

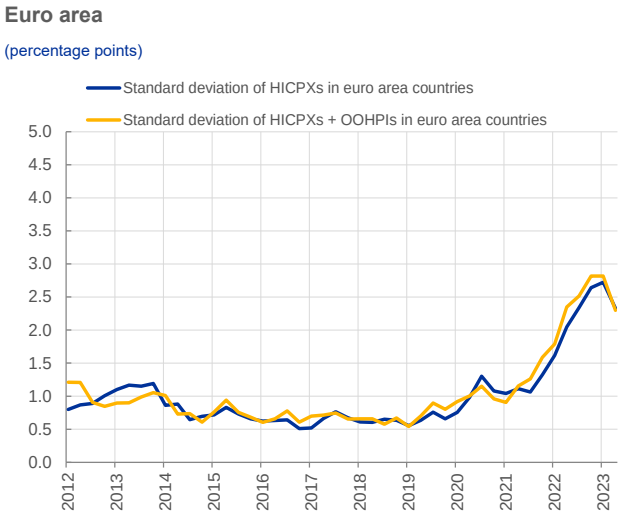
[43] The source of the home ownership rates is the European Union Statistics on Income and Living Conditions (EU-SILC).

Chart 14
Standard deviation of HICP and HICP+OOHPI



Sources: ECB calculations, Eurostat.

Chart 15
Standard deviation of HICPX and HICPX+OOHPI



Sources: ECB calculations, Eurostat.

where as before $HFMCE_{t-1}$ is household final monetary consumption expenditure in year *t*-1, $E_{Na,t-1}$ are consumption expenditure items excluded from the scope of the HICP and E_{t-1}^{OOHPI} the expenditure on owner occupied housing costs. In a second step, expenditure shares v are calculated as basic values for the weights for the HICP combined with OOHPI:

$$v_{HICP}^{t-1} = \frac{E_{0,t-1} - E_{t-1}^{OOHPI}}{E_{0,t-1}}; v_{OOHPI}^{t-1} = \frac{E_{t-1}^{OOHPI}}{E_{0,t-1}}; \qquad (8)$$

The weight for the HICP combined with OOHPI is then derived by price-updating the expenditure shares with the HICP and the OOHPI factor of change obtained by referring to the fourth quarter of year *t*-1 relative to the average of year *t*-1:

$$w_{HICP}^{0t,b} = v_{HICP}^{t-1} \cdot \frac{p_{HICP}^{Q4,t-1}}{\bar{p}_{HICP}^{t-1}}; w_{OOHPI}^{0t,b} = v_{OOHPI}^{t-1} \cdot \frac{p_{OOHPI}^{Q4,t-1}}{\bar{p}_{OOHPI}^{t-1}} \qquad (9)$$

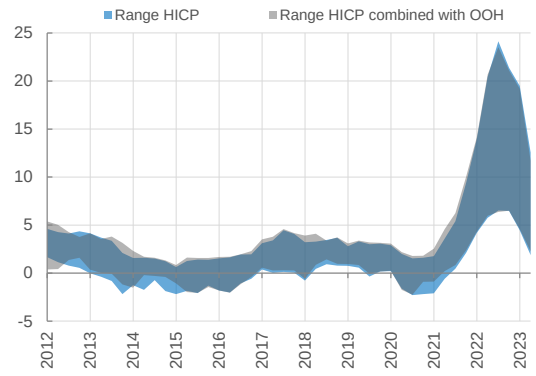
where $p_{HICP}^{Q4,t-1}$ refers to the HICP index value in the final quarter of year *t*-1 and $p_{OOHPI}^{Q4,t-1}$ refers to the price index of the OOHPI costs for the final quarter of year *t*-1. $\bar{p}_{HICP}^{t-1}$ and $\bar{p}_{OOHPI}^{t-1}$ refer to the annual averages of the price indices for year *t*-1. The weights refer to the price reference period $0t$ (December of year *t*-1) and are based on expenditure data from period b (which is *t*-1, in this case).

