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Note on the revision of the user cost of housing indicator (UCOH)

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1 Background

This note documents the revision of the user cost of housing indicator (UCOH) in May 2022 by the JRC.B2 Housing Taxation team. Barrios et al. (2019) remains the reference paper of the database, but we slightly revised the UCOH formula to allow for more flexibility with respect to mortgage related interest rates. Section 2 describes the original UCOH formula, while section 3 introduces the revised version.

2 Original UCOH

The original version of the UCOH is given as (see Barrios et al., 2019):

$$UCOH_{orig} = [i(1 - t_M\varphi)\lambda + t_p + \beta(1 - t_y) + m + \delta - \pi(1 - t_{capgain}) + (1 - \lambda)i(1 - t_y)](1 + t_{trans}) + t_{ir} \quad (1)$$

where

- i is the interest rate paid on mortgage and also forgone on equity investment
- $(1 - t_M\varphi)$ denotes the after-tax nominal cost of debt, with t_M being the rate at which the relief is granted and φ the fraction of interest benefitting from the tax subsidy.
- λ denotes the maximum loan to value ratio to reflect the requirement of a down payment

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- t_p is the recurrent property tax rate
- β is the pre-tax risk premium term to reflect the different risk for housing relative to other (risk-free) assets
- t_y is the tax rate on interest income, i.e., the tax on risk-free saving investment.
- m is the estimated annual maintenance costs
- δ is the economic depreciation rate
- $\pi(1 - t_{capgain})$ is the after-tax revaluation term, with the tax rate on the capital gains $t_{capgain}$ and -consumer price index.
- The fraction of the house purchase that is equity-financed is $1 - \lambda$ foregoes earned interest at the unit yield of i , which is taxed at a rate t_y ;
- t_{trans} is the minimum statutory transfer tax rate.
- t_{ir} is the tax on imputed rent.

Barrios et al. (2019) discusses the different components and its intuition in depth, which is why we do not go further into detail here.

3 Revised UCOH specification

To allow for more flexibility and a more realistic representation of housing financing, we introduce a separate interest rate j , being applied to new mortgages, which is different to the rate i which expresses forgone capital income of alternative investments.¹ In particular we follow the literature (Fatica and Prammer, 2018; Himmelberg et al., 2005; Poterba and Sinai, 2008) and model the UCOH indicator, taking into account the two different interest rates by:

$$UCOH_{rev} = [(1 - \{t_M\varphi\lambda + t_y(1 - \lambda)\})i - t_M\varphi\lambda(j - i) + t_p + \beta(1 - t_y) + m + \delta - \pi(1 - t_{capgain})](1 + t_{trans}) + t_{ir} \quad (2)$$

The first part $(1 - (t_M\varphi\lambda + t_y(1 - \lambda)))i$ of equation 2 is identical to the two financing elements $i(1 - t_M\varphi)\lambda$ and $(1 - \lambda)i(1 - t_y)$, after some algebraic transformations. The new element is the interest rates differential, which is applied to the share of the property being financed via debt considering the mortgage interest deduction, $t_M\varphi\lambda(j - i)$.

¹There are many alternative ways of modelling the user cost of housing. For instance, the depreciation δ should only be applied to the value of the house, but not to its land value share (as currently modelled). However, in this revision we disregard further considerations and focus on the financing part only. The JRC.B2 Housing Taxation Database is very flexible as it provides all components separately. Any user is free to calculate an alternative UCOH based on the components.

Fatica and Prammer (2018, p. 316) argues that "the mortgage interest rates include not only the risk-adjusted required return on a housing loan, but also a premium for the refinancing and default options that the borrower buys from the lender (Campbell and Cocco, 2003). De facto, the tax system subsidizes these options, thus reducing the risk of homeownership from the borrower's perspective. Assuming that these options are fairly priced at a rate $[j]$, the extent of the subsidy is proportional to the spread on the risk-free rate. The term $t_M \varphi \lambda (j - i)$ reflects this." We follow this argument and incorporate the separate interest rates to mortgages accordingly.

4 Final remarks

From the release in May 2022 onwards, the UCOH at the JRC.B2 Housing Taxation Database is based on the revised formula according to equation 2.

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