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ARE SWEDISH HOUSE PRICES TOO HIGH?
WHY THE PRICE-TO-INCOME RATIO
IS A MISLEADING INDICATOR

Lars E.O. Svensson

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Are Swedish House Prices Too High? Why the Price-to-Income Ratio Is a Misleading Indicator
Lars E.O. Svensson
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ABSTRACT

Appropriate indicators of housing valuation are important for macroprudential policy and assessments of risks to financial stability. Overvalued housing may result in a correction and a fall in house prices. This would weaken households' balance sheets, reduce the collateral of mortgages and covered housing bonds, and could threaten financial stability.

According to ECB (2023) and European Systemic Risk Board (2022), Swedish owner-occupied housing (OOH) was overvalued by about 55% in 2021q2, the largest overvaluation in the EU and EEA; according to European Commission (2023c), by about 30% in 2022. These assessments affect warnings and recommendations issued for Swedish economic policy and the shocks in EBA stress tests of Swedish banks.

But these large overvaluation assessments are due to the use of misleading indicators: the deviations of price-to-income (PTI) and price-to-rent ratios from their historical averages. They disregard mortgage rates and other housing costs and lack scientific support. According to a large housing literature, it is not the purchase price but the user cost that is the appropriate measure of the cost of living in OOH, the cost of the housing services that the OOH delivers.

From this point of view, “Are house prices too high?” is the wrong question. The right question is, “Are user costs too high?”

New improved estimates of the user costs are constructed, including an adjustment for a preference shift during the coronavirus crisis in favor of larger and better housing. According to the user-cost-to-income (UCTI) ratio, Swedish owner-occupied houses have since 2010 instead become increasingly undervalued (not overvalued), by about 35% in 2019q4. Due to higher mortgage rates, they are less undervalued in 2023q4, but still about 25%.

For Sweden, the UCTI and PTI indicators are in fact strongly negatively correlated, with opposite signs. If the UCTI indicator is the right one, the PTI indicator is consistently wrong.

The valuation assessments of the ECB, the ESRB, the Commission, the OECD, and the IMF are scrutinized and compared. The problem of misleading indicators and overvaluation assessments—and resulting distorted warnings and recommendations—is not restricted to Sweden but concerns several other countries in the European Union.

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Contents

1	Introduction and summary	1
1.1	The price-to-income indicator	2
1.2	The user-cost-to-income indicator	3
1.3	The PTI and UCTI indicators are strongly negatively correlated	6
1.4	The user-cost-to-rent indicator	7
1.5	Absolute comparisons of user cost	8
1.6	What is new?	9
1.7	Not a model of house-price determination: The user-cost approach vs. models of house prices	11
1.8	Outline	13
2	The price-to-income and price-to-rent ratios	14
3	User cost and user cost of capital	15
3.1	Expected capital gains: A conservative assumption	17
3.2	Overoptimistic household expectations or not?	18
3.3	The components of the UCC	20
3.4	The user cost	25
4	The user-cost-to-income and user-cost-to-rent ratios	26
4.1	Positive expected real 5-year after-tax capital gains	28
5	International organizations on overvaluation of Swedish housing	28
5.1	The ECB and the ESRB	29
5.1.1	The ESRB's calculation of UCTI and UCTR ratios	30
5.1.2	The European Banking Authority EU-wide stress tests	33
5.2	The European Commission	34
5.2.1	The Commission's UCC calculation and the corresponding UCTI results	36
5.3	The OECD	38
5.3.1	Housing affordability	40
5.4	IMF	42
5.5	Model estimates: The ECB, the Commission, the Riksbank, and the National Debt Office	42
6	Conclusions	43
	Appendix	46
A	Data appendix	46
B	Cointegration and elasticities	47
C	Four-year extrapolative house-price expectations?	49
D	Capital gains on owner-occupied houses	49
E	Housing expenditures as a percentage of disposable income by tenure	51
F	Additional figures and table	53
	References	62

1 Introduction and summary

Appropriate indicators of housing valuation are important for macroprudential policy and the assessment of risks to financial stability. Overvalued housing may result in a correction and a fall in house prices. Such a fall would weaken households' balance sheets, reduce the collateral of mortgages and covered housing bonds, and possibly threaten financial stability. Appropriate housing valuation assessments are a crucial ingredient in good macroprudential policy.

Several international organizations that monitor and comment on Swedish economic policy have for many years maintained that Swedish house prices are too high and that Swedish (owner-occupied) housing thus is overvalued. The European Systemic Risk Board (ESRB)—with the help of estimates provided by the ECB—has concluded that Swedish housing was overvalued by about 55% in 2021q2 (ECB, 2023, ESRB, 2022b). This is the largest reported overvaluation in the European Economic Area (the EU as well as Iceland, Liechtenstein, and Norway). More recently, the European Commission has concluded that Swedish housing was overvalued by about 30% in 2022 (European Commission, 2023c).

These assessments of housing overvaluation affect the warnings and recommendations that these organizations issue for Swedish economic policy (European Commission, 2023c, ESRB, 2022a). They also affect the stress tests of the European Banking Authority that Swedish banks are subject to (ESRB, 2021). Because Sweden is considered having the largest overvaluation, Swedish banks are subject to more demanding stress tests than other EU banks. Nevertheless, Swedish banks have managed the tests quite well (FI, 2021).¹

This paper demonstrates that these large overvaluation assessments are mainly due to the use of unreliable and misleading indicators, more precisely, the deviation of price-to-income (PTI) and price-to-rent (PTR) ratios from their historical averages. These indicators disregard the crucial role of interest rates and other costs of owner-occupied housing. They lack any scientific support. A simple and robust indicator that has scientific support in a large housing literature is the so-called *user cost of housing*. It is the actual cost of living in owner-occupied housing and takes into account mortgage interest; the cost of housing equity; costs of operation, maintenance, repair, and depreciation; taxes; capital gains; and so on.²

From this point of view, “Are house prices too high?” is simply the wrong question. The right question is, “Are *user costs* too high?” Given this, the analysis may to a considerable extent proceed as before, but with house prices replaced by user costs.

The deviation of the user-cost-to-income (UCTI) ratio from a benchmark is a natural indicator of the valuation and affordability of owner-occupied housing. The benchmark can be a reasonable

¹ To provide serious and relevant tests of the resilience of EU banks, the tests need of course assume substantial negative shocks, including negative house-price shocks. But the results of these tests are more informative if the magnitude of these house-price shocks—and any differentiation across countries—beyond a substantial minimum size is determined in the light of *relevant* indicators instead of the deviations of PTI and PTR ratios from their historical averages.

² Boije (2019) has previously criticized the overvaluation assessments of European Commission (2019), including its disregard of the downward trend in real mortgage rates and its comparisons with rents that are subject to rent-control and differ from market rents.

fraction of disposable income, an index of the UCTI ratio set at 100 for a given base year (for example, a year at which the housing market is considered to have been neither over- nor undervalued), or a historical average. Here, the “UCTI indicator” will refer to a historical average as the benchmark. There will also be a few figures with indices somewhat arbitrarily set to 100 for 2010.³

The deviation of the user-cost-to-rent (UCTR) ratio from a benchmark is a natural indicator of the relative affordability of owner-occupied to rental housing. The benchmark can again be a reasonable ratio (for example, unity for similar owner-occupied and rental dwellings), an index set to 100 for a given base year, or a historical average. Here, the “UCTR indicator” will refer to a historical average as the benchmark, but there will also be a few figures with indices set at 100 for 2010. However, for Sweden, the UCTR ratio is less informative and need to be interpreted with special care, because the rental market is deeply dysfunctional due to rent control.

For Sweden, the UCTI and PTI indicators turn out to be strongly negatively correlated and even of opposite signs after 2014. Both can therefore not be right. If we accept that the UCTI indicator is the right one, it follows that the PTI indicator is not only irrelevant but after 2014 consistently wrong in indicating over- or undervaluation. When the PTI indicator after 2014 signals overvaluation, the UCTI indicator signals undervaluation.⁴

According to the UCTI indicator, Swedish owner-occupied houses have since 2010 become increasingly undervalued, not overvalued, with a trough in late 2019 of about -35% . Since then, taking into account a preference shift during covid toward larger and better homes as well as rising interest rates from 2022, the UCTI indicator has risen to about -25% in 2023q4, still indicating a significant undervaluation.

1.1 The price-to-income indicator

The main results of this paper can be summarized with the help of figure 1.1. The solid blue line shows the PTI indicator—the percentage deviation of the PTI ratio from its historical average, where the PTI ratio is Swedish house prices divided by disposable income per capita.⁵ The peak value is about 46% and occurs in 2022q1. According to the PTI indicator, Swedish houses were thus overvalued by almost 50% in 2022q1. The PTI indicator has since fallen to about 12% in 2023q4, still indicating overvaluation but less so.⁶

Several international organizations use the percentage deviation of the PTI ratio from a benchmark as one of the indicators of overvaluation of (owner-occupied) housing. The benchmark is

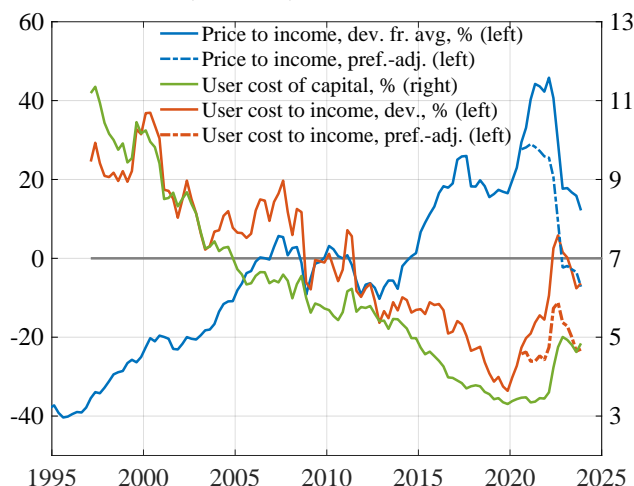
³ A historical average has the advantage than a bias in the UCTI may have little or no effect on deviations from the average. On the other hand, it has the disadvantage that real-time indicators differs from full-sample ones. This is because the real-time average varies with the sample.

⁴ The correlation coefficient for the PTI and UCTI indicators is -0.8 .

⁵ The house prices are an index of current prices of one- and two-dwelling owner-occupied houses. Disposable income is a 4-quarter trailing moving sum of quarterly net disposable income at current prices. Disposable income per capita is this sum divided by the population in the quarter. The historical average is from 1997q1 to the latest available observation. See appendix A for details.

⁶ This paper focuses on owner-occupied houses and excludes owner-occupied apartments, because the price series on houses is longer. At the end of 2021, houses formed about 70% and apartments about 30% of the value of Swedish owner-occupied housing for permanent living (Statistics Sweden, 2023a).

Figure 1.1: Price-to-income and user-cost-to-income ratios (percentage deviation from historical averages) and the user cost of capital (percent), Swedish houses.