Chart 16

Min-max range for HICP and HICP+OOHPI

Euro area

(annual percentage changes)



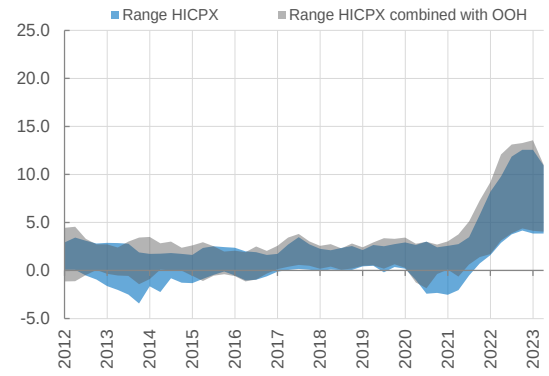
Sources: ECB calculations, Eurostat.

Chart 17

Min-max range for HICPX and HICPX+OOHPI

Euro area

(annual percentage changes)



Sources: ECB calculations, Eurostat.

With these weights, the HICP and the OOHPI index, we can combine the OOHPI with the HICP. As the HICP is a chain-linked Laspeyres-type index, only the unchained rates of change up to the time of chaining can be aggregated in a consistent manner. For aggregating changes of quarterly indices, the final quarter of each year is the link period. The change rate in the HICP which is combined with OOHPI from the final quarter of *t*-1, $P^{0t,qt}$, is given by:

$$P^{0t,qt} = \frac{p_{HICP}^{qt}}{p_{HICP}^{0t}} \cdot w_{HICP}^{0t,b} + \frac{p_{OOHPI}^{qt}}{p_{OOHPI}^{0t}} \cdot w_{OOHPI}^{0t,b} \qquad (10)$$

The HICP combined with OOHPI of quarter *qt* is calculated by multiplying $P^{0t,qt}$ with the index value of the last year's final quarter:

$$I_{HICP-OOHPI}^{qt} = I_{HICP-OOHPI}^{0t} \cdot P^{0t,qt} \qquad (11)$$

Assessing the properties of euro area HICPs and HICPXs combined with OOHPIs can draw on just a short time span of historical data. In terms of annual rates of change, data are available from 2012 onwards. Because we do not have data for a full business and/or house price cycle, any stylised facts presented below are highly tentative and need to be assessed with caution. Another caveat is that data for Greece are missing, so the euro area HICP combined with OOHPI is calculated without an OOHPI for Greece.

For the time span for which data are available, from 2012 to the second quarter of 2023, euro area HICP combined with OOHPI and HICPX combined with OOHPI do not have substantially different averages compared to HICP and HICPX, respectively. The combined inflation series has almost the same average, while average inflation of the euro area HICPX combined with OOHPI is around 0.2 percentage points higher (2.1% for HICP and 1.5% for HICPX) (Charts 12 and 13). Results for the largest euro area countries are presented in the Annex. There are significant differences in the relative impact across countries, with a very high impact seen in Spain, but a lower impact seen in Italy and France, for example.

Furthermore, although the differences across countries are significant, they do not seem to contribute significantly to increasing inflation dispersion.

Combining OOHPI with the HICP increases inflation dispersion across countries very mildly. In terms of covering household expenditure more comprehensively, the inclusion of OOHPI in the HICP is expected to increase comparability of inflation rates countries; at present HICP includes only rents, and the weights of these are very different across countries due to the large differences in home ownership. Indeed, given that OOHPIs partly include house price developments, the intrinsic heterogeneity of the housing markets and house price cycles across euro area countries could have implications for inflation dispersion and differentials in the combined HICP series across countries. The standard deviation of the combined HICP series for the euro area is slightly higher than for the standard series, especially in the period up to 2015 (Chart 14). This holds even more so for HICPX combined with OOHPI, which shows some significantly higher volatility in recent years too (Chart 15). Also, the dispersion in terms of the min-max range of the combined HICP series differs somehow from the official series (Charts 16 and 17). Overall, buoyant house price trends and elevated ownership rates tend to increase the HICP inflation rates to which OOHPIs are added in a country, and vice versa, adding to the intrinsic inflation differentials observed in a monetary union. The main characteristic of OOHPIs compared to rents is presumably a much stronger amplitude/cyclicality. We cannot automatically assume that our current findings about the volatility of HICP combined with OOHPI would hold over a longer sample.