Source and note: Own calculations. See appendix A and figure 3.7 for the underlying data. The “preference-adjustment” is explained in the text. The user cost of capital is from figure 3.6. The latest observation is 2023q4.

typically a historical average from the mid 1990s until the latest available observation.⁷

The rationale for the PTI indicator has been expressed as follows:

Another statistical indicator relates house prices to income. Similar to the house price-to-rent ratio, such indicators are generally related to their long-term average. If the ratio lies above its long-term average, prospective buyers may find purchasing a home, and servicing the associated debt, more difficult, which should reduce demand and lead to downward pressures on house prices. (ECB, 2015b)

We may note that the rationale presented is an affordability argument: A PTI ratio above its historical average would imply that houses are less affordable for prospective buyers, which should reduce demand and lead downward pressure on house prices.

1.2 The user-cost-to-income indicator

However, there is a big problem with the PTI ratio as an indicator of affordability. The price of a dwelling is not at all the same as the annual cost of owning and living in the dwelling (Himmelberg et al., 2005, Mulheirn, 2019, for example). A simple thought experiment is sufficient to prove this statement: Assume for simplicity that taxes and operation, maintenance, repair, and depreciation costs are zero. Assume also that the house price is constant so there are no capital gains or losses. Assume finally that the buyer of a house can finance the purchase with an interest-only mortgage equal to the purchase price, that is, with a zero down payment and thus a loan-to-value ratio of 100%. Then the purchase of the dwelling results in an annual interest expenditure of just the interest on the mortgage. The relevant cost and the relevant measure of affordability is in this case

⁷ ECB and ESRB use the historical averages from 1996 until the latest available observation; the European Commission from 1995 until the latest available observation.

the annual interest expenditure, not the purchase price. If the purchase price is twice as large, but the mortgage rate is half as large, the interest expenditure is unchanged.⁸

The last sentence in the quote above is thus misleading. A PTI ratio above its long-term average does not by itself imply that prospective buyers will find purchasing a home, and servicing the associated debt, more difficult.⁹

More generally, a dwelling is a durable good, an asset, which delivers a flow of services, housing services. It is the housing services that are consumed by the owner-occupier, not the dwelling.¹⁰ It is therefore important to distinguish between the purchase price of the dwelling and the annual cost of the housing services that the dwelling delivers. The latter is the annual cost of living in the dwelling, the *user cost of housing* (services) (UC). It is the user cost, by itself or relative to income or rents, that is the relevant metric for valuation assessments, not the purchase price.

For rental housing, it is obvious that it is the rent that is the cost of the housing services consumed and that the rent is the appropriate measure of the cost of living in rental housing. To assess the affordability of rental housing, it is then natural to look at the rent-to-income (RTI) ratio.

For owner-occupied housing, it should be equally obvious that it is the user cost, not the purchase price, that is the appropriate measure of the cost of living in owner-occupied housing. To assess the valuation and affordability of owner-occupied housing, it should then be equally natural to examine the user cost-to-income (UCTI) ratio.

Furthermore, the user-cost-to-rent (UCTR) ratio is a natural measure of the relative affordability of owner-occupied and rented housing. In a hypothetical perfectly functioning market for rented and owner-occupied housing without transactions costs and any differences in taxation, the UCTR ratio should be equal to unity for similar dwellings.

As explained in some detail in section 3, the (annual) user cost equals the sum of the annual operation, maintenance, repair, and depreciation (OMRD) costs; the real after-tax interest on the mortgage; the real cost of the housing equity; the taxes on the property and on imputed rental income; transactions costs; possibly a risk premium; and the negative of the real after-tax annual net capital gains on the house. Positive capital gains reduce the user cost and therefor enter with a negative sign.

The user cost can be calculated for a particular dwelling size or per square meter (sqm). It

⁸ However, the PTI ratio—preferably expressed in the years of disposable income for the average dwelling—would be an appropriate as measure of housing affordability on the island of Sark in the English Channel, on which mortgages are forbidden (Kelly, 2019). But it is not suitable as such an indicator if mortgages are available.

⁹ Interestingly, the rationale for the PTI indicator in the above quote is directly followed by a warning that the interest rate matters:

Given a strong prevalence of mortgage financing, such indicators are often transformed into “affordability” measures, which are adjusted to reflect the prevailing average interest rate on bank loans for house purchase.

The affordability ratio can be adjusted for interest rate developments in a number of ways. An interest rate variable, derived from a standard annuity formula, can be incorporated directly into the affordability ratio. (ECB, 2015b)

Unfortunately, this warning is apparently easily forgotten.

¹⁰ Conceptually, the owner-occupier combines the two roles of a landlord and renter; the owner-occupier is both a landlord owning the dwelling and renting it to herself and a renter renting from herself (for details, see Svensson, 2022b, section 4.2)). Haffner and Heylen (2011) provides a thorough conceptual discussion of the user cost.

can also be calculated as a percentage of the dwelling value. Then it can be called the *user cost of (housing) capital* (UCC). The UCC_t in quarter t is thus defined as

$$UCC_t \equiv UC_t/P_t, \quad (1.1)$$

where UC_t and P_t denote, respectively, the user cost and house price (for a given dwelling size or per sqm) in quarter t .¹¹

It follows that the UCTI ratio can be calculated as the product of the UCC and the PTI ratio,

$$UCTI_t \equiv UCC_t PTI_t, \quad (1.2)$$

where PTI_t denotes the PTI ratio in quarter t .¹² As we shall see, it is practical to first calculate the UCC and then calculate the UCTI ratio according to (1.2).

The green line in figure 1.1 shows the UCC (measured along the right axis). It falls substantially from about 11% in 1997 to a trough close to 3% in 2019. It stays down until 2022q1 and then rises to almost 5% in 2023q4. As is explained in section 3, the fall and rise of the UCC is explained by the fall and rise in mortgage rates as well as a fall and rise in the OMRD rate, the ratio of OMRD costs to house prices.

The solid red line shows the resulting UCTI indicator—the percentage deviation of the UCTI ratio from its historical average. The UCTI ratio is the product of the UCC and PTI ratio as in (1.2). We see that the large fall in the UCC dominates over the substantial rise in the PTI ratio. This makes the UCTI ratio fall from about 25% *above* its historical average in 1997 to a trough of about 30% *below* its historical average in 2019q4. It then rises to about 6% below the historical average in 2023q4.¹³

Thus, according to the UCTI indicator, Swedish houses were *undervalued* by about 35% in 2019q4, not overvalued by about 17% as suggested by the PTI indicator. Furthermore, by the UCTI indicator, in 2023q4 Swedish houses were undervalued by about 6%, not overvalued by about 16% as suggested by the PTI indicator.

However, figure 1.1 shows that the PTI ratio rose particularly fast during the coronavirus crisis in 2020 and 2021. A similar development can be seen in several comparable countries. As discussed further in section 2, this price rise is best explained by a household preference shift in favor of larger and better homes, due to widespread working from home. That is, this price rise is consistent with fundamental factors and is not by itself any indication of overvaluation (Sveriges Riksbank, 2021).

Given this, for the purpose of assessing over- or undervaluation of housing over time, one may want to use “preference-adjusted” house prices and user costs, corresponding to approximately unchanged preferences. The dash-dotted blue line in figure 1.1 shows the percentage deviation from

¹¹ What is called the “user cost of capital” in this paper is called the “user cost” or “user cost of (owner-occupied) housing” in some papers, and what is called the “user cost” in this paper may be called the “price of housing services,” the “imputed rent,” the “rental price of housing services” (Poterba, 1984), or the “imputed rental price” (Prescott, 1997). It is often denoted by R_t or R_t^H .

¹² Given the identity (1.1), (1.2) is also an identity.

¹³ The historical average of the UCTI ratio is from 1997q1 to the latest observation, because the mortgage rates used are only available from 1997q1.

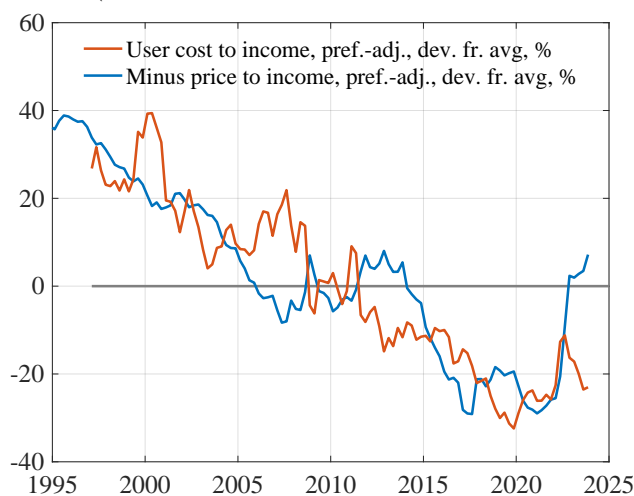
the historical average of a PTI ratio for preference-adjusted housing prices. The simple assumption is that 75% of the price increases during 2020q2–2022q1 were due to the preference shift, so the preference-adjusted house prices are simply the observed house prices less those price increases.

The dash-dotted red line shows the corresponding preference-adjusted UCTI indicator, the UCTI ratio’s deviation from its historical average. It stays down in 2021 well below the historical average and thereafter rises to about 25% below the historical average in 2023q4.

1.3 The PTI and UCTI indicators are strongly negatively correlated

Furthermore, in figure 1.1, the preference-adjusted PTI and UCTI indicators appear to be approximately the mirror image of each other. This is confirmed in figure 1.2, where the PTI indicator is replaced by its negative. That is, the *negative* of the preference-adjusted PTI indicator gives essentially the same message about over- and undervaluation in Sweden as the preference-adjusted UCTI indicator. The correlation coefficient between the preference-adjusted PTI and UCTI indicators is -0.8 . If we accept that the UCTI indicator is the relevant indicator, it follows that for Sweden the PTI indicator is not only irrelevant but after 2014 consistently wrong. This is a pretty devastating result for the PTI ratio as an indicator of over- and undervaluation. Taking the average of the two indicators is not a good idea.¹⁴

Figure 1.2: The preference-adjusted user-cost-to-income ratio and the negative of the preference-adjusted price-to-income ratio (percentage deviation from historical averages).



Source and note: The deviation from historical averages of the preference-adjusted UCTI and PTI ratios, the latter with opposite sign, from figure 1.1. The correlation coefficient is then 0.8. The latest observation is 2023q4.

In summary, the PTI and UCTI indicators deliver opposite messages about housing valuation. According to the preference-adjusted PTI indicator (adjusted from 2020q2), Swedish houses were undervalued by about 35% in 1997, neither over- nor undervalued in 2010, overvalued by about 26%

¹⁴ Appendix B provides some cointegration analysis of the logs of the UCC and preference-adjusted house prices and PTI and UCTI ratios. The hypothesis of no cointegration for the log UCC and preference-adjusted PTI ratio is rejected at a significance value of close to 1%, with a p-value of 1.3%. A linear relation between the demeaned logs of the preference-adjusted log PTI and UCTI ratios is estimated to be $\log \text{PTI} = -0.93 \log \text{UCTI} + \varepsilon_t$, consistent with figure 1.2.

in 2021q4, and undervalued by 7% in 2023q4.

According to the preference-adjusted UCTI indicator, Swedish houses were *overvalued* by about 25% in 1997, neither over- nor undervalued in 2010, *undervalued* by about 25% in 2021q4, and still *undervalued* by about 25% in 2023q4 (see table 1.1 for details).

Table 1.1: Price-price-to-income and user-cost-to-income ratios. Preference-adjusted, percentage deviations from historical means, and percentage-point differences.

	PTI	UCTI	PTI–UCTI
1997	–34%	+25%	–59 pp
2010	+1%	–2%	+4 pp
2019q4	+17%	–34%	+50 pp
2021q4	+26%	–26%	+52 pp
2023q4	–7%	–23%	+16 pp

Source and note: Figure 1.1, preference-adjusted (during 2020q2–2021q1) PTI and UCTI deviations from historical means.

The reason for these different messages is that the PTI indicator ignores movements in the UCC, but these movements are large and negatively correlated with the PTI ratio. This makes the UCTI and PTI indicators negatively correlated in figures 1.1 and 1.2. The international organizations mentioned prefer a valuation indicator that—at least for Sweden—is strongly negatively correlated with the more relevant indicator, the indicator that has scientific support in a large housing literature.¹⁵

1.4 The user-cost-to-rent indicator

The international organizations also use the percentage deviation of the price-to-rent (PTR) ratio from a historical average as another indicator of overvaluation. The rationale for the PTR indicator is similar to that of the PTI indicator:

[The price-to-rent indicator] relates house prices to rents based on an arbitrage assumption. Accordingly, if house prices rise beyond what is justified by fundamentals then households will postpone purchasing a house and rent instead, thereby producing downward pressure on house prices. The validity of this assumption rests on households having a viable alternative in the rental market. (ECB, 2015b)

The PTR indicator is subject to the same problem as mentioned above for the PTI indicator, namely, that the price of a dwelling is not at all the same as the annual cost of owning and living in the dwelling. The same simple thought experiment as above applies. Instead, the user-cost-to-rent ratio and its deviation from a historical average are the appropriate indicators.

In a similar way to the UCTI ratio, it is practical to calculate the UCTR ratio as the product of the UCC and the PTR ratio,

$$\text{UCTR}_t \equiv \text{UCC}_t \text{PTR}_t. \quad (1.3)$$

Importantly, the UCTR ratio is an appropriate indicator only with a well-functioning rental market, so some arbitrage between renting and owning is practically possible. In a well-functioning

¹⁵ See footnote 31 for references to this literature.

market for rented and owner-occupied housing with moderate transactions costs and differences in taxation, the UCTR ratio should not deviate too much from unity for similar dwellings.¹⁶

However, Sweden has a dysfunctional rental market for apartments due to rent control, with regulated rents substantially below market rents. Queuing time to get a rent-controlled apartment in the major cities is often ten years or more. Furthermore, there is no functioning rental market for houses.¹⁷ The UCTR ratio is therefore hardly an appropriate indicator of over- or undervaluation of owner-occupied housing in Sweden. It is briefly discussed in section 4.^{18 19}

In 2006, a reform of the Swedish rent-control system was implemented to stimulate the construction of new rental housing. It had been rather limited after the dismantling of construction subsidies in 1990. The reform consisted of introducing a special option for new rental housing, namely, to negotiate and set rents before the construction start. These rents were “presumed” to be exempt for fifteen years from the standard rent-control of the existing housing stock. They are therefore called “presumption rents” (Lind, 2021). As a result, rents in newly constructed buildings are set at a substantially higher level than rent-controlled rents. The presumption rents are arguably close to free-market levels. They may thus be used as indicators of market rents as distinct from rent-controlled rents. Therefore, UCTR ratios for presumption rents can arguably be used for assessing valuation of owner-occupied housing, although only a small minority of rented housing has presumption rents.

In practice, Swedish presumption rents have increased over time in line with per capita disposable income (figure F.2, p. 53) so the deviation from a historical average of the UCTR ratio for presumption rents looks rather similar and provides similar information as the UCTI ratio.

1.5 Absolute comparisons of user cost

The house price used in this paper is only available in index form. With more specific data, over- and undervaluation can be determined with more precision. Suppose there is data available so that

¹⁶ The equality of the user cost and the rent for similar dwellings is the rationale for the method of Owner Equivalent Rents (OER)—also called the rental-equivalence method. It uses observed rents on similar rented dwellings as an estimate of the user cost of owner-occupied housing in national accounts and consumer price indices (BLS, 2024). However, we can see in figure 4.3, p. 27, that there can be a substantial difference between rents and user costs, due to inertia, frictions, rent control, and other imperfections in the housing market. This means that the OER method can be quite misleading.

¹⁷ Buy-to-let for houses is very rare or non-existing in Sweden. Buy-to-let for apartments is quite rare, because tenant-owner associations normally restrict subletting. Tenant-ownership is the dominant type of ownership for Swedish owner-occupied apartments.

¹⁸ There is no rental market to speak of for houses, only owner occupation (including some tenant-ownership also of houses). Therefore, the calculation of UCTR ratios here use rents of rental apartments in apartment buildings.

¹⁹ The rationale in quoted above for the PTR indicator is directly followed by several warnings:

The validity of this assumption rests on households having a viable alternative in the rental market. The extent to which this holds differs across euro area countries and largely depends on the scale and composition of national rental and owner-occupied markets. . . . Further complicating this, rents may not always be set at market rates given considerable regulation of the sector. Last but not least, the house price-to-rent indicator typically assumes a constant long-term average, but there may be important structural breaks arising from policy changes. For these reasons, the house price-to-rent indicator, although commonly used as a benchmark for house price valuation, may not be a reliable metric for assessing valuations in some euro area countries. (ECB, 2015b)

Again, these warnings seem to be easily forgotten.

the user cost can be calculated in SEK for a specific type of owner-occupied dwelling of a given quality. Suppose that there is also data on the rent in SEK on rented dwellings of the same type and quality. Then we can say that the owner-occupied dwelling is over- or undervalued depending on whether the user cost is lower or higher, respectively, than the rent. This is a case when it is possible to make absolute comparisons of the user cost and rent for similar dwellings. It is also possible to express UCTI ratios as percentages of income, providing in this sense absolute measures of affordability.

[Flam \(2016\)](#) provides such an absolute comparison. For 2000–2015, he compared OOH user costs (excluding capital gains) per square meter to presumption rents in Stockholm’s inner city, the hottest housing market in Sweden. He found that presumption rents exceeded the user cost and concluded that there was no indication of overvaluation even in this hot market.

[Svensson \(2020, figure 10\)](#) shows that the monthly user cost for an owner-occupied average studio (an apartment with a single multipurpose room) in Stockholm Municipality 2017 was substantially lower than the monthly rent for a similar rent-controlled apartment: SEK 2,800 vs. SEK 5,300, respectively (about EUR 280 vs. EUR 530 at the time). Furthermore, the queue to get a rent-controlled apartment was about 10 years, and the free-market rent for a secondary rental would be double the rent-controlled rent or more.²⁰ Another example is presented in [Flam \(2016\)](#).

1.6 What is new?

Even though there is a large literature on various aspects of user costs (see footnote 31 for references), I believe that a few things are special or new in this paper:

1. The starting point is that, in the present context, “Are house prices too high?” is the wrong question. The right question is, “Are user costs too high?” Then the analysis can to a considerable extent proceed as before, but with house prices replaced by user costs.
2. The UCTI ratio relative to its historical average is used as a main indicator of overvaluation.²¹
3. It is shown that the PTI and UCTI indicators are strongly negatively correlated, at least for Sweden. Thus, they cannot both be right.
4. The comparison between the PTI, PTR, UCTI, and UCTR ratios is undertaken in a few informative figures. The reasons why the PTI and PTR ratios are misleading are clearly demonstrated in these figures.
5. A simple and transparent method is used to adjust for the household preference shift during the coronavirus crisis in favor of larger and better homes.
6. There are no regular time-series data on Swedish households’ expectations of future house-price appreciation and thus of expected capital gains. Actual real 5-year after-tax capital gains have been mostly positive, with zero being an approximate lower bound. I make the conservative assumption that expected real after-tax capital gains equal this lower bound. This assumption

²⁰ The user cost is lower despite excluding substantial positive real after-tax capital gains.

²¹ Only a few papers ([Office of Policy Development and Research, 2000](#), [Birch Sørensen, 2013](#), [Dermani et al., 2016](#), [Svensson, 2019, 2020](#)) have to my knowledge emphasized the role of the user-cost-to-*income* ratio rather than the user-cost-to-rent ratio or the level of the user cost as an indicator of affordability or overvaluation.

is conservative because it underestimates the expected capital gains and overestimates the user cost. It causes a bias toward higher user costs. This in turn introduces a bias toward higher UCTI and UCTR ratios and thereby toward overvaluation, thus stacking the cards in favor of finding overvaluation. Since I will reject the hypothesis of overvaluation after 2010, a bias in favor overvaluation is an advantage and makes the rejection stronger. When overvaluation is measured by the deviations of UCTI and UCTR ratios from their historical averages, there may be less or no bias, because the historical averages are also higher.²²

7. I examine whether or not households have overoptimistic expectations of low future mortgage rates or not. From data on households' mortgage expectations, I construct the expected 5-year average of future short mortgage rates and compare that to mortgage lenders' 5-year mortgage rates. Households expect significantly higher average rates than lenders' 5-year rate. Thus, they do not have overoptimistic expectations.
8. There exist data of households' expectations of 5-year nominal house-price appreciation for a few data points for 2014–2019 and 2022. I use this data to assess whether households have overoptimistic house-price expectation. The expectations are stable, about 5%, and close to the average rate of actual 5-year house-price appreciation. Thus, they are realistic and not overoptimistic. There are large fluctuations in the actual 5-year house-price appreciation. But there is no indication of any extrapolation of past appreciation, counter to what is reported for US house-price expectations (Kuchler et al., 2022). Muellbauer (2012) and Duca et al. (2021a) have argued that households' expectations are strongly influenced by the house-price appreciation the last four years. But there is no indication of this in these Swedish data. Such expectations have large forecast errors, much larger than a simple constant expectations of 5%.
9. As a robustness test the user cost and UCTI ratio is calculated with positive expected real after-tax capital gains. Then the undervaluation after 2010 is larger, confirming the bias toward overvaluation of the conservative assumption.
10. I use National Accounts data for operation, maintenance, and repair (OMR) costs and consider that OMR concerns the structures but not the land (following Hansson, 2019). The share of land in house prices has increased substantially in Sweden. This is handled by weighing these costs and the depreciation with the share of structures in the value of housing. I go beyond Hansson in looking at UCTI ratios rather than just user costs and in relying explicitly on the methods of Statistics Sweden and the US Bureau of Economic Analysis to calculate the depreciation of owner-occupied housing (Svensson, 2022a). It is shown that the common practice of assuming a constant rate of OMR and depreciation is quite misleading for Sweden.
11. An essential part of the paper is a comparison with the valuation results for Sweden of the ECB, the ESRB, the European Commission, the OECD, and the IMF. The valuation results of the ECB, ESRB, and the Commission to a large extent rely on the PTI and PTR indicators.