Practical experience gained with the compilation of OOHPIs so far indicates that quarterly estimates of purchase prices are prone to more uncertainty than normal HICP component indices. Samples used for first estimates, available with a publication delay of one quarter, are usually incomplete; more accurate estimates are provided only later, in several cases with revisions. Statistical offices also use different data sources, the information content of which may vary substantially. This may adversely affect, to some extent, the comparability of OOHPIs across euro area countries, while combining the HICP with OOHPI generally increases comparability, as housing markets (rental and OOH) are covered more comprehensively.

5 Conclusion

All measurements of OOH as a component of the CPI used around the world are designed in line with a specific methodology. That said, the needs and restrictions involved in the practical implementation of this methodology also need to take into account what can actually be measured. The net acquisition approach is conceptually largely consistent with the HICP framework. Since 2016 Eurostat has published quarterly OOHPIs calculated using this approach for almost all EU Member States. OOHPIs are expected to track housing market conditions better over time than the rental equivalence approach. On the other hand, OOHPIs do not yet meet the quality requirements of HICP statistics in terms of frequency and timeliness, and reflect the asset component of the housing decision more strongly.

The user cost and rental equivalence approaches are conceptually interesting alternatives aimed at estimating or imputing the cost of consuming or producing the flow of housing services. They deviate conceptually from the existing HICP framework; the results may depend heavily on the auxiliary assumptions needed for imputation. The more commonly used rental equivalence approach is likely to be only weakly related to concurrent housing market dynamics, which would then not be prominently reflected in the headline inflation measure.

Results from analytical calculations suggest that HICP+OOHPI and HICPX+OOHPI inflation measures for the euro area would have displayed a higher amplitude over several years but fairly similar averages since 2011 compared to the official series. The intrinsic heterogeneity of housing markets across euro area countries could also increase the cross-country inflation dispersion of HICP+OOHPI and HICP-R series.

References

Ahrens, A., Beirne, K., Economides, P., Kostarakos, I., McQuinn, K. and O'Toole, C. (2020), "A review of the methodologies used in compiling owner-occupiers' housing indices", *Working Papers*, No 651, Economic and Social Research Institute.

Allen-Coughlan, M., Coffey, C., Martinez-Cillero, M., Kostarakos, I., McQuinn, K. and O'Toole, C. (2020), "Estimating the cost of Irish housing for the CPI: A rental equivalence approach", mimeo, June.

Bryan, M.F., Cecchetti, S.G. and O'Sullivan, R. (2002), "Asset Prices in the Measurement of Inflation", *Working Papers*, No 8700, National Bureau of Economic Research, January.

Bureau of Labor Statistics (2009), "How the CPI measures price change of Owners' equivalent rent of primary residence (OER) and Rent of primary residence (Rent)"

Burnett-Isaacs, K., Huang, N. and Diewert, W.E. (2019), "Developing Land and Structure Price Indexes for Ottawa Condominium Apartments", *Discussion Paper*, No 16-09, Vancouver School of Economics, The University of British Columbia, January.

Corradin, S. and Fontana, A. (2013), "House Price Cycles in Europe", *Working Paper Series*, No 1613, ECB, Frankfurt am Main, November.

Cecchetti S. (2007), "Housing in inflation measurement", Centre for Economic Policy Research, Vox, 13 June.

Diewert, W.E. and Nakamura, A.O. (2009), "Accounting for Housing in a CPI", *Working Papers*, No 09-4, Federal Reserve Board of Philadelphia, March.

Diewert, W.E., Huang, N. and Burnett-Isaacs, K. (2017), "Alternative Approaches for Resale Housing Price Indexes", *Discussion Papers*, No 17-03, Vancouver School of Economics, The University of British Columbia, May.

Diewert W.E., Nishimura K.G., Shimizu C. and Watanabe T. (2020), "Measuring the Services of Durables and Owner Occupied Housing", in Property Price Index: Theory and Practice. Advances in Japanese Business and Economics, Vol. 11. Springer, Tokyo.

Eiglsperger, M. (2006), "The treatment of owner-occupied housing in the harmonised index of consumer prices", in: Irving Fisher Committee of Central Bank Statistics (ed.),"*IFC Bulletin – Proceedings IFC Workshop on CPI measures: central bank views and concerns Basel, April 2006*", No 24, August, pp. 68-79.