²² As further discussed in section 3.1, the assumption of zero expected real capital gains is frequently used. It has somewhat surprisingly performed well on US data, in the sense that, with this assumption, Garner and Verbrugge (2009b) found that the resulting user costs tracked market rents rather well, when they did not for other assumptions.

To that extent, they are essentially misleading and negatively correlated with the results of this paper. However, the Commission’s own Housing Taxation Database reports a UCC for Sweden ([Grünberger et al., 2023](#)). When this UCC is used, the UCTI results are similar to the results of this paper. The ESRB and the Commission could generally improve their valuation assessments by using the UCTI and UCTR indicators instead of the PTI and PTR ratios. This way they could provide more relevant warnings and recommendations regarding real-estate vulnerabilities as well as better justifications for EBA stress tests. The OECD and the IMF do not maintain that Swedish housing is overvalued. The OECD has done substantial work on housing affordability and uses a set of reasonable affordability measures.

1.7 Not a model of house-price determination: The user-cost approach vs. models of house prices

A comment that I have received on this paper is that one *must* have a structural model of house-price determination to assess over- and undervaluation of housing. I obviously disagree. I consider it an advantage to have several approaches and indicators of valuation, including model approaches and the user-cost approach of this paper. Ideally, they should be ranked and weighted by their reliability and usability.

The user-cost approach used in this paper is a method to assess housing valuation in terms of the cost of living in OOH relative to household incomes or to rents on similar available rental housing. It is not a theory of house-price determination, of how house prices depend on fundamental determinants. The user cost is calculated for given house prices and other relevant variables.

The general idea of the paper is to use affordability of OOH as a reverse indicator of overvaluation. If affordability is high, then there is no overvaluation. In simple terms, “if it is relatively inexpensive to live in OOH, then the housing is not overvalued; then house prices are not too high.” As a measure of affordability, I use the most appropriate measure of the cost of living in OOH, the user cost of housing (UC) of a unit of housing.

As mentioned, I make the conservative assumption of setting (real 5-year after-tax) capital gains equal to their approximate lower bound, which in this case is zero. Then the simple term can be expressed, “if it is relatively inexpensive to live in OOH, *even when any capital gains are disregarded*, then the housing is not overvalued.”

The affordability-based definition of valuation is intuitive, simple, and commonsense. If it is quite inexpensive to live in OOH relative to income or to alternative housing, could house prices be too high? Should it be even more inexpensive to live in OOH? The UC approach also allows very granular analysis of locations and type of dwelling down to the unit level, as demonstrated by [Flam \(2016\)](#) and [Svensson \(2020\)](#). It is very flexible. The assumptions are transparent and can be adapted to the situation in focus.

Recent papers with models of house-prices that discuss overvaluation in Sweden include [Englund \(2011\)](#), [Claussen \(2013\)](#), [Turk \(2015\)](#), [Dermani et al. \(2016\)](#), [Bjellerup and Majtorp \(2019\)](#), [Bergman and Birch Sørensen \(2021\)](#), and [Anundsen \(2021\)](#). They use different models and maintained assumptions to discuss deviations of house prices from predicted prices or long-run equilibrium prices,

“fundamental prices”. The lack of a well-functioning rental market and data on market rents in Sweden is a problem. Some assume that user costs are equal or proportional to rent-controlled rents. The results about overvaluation are quite different. [Englund \(2011\)](#), [Claussen \(2013\)](#), [Dermani et al. \(2016\)](#), and [Bjellerup and Majtorp \(2019\)](#) find that house prices are well explained by fundamentals with no or small over- or undervaluation. [Turk \(2015\)](#) and [Anundsen \(2021\)](#) finds modest overvaluation, and [Bergman and Birch Sørensen \(2021\)](#) find a substantial overvaluation of 37% in 2019q4.²³

[Claussen \(2013\)](#) uses an error-correction model (ECM) to discuss overvaluation (overpricing). Within an ECM, one can make a distinction between a long-run equilibrium price (the “fundamental price”), a short-run equilibrium price (the fitted price, the price predicted by the model and lagged realizations of the explanatory variables), and the actual price. He then notes that the definition of overvaluation is not obvious and considers four alternative definitions:

- (1) The actual price is above the long-run equilibrium price.
- (2) The actual price is above the short-run equilibrium price.
- (3) The actual price is above a dynamic forecast of the model (a forecast in which lagged predicted house prices are used instead of lagged realized house prices).
- (4) The price is predicted by the model to fall substantially in the near future, for reasonable assumptions about the developments of the explanatory variables.

After a thorough estimation and examination, [Claussen](#) concludes that, for his ECM, there is no indication of overvaluation in 2011q3 (his last observation) according to any of the four definitions of overvaluation.

Importantly, [Claussen](#) concludes that definition (1)—the actual house price above the long-run equilibrium price—is *not* useful. This is due to the latter’s high volatility and sensitivity to the explanatory variables. The long-run equilibrium price is more volatile than both the actual and short-run equilibrium price. This definition is nevertheless quite commonly used.

There is thus a multiplicity of models and results, and it is difficult to scrutinize and verify the models, their maintained assumptions, and their results. Compared to this, the user-cost approach in this paper may seem quite simple, direct, robust, transparent, and attractive. And it asks the right question, “Are user costs too high?”

The user-cost approach is sometimes used as a simple house-price theory, by assuming that the user cost is always equal to rents—often referred to as the “rent arbitrage” or “asset pricing” theory of house prices. Alternatively, the UCTI ratio can be assumed to be exogenous or even constant.²⁴ These simple theories for frictionless and perfect housing markets theory are rejected in this paper

²³ [Bergman and Birch Sørensen \(2021\)](#) use the approach of [Hott and Monnin \(2008\)](#), derive the fundamental price as the present value of future imputed rents (user costs), and assume that households’ rational expectations can be represented by an estimated VAR. I interpret the paper as mainly a demonstration of a general model of estimating fundamental house prices rather than a thorough empirical study of overvaluation in Sweden, because some maintained hypotheses are questionable: For example, in addition to the VAR assumption, they set imputed rents equal to rent-controlled rents. They also estimate of the stock of housing by cumulating the time series for gross fixed housing capital formation on the assumption that the depreciation rate is constant. It seems more relevant to use a time series of the number of units available from Statistics Sweden.

²⁴ In a model with Cobb-Douglas preferences for housing services and fixed supply of housing, user-cost-to-consumption ratio will be constant, and with a relatively stable saving ratio, the UCTI ratio will be relatively stable ([Svensson, 2022b](#))

by the simple observation that user costs differ from rents for long periods and that UCTI ratios are far from constant. House prices do not adjust sufficiently fast to keep the UCTI or UCTR ratios constant. Put differently, a good theory of housing prices should explain why and how user costs deviate from rents and why UCTI ratios fluctuate. Such a theory needs to take into account the supply of housing, the liquidity and credit constraints facing households, the role of housing cash payments for liquidity-constrained households as distinct from user costs, and other frictions and imperfections in the housing and mortgage markets (Greenwald, 2018, Bäckman and Khorunzhina, 2023, Svensson, 2019, Mølbak Ingholt, 2022).²⁵

1.8 Outline

The rest of the paper is organized as follows: Section 2 discusses the PTI and PTR indicators and reports what overvaluation they would indicate. Section 3 defines the user cost of housing and the user cost of capital (UCC), which is the user cost divided by price of the dwelling in SEK (or the local currency in another country in focus). It also calculates the UCC and displays its components. Section 4 discusses the UCTI and UCTR ratios and their implication for any overvaluation of Swedish housing, taking into account the household preference shift. Section 5 scrutinizes the calculations of and comments on Swedish housing overvaluation by the ECB and the ESRB, the European Commission, the OECD, and the IMF. It also briefly compares the ECB and Commission model results with those of the staff of the Riksbank and of the National Debt Office. Section 6 concludes.

The companion note Svensson (2022b) and a few appendices present a theoretical background and some details. With a simple frictionless theoretical model, the companion note shows with a simple rewriting of an owner-occupying household's budget constraint why the user cost is the appropriate measure of the cost of living in owner-occupied housing. Furthermore, with Cobb-Douglas preferences, the frictionless equilibrium UCTI ratio may be quite stable over time and therefore a reasonable benchmark. Appendix A lists the data used. Appendix B provides some cointegration analysis of the logs of the UCC and preference-adjusted house prices and PTI and UCTI ratios. Appendix C assesses the performance of house-price appreciation forecast given by the 4-year memory that Muellbauer (2012) and Duca et al. (2021a, section 4.3) have emphasized. Appendix D reports the actual capital gains on owner-occupied houses. Appendix E reports data on housing-expenditure-to-income ratios by tenure. Appendix F includes additional figures.

²⁵ Duca et al. (2021a,b) have criticized the simple rent-arbitrage (asset-price) theory for being misleading, inconsistent with empirical estimates, and not taking into account inertia, frictions and other imperfections in housing and mortgage markets. These include that fact that rented apartments are imperfect substitutes to houses with more land per occupant, rents are stickier and less cyclical than house prices, different characteristics of renters and owner-occupiers, unobserved costs and benefits of owning versus renting, and the combination of large transactions costs, risk aversion, and house-price volatility making it difficult to arbitrage between renting and buying. Furthermore, credit constraints and entry barriers in the form of affordability tests; limits on debt-service-to-income, loan-to-income and loan-to-value ratios imposed by lenders and macroprudential authorities restrict the demand for owner-occupied housing.

2 The price-to-income and price-to-rent ratios

The *price-to-income* (PTI) and *price-to-rent* (PTR) ratios are defined as $PTI_t \equiv P_t/DI_t$ and $PTR_t \equiv P_t/R_t$. Here, P_t denotes the price of a dwelling of standardized size (or per sqm) in period t , DI_t denotes net disposable income per capita, and R_t denotes rents.²⁶ Figure F.1 shows Swedish house prices, disposable income, disposable income per capita, rents, presumption rents, and population.

For house prices, the longest available series is a quarterly price index for one- and two-dwelling houses for permanent living provided by [Statistics Sweden \(2024f\)](#). It excludes apartments. It is also reported with a lag of 2–3 months because it uses the date of the deed rather than the earlier date of the contract. From 2005 a monthly index, the HOX index, is provided for houses and apartments by [Valueguard \(2024\)](#). Figure F.19 shows the different price indices.²⁷ I use a linked quarterly price index consisting of the Statistics Sweden price index up to 2005q1 and a quarterly mean of the HOX index from 2005q1 (figure F.7).

Figure 2.1: Price-to-income and price-to-rent ratios. Index 2010 = 100.

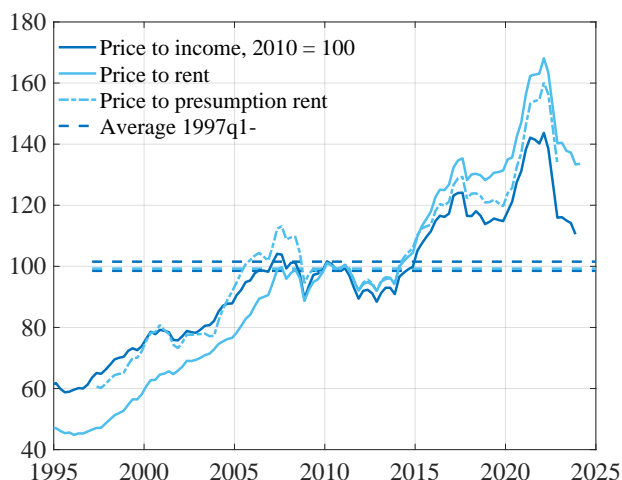
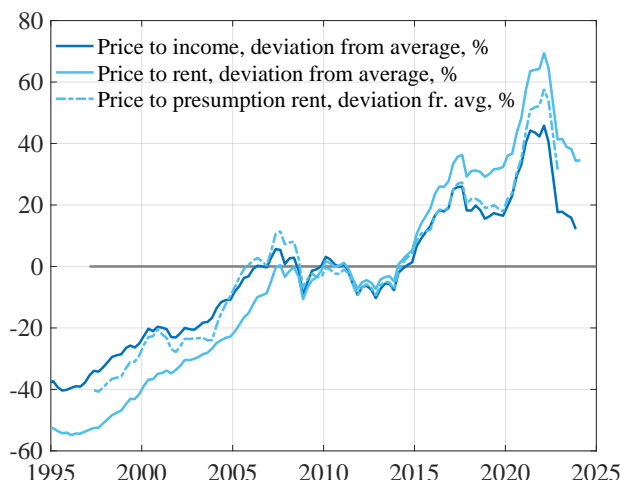


Figure 2.2: Price-to-income and price-to-rent ratios. Deviation from historical average.



Source and note: [Statistics Sweden \(2024d,f\)](#), [Valueguard \(2024\)](#), and own calculations. Income is disposable income per capita. Presumption rents are rents in newly constructed buildings exempt from rent control.

Figure 2.1 shows the PTI and PTR ratios and their averages during 1997q1–2023q4. Figure 2.2 shows their percentage deviations from their averages. According to the PTI indicator, Swedish houses were overvalued by 46% in 2022q1 and 12% in 2023q4.²⁸ According to the PTR indicator, they were overvalued by 70% in 2022q1 and by 35% in 2023q4. For presumption rents, the PTR ratio is similar to the PTI ratio and thus indicates a similar degree of overvaluation as the PTI ratio.

²⁶ There is a choice between using disposable income or disposable income per capita, and between gross and net disposable income (the latter is net of the depreciation of households' fixed capital). Here I use net disposable income per capita. International organizations often use gross in international comparisons, because countries calculate fixed-capital depreciation differently. Figure F.10 shows that for Sweden the difference between gross and net disposable income is small.

²⁷ [SBAB Booli \(2024\)](#) has a monthly price index for apartments and houses from 2013.

²⁸ In contrast, [ESRB \(2022b, table 1, Scoreboard\)](#), reproduced as figure F.28, reports that the PTI ratio in 2021q2 exceeds its average during 1996q1–2021q2 by no less than 66%, a number difficult to explain (section 5.1).

In this paper, variables are expressed as percentage deviations from historical averages or indexed to 100 for the base year 2010. The former have the advantage that they do not depend on the indexation base year. They do have the disadvantage that there is a (decreasing) difference between full-sample and real-time estimates.²⁹

3 User cost and user cost of capital

The (annual) *user cost of housing* (services) can be defined as the annual cost of buying a dwelling at the beginning of a year; paying operating, maintenance, and depreciation costs as well as taxes during the year; and selling the dwelling at the end of the year, paying any capital-gains tax at the end of the year.³⁰ More precisely, a simple version of the user cost of housing (UC) equals the sum of the operating, maintenance, repair, and depreciation costs (OMRD), the real after-tax mortgage interest, the real cost of housing equity, property taxes, possibly a risk premium, and the negative of the (expected or realized) real after-tax capital gains.³¹

The note [Svensson \(2022b\)](#) presents a simple frictionless model that explains why the user cost is the appropriate measure of the cost of owner-occupied housing. It also explains why the UCTI and UCTR ratios rather than the PTI and PTR ratios are appropriate indicator of overvaluation. In particular, the model shows that, for an economy with households that have Cobb-Douglas preferences, the equilibrium UCTI ratio is likely to be approximately constant whereas the equilibrium PTI and PTR ratios are not.

The user cost can be calculated for a particular dwelling size or per square meter. It can also be calculated per SEK dwelling value and expressed as percentage of the house price. Then it can be called the *user cost of (housing) capital* (UCC) and is given by

$$UCC_t \equiv UC_t/P_t, \quad (1.1 \text{ repeated})$$

where UC_t denotes the (annual) user cost in quarter t and P_t denotes the house price.

It is often practical to first calculate the UCC, and then calculate the user cost as

$$UC_t = UCC_t P_t. \quad (3.1)$$

The user-cost-to-income (UCTI) and user-cost-to-rent (UCTR) ratios are defined as $UCTI_t \equiv UC_t/DI_t$ and $UCTR_t \equiv UC_t/R_t$, respectively. Given the UCC and the PTI and PTR ratios, the

²⁹ The historical average moves with the recent deviation from it. One could consider real-time deviations from a historical average or from the average over a moving constant-length window. See figure [F.5](#) for the PTI deviation from a real-time historical average. See figure [F.6](#) for the real-time and full-sample deviations of the adjusted UCTI ratio. The difference between the real-time estimates and the full-sample estimates is decreasing over time but substantial early in the sample.

³⁰ Annual average transactions cost associated with the purchase and sale of the dwelling over a typical ownership period can be added. The fraction of houses sold each year is about 3%, so an approximate duration of home ownership is about 33 years ([Statistics Sweden, 2024e,h](#)).

³¹ The user cost of housing is discussed by, for example, [Dougherty and Van Order \(1982\)](#), [Poterba \(1984\)](#), [Prescott \(1997\)](#), [Office of Policy Development and Research \(2000\)](#), [Meen \(2001\)](#), [Himmelberg et al. \(2005\)](#), [Poterba and Sinai \(2008\)](#), [Díaz and Luengo-Prado \(2008\)](#), [Verbrugge \(2008\)](#), [Garner and Verbrugge \(2009a,b\)](#), [Englund \(2011, 2020\)](#), [Haffner and Heylen \(2011\)](#), [Muellbauer \(2012\)](#), [Diewert \(2013, appendix\)](#), [Fox and Tulip \(2014\)](#), [Duca et al. \(2016, 2021a,b\)](#), [Hansson \(2019\)](#), [Mulheirn \(2019\)](#), and [Svensson \(2019, 2020, 2022b\)](#).

UCTI and UCTR ratios can then conveniently be calculated as

$$\text{UCTI}_t \equiv \text{UCC}_t \text{PTI}_t, \quad (1.2 \text{ repeated})$$

$$\text{UCTR}_t \equiv \text{UCC}_t \text{PTR}_t. \quad (1.3 \text{ repeated})$$

Here, (1.2) and (1.3) (and (3.1)) are actually identities, given the definitions of each variable in them.

Following [Poterba \(1984\)](#), [Poterba and Sinai \(2008\)](#), and [Barrios et al. \(2019\)](#), the UCC can be written as

$$\text{UCC}_t = [\text{LTV}_t(1 - \tau_t^M)i_t + (1 - \text{LTV}_t)(1 - \tau_t^{ci})i_t^{eq}] + m_t + \tau_t^p + \rho_t - (1 - \tau_t^{cg})\pi_t^{he}. \quad (3.2)$$

Here, the term in square brackets is the nominal after-tax *financing cost*. The first term within the squared brackets is the LTV-weighted after-tax nominal mortgage rate. The second term is the housing-equity-to-value-weighted after-tax nominal cost of housing equity. The before-tax mortgage rate, i_t , may differ from the before-tax cost of housing equity, i_t^{eq} , as may the rates of mortgage tax relief, τ_t^M , and capital-income tax, τ_t^{ci} .³²

The variable $m_t = \text{OMRD}_t/P_t$ (the OMRD rate) denotes the ratio of the operation, maintenance, repair, and depreciation costs to the house price; τ_t^p denotes the property tax rate; and ρ_t denotes a risk premium, representing that housing ownership may be perceived to be risky relative to a safe alternative investment.³³

Finally, the last term in (3.2) is the negative of the expected rate of nominal after-tax capital gains. Here, π_t^{he} denotes the expectations held in quarter t of the rate of future nominal house-price appreciation, and τ_t^{cg} denotes the nominal capital-gains tax rate.³⁴ The expected nominal after-tax capital gains reduce the user cost and therefore enter with a negative sign in the UCC.

Let the variable π_t^e denote the homeowner's (not necessarily rational) expectations in quarter t of the rate of future CPI inflation. Following [Svensson \(2019, 2020\)](#) by subtracting and adding this term in (3.2), the UCC can be written as

$$\text{UCC}_t = r_t + m_t + \tau_t^p + \rho_t - [(1 - \tau_t^{cg})\pi_t^{he} - \pi_t^e], \quad (3.3)$$

where

$$r_t = \text{LTV}_t(1 - \tau_t^M)i_t + (1 - \text{LTV}_t)(1 - \tau_t^{ci})i_t^{eq} - \pi_t^e. \quad (3.4)$$

denotes the *real* after-tax financing cost. The term in square brackets in (3.3) is the expected rate of *real* after-tax capital gains.

To take into account to some extent that house purchases are longer-run decision, I will use a 5-year horizon with a 5-year mortgage rate and 5-year expectations of inflation and capital gains.

³² The financing cost can obviously be extended to include the cost of unsecured loans that finance deposits, the return on a diversified portfolio of financial assets as the cost of housing equity, and so on.

³³ Any tax on imputed rental income should be added. Sweden had such a tax before 1991 ([Englund, 2020](#)).

³⁴ According to [Barrios et al. \(2019\)](#), only Cyprus and Sweden have such a capital-gains tax in the EU.

3.1 Expected capital gains: A conservative assumption

With data on households' expectations of 5-year house-price appreciation, it would be natural to use that data in the calculations, including a crucial assessment of whether the expectations are reasonably realistic or over- or under-optimistic. Unfortunately, regular monthly or quarterly data of Swedish households' expectations of house-price appreciation is not available.

The actual real 5-year after-tax capital gains are shown in figure D.2. We see that the real after-tax capital gains are mostly positive, with zero as an approximate lower bound. I make the conservative assumption of setting the expected real after-tax capital gains, the bracketed term in (3.3), equal to this lower bound. The lower bound could have been any number but, because it is zero in this case, the conservative assumption is equivalent to excluding the capital gains term.