Eiglsperger, M. and Goldhammer B. (2018), "Consumer price indices, owner-occupied housing and measures of underlying inflation in monetary policy of selected central banks", paper prepared for the "Meeting of the Group of Experts on Consumer Price Indices", 7-9 May, Geneva.

European Central Bank (2016), "Assessing the impact of housing costs on HICP inflation", *Economic Bulletin*, Issue 8, pp. 47- 50.

European Central Bank (2009), "Treatment of Owner-Occupied Housing in the HICP", Letter from Mr J.M. González-Páramo, Member of the Executive Board, ECB, to Mr J. Almunia, Member of the European Commission, 19 February, ref. L/JMGP/09/04.

European Central Bank (2020), "Letter from the ECB President to Mr Engin Eroglu, Member of the European Parliament", 8 May, ref. L/CL/20/124.

European Commission (2018), "On the suitability of the owner-occupied housing (OOH) price index for integration into the harmonised index of consumer prices (HICP) coverage", Report from the Commission to the European Parliament and the Council, COM(2018) 768, Brussels, November.

European Commission (2020), "Commission Implementing Regulation (EU) 2020/1148 of 31 July 2020 laying down the methodological and technical specifications in accordance with Regulation (EU) 2016/792 of the European

Parliament and of the Council as regards harmonised indices of consumer prices and the house price index".

Eurostat (2006), "Methodology of short-term business statistics – Interpretation and Guidelines", Luxembourg, March.

Eurostat (2017), "Technical manual on Owner-Occupied Housing and House Price Indices", Luxembourg.

Eurostat (2018), "Harmonised Index of Consumer Prices (HICP) – methodological manual", Luxembourg, November.

Eurostat (2023), "Owner-occupied housing and the harmonised index of consumer prices - Outcome of the work of the European Statistical System - 2023 edition", Statistical Working Papers, Luxembourg, June.

Girouard, N., Kennedy, M., van den Noord, P. and André, C. (2006), "Recent House Price Developments: The Role of Fundamentals", *OECD Economics Department Working Papers*, No 475, January.

Goodhart, C. (2001), "What Weight Should be Given to Asset Prices in the Measurement of Inflation?", *The Economic Journal*, Vol. 111, Issue 472, June, pp. 335-356.

Goodhart, C. and Hofmann, B. (2008), "House prices, money, credit and the macroeconomy", *Working Paper Series*, No 888, ECB, Frankfurt am Main, April.

Hill, R.J., Steurer, M. and Waltl, S.R. (2020), "Owner-Occupied Housing, Inflation, and Monetary Policy", *Graz Economics Papers*, No 2020-08, University of Graz, Department of Economics.

Hoffmann, J. and Kurz, C. (2002), "Rent Indices for Housing in West Germany – 1985 to 1998," *Working Paper Series*, No 116, ECB, Frankfurt am Main, January.

International Labour Office, International Monetary Fund, Organisation for Economic Co-operation and Development, Statistical Office of the European Communities (Eurostat), United Nations Economic Commission for Europe, The International Bank for Reconstruction and Development and The World Bank (2004), "Consumer Price Manual: Theory and Practice", Geneva.

International Monetary Fund, International Labour Organization, Statistical Office of the European Union (Eurostat), United Nations Economic Commission for Europe, Organisation for Economic Co-operation and Development and The World Bank (2020), "Consumer Price Index Manual: Concepts and Methods", Geneva.

Knoll, K., Schularick, M. and Steger, T. (2017), "No Price Like Home: Global House Prices, 1870-2012", *American Economic Review*, Vol. 107, No 2, pp.331-353.

McCarthy, J., Peach, R.W. and Ploenzke, M.S. (2015), "The Measurement of Rent Inflation", *Staff Reports*, No 425, Federal Reserve Bank of New York, August.

Office for National Statistics (2016), "CPIH Compendium", London, March.

Ptacek, F. and Rippy, D.A. (2013), "Owners' equivalent rent and the Consumer Price Index: 30 years and counting," *Beyond the Numbers: Prices & Spending*, Vol. 2, No 14, U.S. Bureau of Labor Statistics, May.

Roma, M. (2019), "Rent inflation in the euro area since the crisis", *Economic Bulletin*, Issue 4, ECB.

Sabourin, P. and Duguay, P. (2015), "Measuring Durable Goods and Housing Prices in the CPI: An Empirical assessment", *Bank of Canada Review*, pp. 24-38, November.

Shimizu, C., Nishimura, K.G. and Watanabe, T. (2008), "Residential Rents and Price Rigidity: Micro Structure and Macro Consequences", National Bureau of Economic Research, November.

Soumare, A. (2017), "Shelter in the Canadian CPI: An overview", Statistics Canada, September.

Statistics Canada (2019), "The Canadian Consumer Price Index: Reference Paper", February.

Woodford, K. (2006), "An exploration of alternative treatments of owner-occupied housing in a CPI", presentation at the 9th meeting of the Ottawa Group, London, 14-16 May.

Work stream on inflation measurement (2021), "Inflation measurement and its assessment in the ECB's monetary policy strategy review", *Occasional Paper Series*, No 265, ECB, Frankfurt am Main, September.

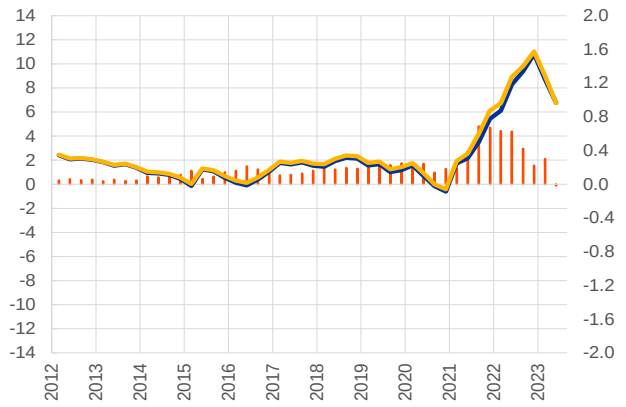
6 Annex

Chart 18
HICP and HICP+OOHPI

Germany

(annual percentage changes)

HICP
HICP+OOHPI
Difference in percentage points (right-hand scale)



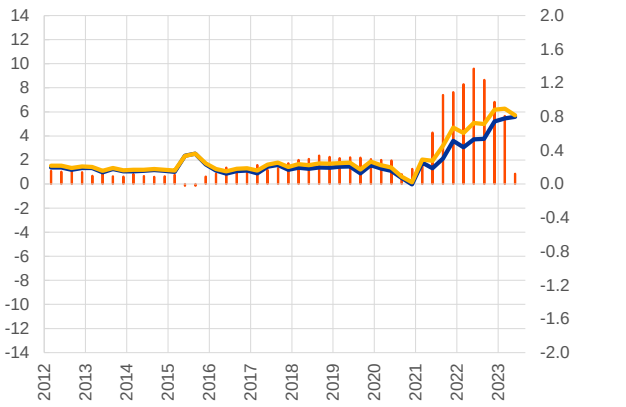
Sources: ECB calculations, Eurostat.

Chart 19
HICPX and HICPX+OOHPI

Germany

(annual percentage changes)

HICPX
HICPX+OOHPI
Difference in percentage points (right-hand scale)



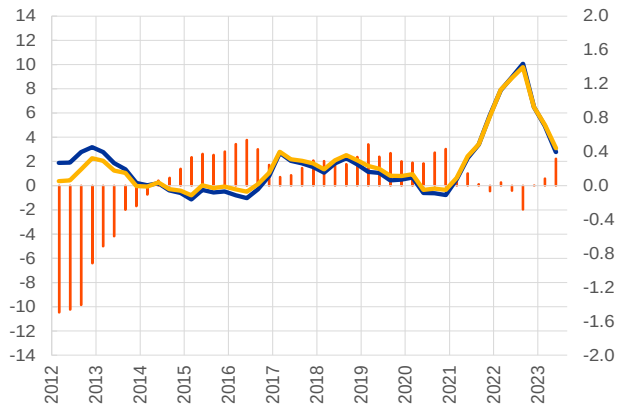
Sources: ECB calculations, Eurostat.