Under the conservative assumption, the expression for the UCC simplifies to

$$\text{UCC}_t = r_t + m_t + \tau_t^p + \rho_t. \quad (3.5)$$

The assumption is conservative because it underestimates the expected real capital gains. The assumption is actually quite conservative, given that the average annual rate of the real 5-year after-tax capital gains has been 3.3% during 1997q1–2023q4 and 0.8% during 2010q1–2023q4 (marked in figure D.2).

The underestimation of the expected real capital gains means that the resulting UCC and user cost is overestimated. The assumption thus causes a bias toward higher user costs. This in turn introduces a bias toward higher UCTI and UCTR ratios and thereby toward overvaluation, thus stacking the cards to some extent in favor of finding overvaluation.³⁵

An assumption of zero real capital gains has actually been frequently used. As noted by [Garner and Verbrugge \(2009b\)](#), footnote 18):

¹⁸ While this measure [a user cost with zero real capital gains] has little theoretical justification, it is nonetheless popular amongst practitioners; see, e.g., [Poterba \(1992\)](#), [Blackley and Follain \(1996\)](#), [OECD \(2005\)](#) and [Cournède \(2005\)](#). A similar user cost measure is also used in Iceland's CPI (see ... [Guðnason and Jónsdóttir, 2009](#)), and variants are in use in the system of national accounts statistics in several Western Balkan countries such as Croatia and Serbia ... A priori, this no-real-capital-gains-in-the-short-run assumption seems strange since it is both so strongly at odds with the US data, and is also so theoretically dubious—in that, at least outside of steady state, there is no reason to believe that expected inflation equals expected home price appreciation.

[Verbrugge \(2008\)](#) has previously observed a puzzling divergence between rents and user costs in the US. [Garner and Verbrugge \(2009b\)](#) use a large amount of US microdata at the individual dwelling level to try to resolve the puzzle. They consider four alternative assumptions about the expected capital gains (housing appreciation): (1) a forecast of expected appreciation during the next year, (2) an annualized forecast of expected appreciation over the next four years, (3) the assumption of

³⁵ However, when overvaluation is measured by the deviations of UCTI and UCTR ratios from their historical averages, there may be less or no bias, because the historical averages are also higher. In practice, for Sweden, there is still a bias, as discussed in section 4.1.

zero real capital gains, and (4) that the user cost is just equal to the out-of-pockets costs of housing. They actually find that assumption (3), zero real capital gains, results in a close correspondence between user costs and rents and thus resolves the puzzle. The other assumptions do not.³⁶

3.2 Overoptimistic household expectations or not?

It is important to assess whether or not households have overoptimistic expectations of future mortgage rates and house prices. Unrealistically low mortgage-rate expectations or high house-price expectations can be considered a separate indicator of overvaluation risk and a separate indicator of instability.

Mortgage-rate expectations To start with mortgage-rate expectations, one test is whether households' expectations of future short mortgage rates are consistent with or lower than the 5-year mortgage rates offered by lenders. Fortunately, there is good data on households' expectations of 3-month mortgage rates at the 1-, 2-, and 5-year horizon (NIER, 2024).

Figure 3.1 plots a time series of the households' expected 5-year average of future 3-month rates with and without an added term premium, the SBAB 5-year mortgage rate, and the spread between them with and without a term premium. The spreads indicate that since 2011 Swedish households' expectations of future mortgage rates have mostly been substantially higher than those consistent with SBAB 5-year rate. However, during July 2022–May 2023, the spread was close to zero, but thereafter it has picked up a bit. Clearly, the spread has not been significantly negative.

Altogether, there is no evidence that households would have overoptimistic expectations of low future mortgage rates, at least not compared to banks.³⁷

House-price expectations Unfortunately, as mentioned, there are no regular time-series data at monthly or quarterly frequencies on households' expected house-price appreciation. The NIER did collect monthly data on 1-year house-price expectations from November 2015 to October 2017. Respondents were told how many percent house prices have risen during the last 12 month, and asked how much they expected prices to increase during the next 12 months. They were not asked about 2-year and 5-year expectations. Due to response burden and cost considerations, the survey was unfortunately discontinued thereafter.³⁸

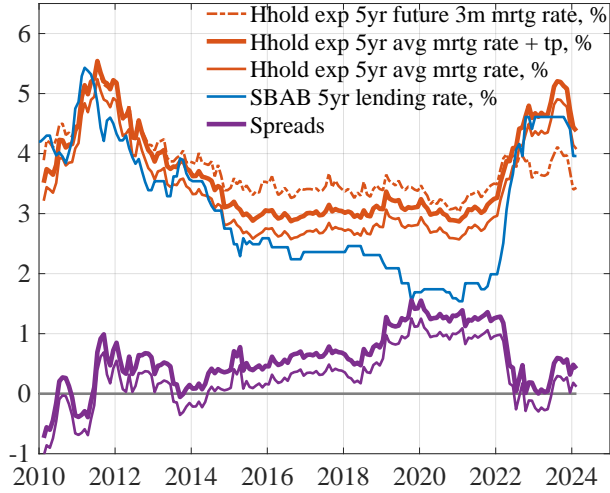
However, 5-year house-price expectations have been collected for a few years from June 2014 to March 2022 by the consulting firm Evidens, specializing in reports on real estate and construction.

³⁶ See also Diewert (2013, appendix, para. 3.67).

³⁷ Previously, Hjalmarsson and Österholm (2017) and Österholm and Österholm (2023)—by examining the time series and forecast errors, respectively, of the households' mortgage-rate expectations—have not found any evidence of Swedish households' mortgage-rate expectation being unrealistically low. Hjalmarsson and Österholm (2019) use microdata of the households' expectations. They note that youngest group (16–24 years) has an expectation at the five-year horizon that is around 0.38 percentage points lower than the oldest group (65 years and older). However, when the youngest group is compared to the median-age group (35–49 years) and all other groups (25 years and older), the difference is only 0.21 and 0.25 percentage points, respectively (email correspondence with Hjalmarsson). This is not a large difference relative to the differences in figure 3.1.

³⁸ The NIER data has been studied in detail by Hjalmarsson and Österholm (2020, 2021).

Figure 3.1: Swedish households' expected 5-year average of future 3-month mortgage rates with and without term premium, the SBAB 5-year lending rate, and spreads, 2010–January 2024.



Source and note: Figure 3.1: NIER (2024), SBAB (2024), and own calculations. The term premium is assumed to be 0.5 basis points (bp) per month fixation period, so it is 30 bp for a 5-year fixation period. Figure 3.2: Evidens (2019, 2022), Statistics Sweden (2024f), Valueguard (2024) and own calculations. The average rate of nominal house-price appreciation from 1997q1 to 2023q4 is calculated as $100 * \{ [P_{23q4} / P_{97q1}]^{4 / (23q4 - 97q1)} - 1 \}$, and analogously from 2010q1 to 2023q4.

Evidens (2019, 2022) reports surveys of the views on the housing market of households that are active in the housing market in the Swedish major cities. The households answered question mirrored on those of Case and Shiller (2003) for US households, including also their expectations of annualized house-price appreciation for the next 5 years. One objective of the survey has been to examine whether Swedish households have as dramatically overoptimistic house-price expectations as Case and Shiller documented for US households. That is far from the case, as Evidens concluded (Evidens, 2019, p. 3, my translation):

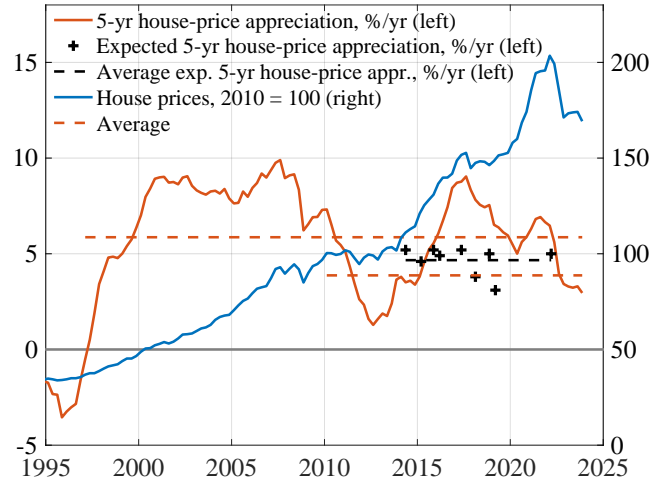
In summary, the study shows that the house-price growth in the major and regional cities is not to any noticeable extent affected by unrealistic and highly elevated price expectations. The level of the price expectations falls short of or is in line with the historical growth of incomes.

Figure 3.2 shows actual annualized 5-year nominal house-price appreciation, the household expectations of annualized 5-year capital gains collected by Evidens, the mean of those expectations, and the actual level of house prices. We see that the recorded expectations from June 2014 to March 2022 have not exceeded 5.2%. Their average is 4.7%.

The horizontal dashed lines in the figure show the average rate of house-price appreciation from 1997q3 and 2010q1 to 2023q4, 6% and 4%, respectively. We see that household's expected 5-year house-price appreciation falls neatly between the two averages. Clearly, the expectations are not overoptimistic and but rather realistic, and quite stable.

During the sample period, the actual annual 5-year house-price appreciation fluctuated from

Figure 3.2: Actual and expected 5-year nominal house-price appreciation, actual house prices, and the average rates of nominal house-price appreciation from 1997q1 to 2023q4 and from 2010q1 to 2023q4.



3.5% in June 2014 to 9% in August 2017 and down to 5% in March 2022. There is no indication that household expectations were significantly influenced by the swings in the actual 5-year house-price appreciation. There is no indication of extrapolative expectations.

Kuchler et al. (2022) survey the literature on households’ house-price expectations in the US house-price expectations. They note that recent work suggests that individuals appear to under-extrapolate from recent price changes when forming short-run expectations and over-extrapolate when forming long-run expectations. The Swedish data does not indicate any apparent extrapolation at the 5-year horizon. A thorough examination of this issue would require a time series of house-price expectations at the 1-, 2-, and 5-year horizon, similar to what is available for mortgage-rate expectations.

Muellbauer (2012) and Duca et al. (2021a) argue strongly in favor of a “4-year memory”, that households’ expectations are strongly influenced by the house-price appreciation the last four years. There is no indication of this in this Swedish data. In addition, appendix C shows that a forecast of Swedish 4-year house-price appreciation equal to the past 4-year appreciation is very bad. The correlation coefficient between the forecast and the outcome is -0.3 . The mean squared error is 25. A constant forecast of 5%, like the household expectations in figure 3.2, is significantly better, with a mean squared error of 12.

3.3 The components of the UCC

The real after-tax financing cost It remains to determine the components of the UCC in (3.5) and (3.4). I use a mortgage rate with a 5-year fixation period from SBAB (2024) (figure F.21). These are “listed” rates. Actual rates are lower by a rebate. SBAB listed rates have the advantage that they seem much closer to actual rates than the average listed rates, see figure F.26. Any resulting upward bias in the financing user cost should in any case have little or no effect on the deviation from a historical average.