Chart 20
HICP and HICP+OOHPI

Spain

(annual percentage changes)

HICP
HICP+OOHPI
Difference in percentage points (right-hand scale)



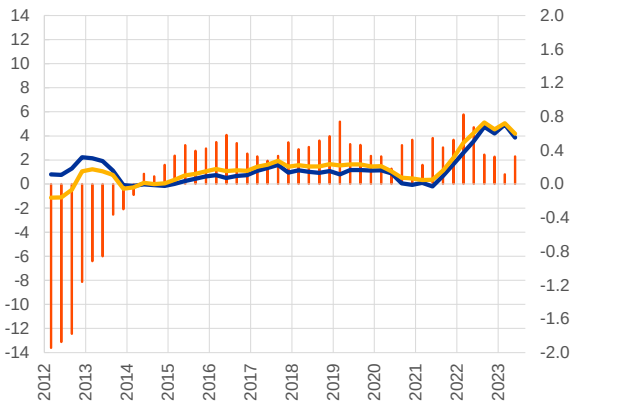
Sources: ECB calculations, Eurostat.

Chart 21
HICPX and HICPX+OOHPI

Spain

(annual percentage changes)

HICPX
HICPX+OOHPI
Difference in percentage points (right-hand scale)



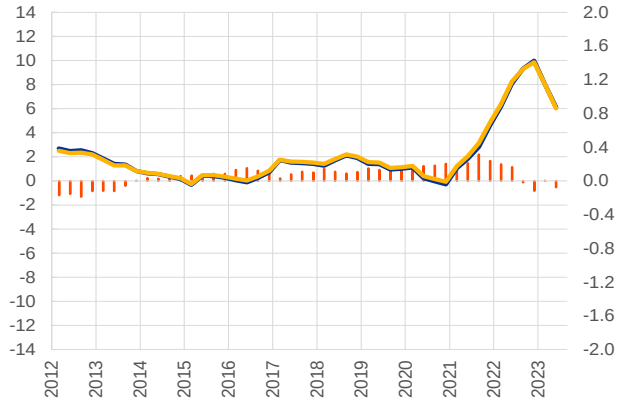
Sources: ECB calculations, Eurostat.

Chart 22
HICP and HICP+OOHPI

France

(annual percentage changes)

HICP
HICP+OOHPI
Difference in percentage points (right-hand scale)



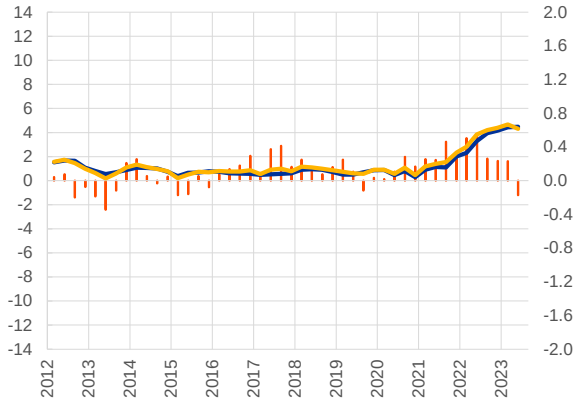
Sources: ECB calculations, Eurostat.

Chart 23
HICPX and HICPX+OOHPI

France

(annual percentage changes)

HICPX
HICPX+OOHPI
Difference in percentage points (right-hand scale)



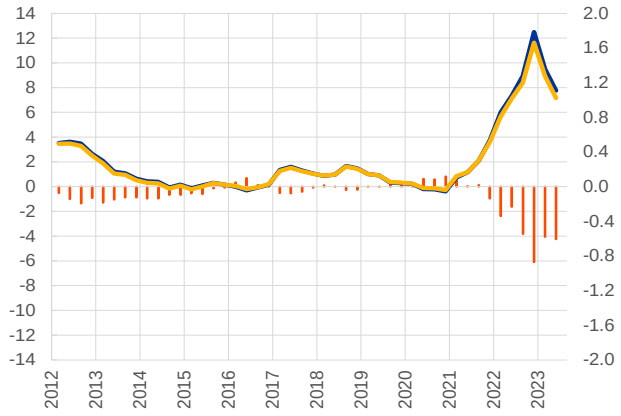
Sources: ECB calculations, Eurostat.