Using a 5-year rate implies considering the user cost as being perceived as a longer-run annual average, which seems appropriate given that house purchases are longer-run decisions. Five-year rates are also normally higher than short rates, which implies a bias toward higher UCCs.^{39 40}

For Sweden, the rates of mortgage tax relief and capital-income tax are the same and equal to 30%. Furthermore, for simplicity, for most of the sample, I assume that the cost of housing equity equals the mortgage rate, $i_t^{eq} = i_t$. In this case, the LTV ratio does not matter for the financing cost.

However, the rapid increase in mortgage rates in 2022 from a situation of generally very low interest rates has not been accompanied by increased rate of return of alternative investments.

³⁹ The SBAB 5-year rate is similar to the average 5+years rate for all mortgage lenders published by Statistics Sweden but available for a longer sample; see figure F.21. Another option would be to use the Statistics Sweden rate from September 1995 and the SBAB rate before. Very few loans would have as long a fixation period as 10 years.

⁴⁰ As noted in the introduction, a bias toward higher user costs implies a bias toward higher UCTI and UCTR ratios and thereby toward overvaluation, thus stacking the cards in favor of finding overvaluation. However, when overvaluation is measured by the deviations of UCTI and UCTR ratios from their historical averages, there is less or no bias, because the historical averages are also higher.

Swedish mortgagors have substantial financial assets, including substantial bank deposits with safe but very small rates of return (FI, 2022a, Statistics Sweden, 2024g). These have not increased in parallel with the mortgage rates. Given this, I assume that the cost of equity is constant starting from 2021q3 and equal to the mortgage rate of that quarter, which happens to be 3%. Furthermore, I assume a constant LTV ratio of 70%, which is equal to the average LTV ratio for mortgagors that bought a new dwelling in 2021 (FI, 2022a, p. 11). The 5-year mortgage rate, the cost-of-house equity, and the resulting financing cost is shown in figure F.22.

For inflation expectations, I use 5-year inflation expectations (expectations of 12-month inflation in 5 years) collected by Kantar Sifo (2024) and available from Refinitiv Datastream.⁴¹

The OMRD rate The OMRD includes nominal operation, maintenance, and repair costs, as well as any remaining depreciation when the maintenance and repair is not full. The OMRD is often for simplicity assumed to be a constant fraction of the house price, but these costs are not directly related to the house price.⁴² Some of the operation and maintenance (including repair) are rather real costs that follow the CPI index or wages, or disposable income per capita. Furthermore, any repair and remaining physical depreciation would apply to the structure of the dwelling but not the land it sits on, whereas the house price is the sum of the value of the structure and the value of the land (Diewert, 2013, appendix).⁴³ One way to deal with this issue would be to assume that the OMRD cost is a fixed share μ of the value of the structure, which implies that the OMRD share of the value of the house, the OMRD rate, is given by

$$m_t = \mu \frac{P_t^{sh}}{P_t}, \quad (3.6)$$

where P_t^{sh} denotes the value of the structure of the house.

However, I follow Hansson (2019) in using National Accounts data in Statistics Sweden (2023c) on operation, maintenance, and repair costs of Swedish owner-occupied houses.⁴⁴ Hansson furthermore assumes that the rate of depreciation is 2% of the value of structures. However, as discussed in Svensson (2022a), Statistics Sweden follow a method of the US Bureau of Economic Analysis—described in Katz and Herman (1997)—together with additional assumptions that result in a depreciation rate of approximately 1.5% of the price of the structures. I follow this method.⁴⁵

Figure 3.3 shows the value of the structures of and land under owner-occupied houses in Sweden, as well as the share of structures in the house price, P_t^{sh}/P_t . Land values have risen more rapidly than the value of structures, and the share of the structures in the house price has fallen from almost 80% in the late 1990s to about 45% at the end of 2022.

⁴¹ Figures F.13 and F.14 show the components of the UCC and the UCTI indicator if instead the expected average inflation over the next 5 years is used.

⁴² Harding et al. (2007) estimate the depreciation rate for US housing during 1983–2001 to 2.5% gross of and 2.0% net of maintenance.

⁴³ There are of course some operating and maintenance costs associated with the land the dwelling sits on, but they are disregarded relative to the substantial OMR associated with the dwelling.

⁴⁴ I thank Peter Buvén of Statistics Sweden for providing updated data, table F.1 and Statistics Sweden (2023c).

⁴⁵ I thank Michael Wolf of Statistics Sweden for explaining the methods used.

Figure 3.3: Values of structures and land.

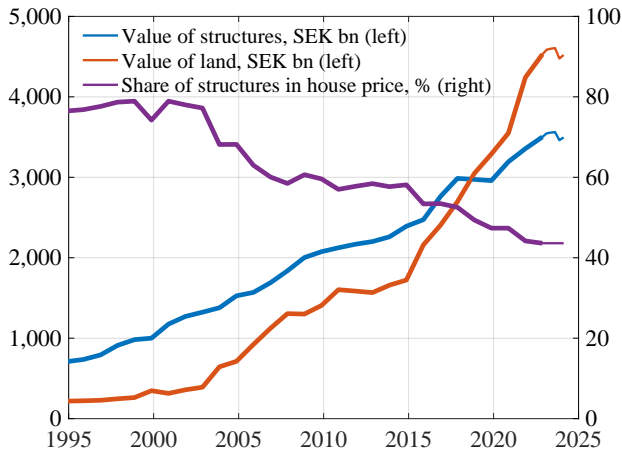
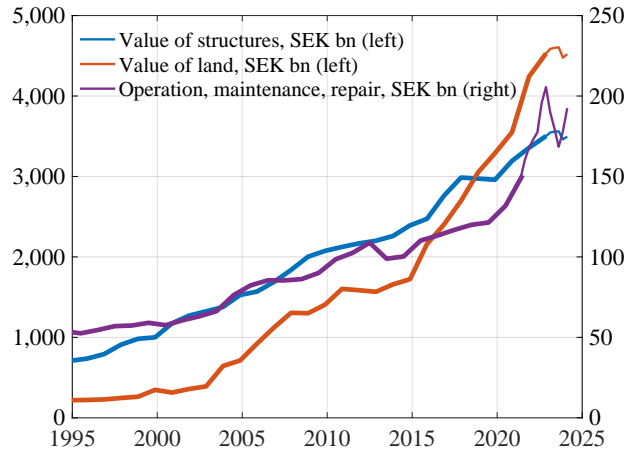


Figure 3.4: Value of structures and land; and operation, maintenance, and repair costs.



Source and note: [Statistics Sweden \(2023a,c\)](#), summarized in table [F.1](#). The values of structures and land are slightly smoothed; see figure [F.11](#). The thick lines are data. Figure 3.3: The thin lines are values extrapolated with the house-price index under the assumption of a constant share of structures in 2023. Figure 3.4: The OMR costs for 2022 and 2023 of heating, insurance, and maintenance and repair are extrapolated with the prices of electricity; repair goods; water, sewage, and waste; and home insurance in figure [F.23](#). See figure [F.12](#) for details.

Figure 3.4 shows the OMR together with the value of structures and land. We see that the share of the OMR in the value of structures varies a bit and falls over time. In figure 3.5 the dashed dark red line shows the OMR share of structures. In line with Statistics Sweden practice and details explained in [Svensson \(2022a\)](#), the depreciation rate is assumed to be 1.5% of the value of structures, resulting in an OMRD share of structures given by the solid dark red line. Multiplying this OMRD share by the share of structures in the price of the house results in the OMRD share of the house price—the OMRD rate—given by the solid yellow line in figure 3.5. The OMRD rate drops from 6.7% at the end of 1995 to 2.7% in 2019q2. It then rises to a small peak in 2022q4 and then fluctuates with the price of heating and electricity (figures [F.12](#) and [F.23](#)).

Assuming a constant OMRD rate is thus a bad approximation, at least for Sweden. Even assuming a constant OMRD share of the value of structures, as in (3.6), is only a moderately good approximation, as shown by the solid dark red line in the figure. The UCC and the UCTI indicator for a constant OMRD rate equal to its mean is shown in figures [F.15](#) and [F.16](#).

The property tax rate [Barrios et al. \(2019, pp. 48–49\)](#) reports property tax rates for EU countries that are implicit and calculated as the revenues from property taxes on households divided by the net stock of dwellings of households. [Englund \(2020, diagram 14\)](#) provides an explicit calculation of property tax rates for Sweden. This results in somewhat lower numbers than for [Barrios et al. \(2019, pp. 48–49\)](#), but the difference is small.

On January 1, 2008, the property tax was reduced substantially. In particular, a low ceiling was introduced, currently about SEK 8,500 per year, about EUR 1,000 at the time of writing. This is binding for most homeowners, effectively turning the property tax into a modest lump-sum tax.⁴⁶

⁴⁶ This means that the property tax is regressive—the more expensive properties have a lower tax rate. Below the

Figure 3.5: Operation, maintenance, repair, and maintenance; shares of the value of structures and of the house price.

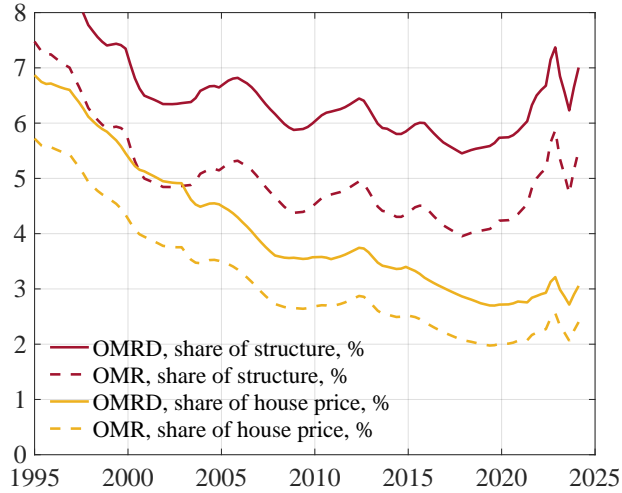
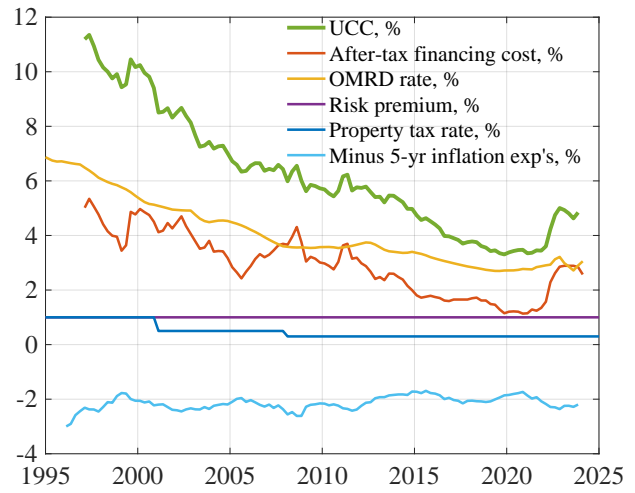


Figure 3.6: The UCC and its components.