Chart 24
HICP and HICP+OOHPI

Italy

(annual percentage changes)

HICP
HICP+OOHPI
Difference in percentage points (right-hand scale)



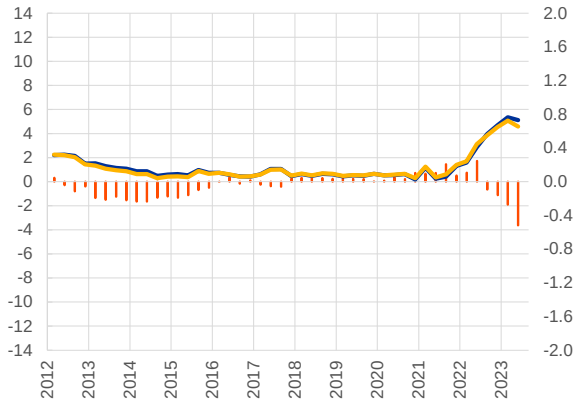
Sources: ECB calculations, Eurostat.

Chart 25
HICPX and HICPX+OOHPI

Italy

(annual percentage changes)

HICPX
HICPX+OOHPI
Difference in percentage points (right-hand scale)



Sources: ECB calculations, Eurostat.

Abbreviations

Countries

BE	Belgium	**HR**	Croatia	**PL**	Poland
BG	Bulgaria	**IT**	Italy	**PT**	Portugal
CZ	Czech Republic	**CY**	Cyprus	**RO**	Romania
DK	Denmark	**LV**	Latvia	**SI**	Slovenia
DE	Germany	**LT**	Lithuania	**SK**	Slovakia
EE	Estonia	**LU**	Luxembourg	**FI**	Finland
IE	Ireland	**HU**	Hungary	**SE**	Sweden
GR	Greece	**MT**	Malta	**UK**	United Kingdom
ES	Spain	**NL**	Netherlands	**US**	United States
FR	France	**AT**	Austria		

In accordance with EU practice, the EU Member States are listed in this report using the alphabetical order of the country names in the national languages.

Others

BIS	Bank for International Settlements	EUR	euro
CPI	Consumer Price Index	GDP	gross domestic product
DG ECFIN	Directorate General for Economic and Financial Affairs, European Commission	HICP	Harmonised Index of Consumer Prices
		i.i.p.	international investment position
ECB	European Central Bank	ILO	International Labour Organization
EDP	excessive deficit procedure	IMF	International Monetary Fund
EER	effective exchange rate	MFI	monetary financial institution
EMI	European Monetary Institute	MIP	macroeconomic imbalance procedure
EMU	Economic and Monetary Union	NCB	national central bank
ERM	exchange rate mechanism	OECD	Organisation for Economic Co-operation and Development
ESA 95	European System of Accounts 1995		
ESCB	European System of Central Banks	SSM	Single Supervisory Mechanism
ESRB	European Systemic Risk Board	TSCG	Treaty on Stability, Coordination and Governance in the Economic and Monetary Union
ESS	European Statistical System		
EU	European Union		

Conventions used in the tables

“-” data do not exist/data are not applicable
“.” data are not yet available

Acknowledgements

Martin Eiglsperger
European Central Bank, Frankfurt am Main, Germany; email: Martin.Eiglsperger@ecb.europa.eu

Ioannis Ganoulis
European Central Bank, Frankfurt am Main, Germany; email: ioannis.ganoulis@ecb.europa.eu

Bernhard Goldhammer
European Central Bank, Frankfurt am Main, Germany; email: Bernhard.Goldhammer@ecb.europa.eu

Omiros Kouvavas
European Central Bank, Frankfurt am Main, Germany; email: Omiros.Kouvavas@ecb.europa.eu

Moreno Roma
European Central Bank, Frankfurt am Main, Germany; email: moreno.roma@ecb.europa.eu

Aurelian Vlad
European Central Bank, Frankfurt am Main, Germany; email: Aurelian.Vlad@ecb.europa.eu

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

PDF ISBN 978-92-899-6564-4, ISSN 2314-9248, doi:10.2866/2395, QB-BF-24-001-EN-N