Source and note: Figure 3.5: Annual OMR and value of structures and land from figure 3.4. The depreciation rate is in line with Statistics Sweden set to 1.5% of the value of structures (Svensson, 2022a). Figure 3.6: The 5-year mortgage rate is from SBAB (2024), the OMRD rate is from figure 3.5, the risk premium is 1%, the property tax rate is a piecewise constant approximation of Englund (2020), and 5-year inflation expectations are from Kantar Sifo (2024) and Refinitiv Datastream. Own calculations. The latest observation is 2023q4.

I use a piecewise constant approximation to the Englund numbers.

The risk premium Barrios et al. (2019) follow Poterba and Sinai (2008) in assuming a before-tax risk premium β equal to 2%, that is, for Sweden an after-tax risk premium of $(1 - 0.3)2 = 1.4\%$.⁴⁷ A risk premium has been derived by Flavin and Yamashita (2002) in a household optimal portfolio setting, but it may be too large (Himmelberg et al., 2005). It ignores that, relative to renting, owner-occupation provides a hedge against future rent increases (Sinai and Souleles, 2005). Also, owner-occupation have benefits in terms of more control over the housing than renting.

Three additional circumstances for Sweden have a bearing on the risk-premium assumption. First, there is hardly any buy-to-let of houses and apartments in Sweden. That is, there is hardly any pure investor demand for houses and apartments, where the risk and return on the investment naturally is compared to that of other investments. Thus, there is mainly buy-to-live, in which case the comparison is mainly between owner-occupied housing and other tenure alternatives.

Second, the rental market is dysfunctional due to rent-control. This means that rental housing is not very accessible. In the major cities, ten years or more of queuing is normally required to get a rent-controlled apartment. For those who have got a rented apartment, there is a strong lock-in effect because moving is difficult and require a kind of barter or exchange with other rented apartments, sometimes in complicated multi-apartment chains.⁴⁸ Given the high moving costs, renting is therefore quite risky. From this perspective, owner-occupied housing brings considerable

ceiling, the property tax is approximately 0.5% of market value. With a ceiling about EUR 820, the ceiling is then binding for properties with market value exceeding EUR 16,400.

⁴⁷ Diewert (2013) does not consider an explicit risk premium.

⁴⁸ Side-payments for getting a lease on a rent-controlled apartment occur but are illegal.

flexibility and control, with freedom to sell and move, and is from this point of view less risky than rented housing.

Third, Swedish mortgages to a large extent have variable rates, that is, with a fixation period of 3 months, and many of the remaining ones have relatively short fixation periods of one or two years. The variable rates follow the Riksbank’s policy rate with an average lag of 1.5 months and a relatively fixed spread. With floating exchange rates and flexible inflation targeting, policy rates and thus variable mortgage rates generally become procyclical, as do also the mortgage rates with relatively short fixation periods.⁴⁹ This means that mortgagors normally get lower interest payments in recessions and crises, when the marginal utility of the reduced payments is higher. Mortgagors effectively get insurance against bad times. Renters don’t get any such insurance. This may actually justify a negative risk premium on owner-occupied housing.⁵⁰

The above insurance against bad times obviously refer to “normal” bad times, which excludes rare shocks such as the recent global supply disturbances after covid and the shocks to inflation and corresponding central-bank responses due to the Russian attack on Ukraine.

Thus, for Sweden, a zero or even negative risk premium on owner-occupied housing may be appropriate. Nevertheless, here I follow the convention and include a positive risk premium, set to 1%, which increases the user costs and its correlation with house prices somewhat. In any case, the results do not seem very sensitive to a modest level of the risk premium.⁵¹

The UCC and its components Figure 3.6 shows the resulting UCC and its components, namely, the after-tax nominal mortgage rate, the OMRD rate, the risk premium, the property tax, and the negative of inflation expectations. We see that the UCC falls from about 10% in 2000 to about 3.5% in the beginning of 2022. The fall in the UCC is caused by the fall in the after-tax mortgage rate, in the OMRD rate, and in the property tax rate. The subtraction of inflation expectations of about 2% increases the *relative* fall of the UCC. From 2022q2 the UCC quickly rises to about 5%, due mainly to the rise in the financing cost.

Hansson (2019, figure 7) calculates a UCC without a risk premium and with a depreciation rate of 2%, whereas my UCC is calculated for a 1% risk premium and a 1.5% depreciation rate. Hansson uses other interest rates than those used here, but the difference should be small. The UCC is calculated with and without capital gains. The UCC calculated in this paper is slightly higher

⁴⁹ In contrast, with fixed exchange rates, during the banking crisis in the 1990s, mortgage rates became very high, when the Riksbank defended a speculative attack on the krona with a policy rate as high as 500%. Thus, with a fixed exchange-rate regime with insufficient credibility, interest rates may be countercyclical.

⁵⁰ The Riksbank and the National Debt Office have also demonstrated that they have the tools—in particular, purchases of mortgage bonds—to keep the spread down in crises. See figure F.25. Furthermore, during most the coronavirus crisis, Finansinspektionen, the Swedish financial supervisory authority, temporarily abolished the mandatory amortization requirements, to further reduce the debt service of mortgagors. Thereby, it has created a precedence to do so again in future crises. This arguably adds to the insurance benefits of mortgages.

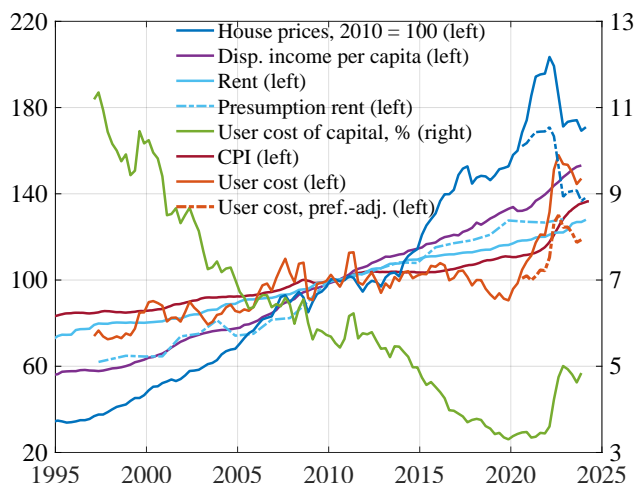
⁵¹ Let $UCTI_t = (UCC_t + \rho)PTI_t$, where UCC_t here denotes the UCC for a zero risk premium and ρ denotes a constant risk premium. The covariance between the UCTI and PTI ratios is given by $Cov(UCTI,PTI) = Cov(UCC,PTI) + \rho Var(PTI)$. For the Swedish data, $Cov(UCC,PTI)$ and $Cov(UCTI,PTI)$ are negative. However, a larger ρ increases $Cov(UCTI,PTI)$ and a sufficiently large ρ would make $Cov(UCTI,PTI)$ positive. Thus, a larger risk premium makes the covariance between UCTI and PTI less negative and a sufficiently large risk premium would make the covariance and correlation positive.

than Hansson’s UCC without capital gains, as is shown in figure F.24. Englund (2020, diagram 9) provides a calculation of the UCC with a more detailed calculation of the relevant taxes but without any OMRD and risk premium. This results in a lower UCC than the one calculated in this paper, as shown in figure F.24. Section 5.2.1 compares with the UCC derived in the Commission’s Housing Taxation Database (Barrios et al., 2019, Grünberger et al., 2023), shown in figure 5.9.

3.4 The user cost

Figure 3.7 shows an index of the user cost (2010 = 100), the UCC in percent, and indices of house prices, disposable income (per capita), rents, presumption rents, and the CPI. The user cost is calculated according to (3.1). The figure shows indexed levels instead of the deviations from historical averages shown in figure 1.1.

Figure 3.7: House prices, disposable income per capita, rents, user cost of capital, user cost, and the CPI. User cost of capital in percent; all other series indexed to 100 for 2010.



Source and note: Statistics Sweden (2024a,c,d,f), Valueguard (2024), and own calculations. See note to figure F.2 for details.

Both actual and preference-adjusted house prices and user costs are shown. As briefly discussed in section 1, house prices increased substantially during the coronavirus crisis 2020 and 2021, despite the negative effect of the crisis on the Swedish economy. As discussed in detail in Sveriges Riksbank (2021), a similar development can be seen in many other comparable countries. The price upturn deviates from historical correlations and is difficult to explain with factors traditionally used to shed light on housing demand, such as interest rates and disposable income. Instead, the most important explanations probably have to do with the unusual economic effects of the pandemic. Households being partially forced to save because of restrictions has freed up scope for housing consumption. At the same time, widespread working from home has probably sparked a desire among households for a larger and better homes and a willingness to spend more money on their housing. In addition, the negative effects of the crisis on the labor market have only affected households with permanent employment to a minor extent and these households normally find it easier to obtain a mortgage. This may have helped prices resist the generally weak development in

the real economy. In figure F.20, we see that the relative price of houses in terms of apartments increased substantially during 2020 and 2021. The conclusion is that the house price rise during 2020-2021 can be seen as the result of a preference shift toward larger and better homes, with more or less a fixed supply of homes. Thus, it is due to fundamental factors and not in itself an indicator of overvaluation.⁵²

The dash-dotted dark blue line shows “preference-adjusted” house prices, for which the 75% of the of the cumulated actual price increases during 2020q2–2022q1 have been deducted from the actual house prices. This reflects the assumption that 75% of the price increases are due to the preference shift. Given the preference shift, for the purpose of assessing over- or undervaluation of housing over time, one may want to use a “preference-adjusted” user cost, corresponding to approximately unchanged preferences. The dash-dotted red line is the corresponding preference-adjusted user cost, calculated using the preference-adjusted housing prices after 2020q2 instead of the actual housing prices.

We see that the dramatic downward trend of the UCC neutralizes the dramatic rise of the house prices and results in a relatively stable user cost until 2020. The preference-adjusted user cost is relatively stable until the spring of 2022, when the UCC starts to rise. As already discussed in section 1, it falls relative to and stays below disposable income. It also falls relative to rents and the CPI, except towards the end where it rises to reach about the same level as the rents and the CPI. Thus, the UCTR ratio and the real user cost is 2023q4 at about the same level as in 2010, whereas the UCTI ratio is at a significantly lower level. Clearly, Swedish house are by these indicators not overvalued but undervalued relative to 2010.⁵³

The results of the preference-adjustment are linear in the assumed fraction of price increases that are attributed to the preference shift. If that fraction is assumed to be 37.5% instead of 75%, the new dash-dotted blue and red lines in figures 3.7–4.3 fall exactly between the current dash-dotted and solid blue and red lines.

4 The user-cost-to-income and user-cost-to-rent ratios

Figure 4.1 shows the PTI and UCTI ratios in index form, with 2010 = 100. The UCC is in percent. The UCTI ratio is calculated according to (1.2).

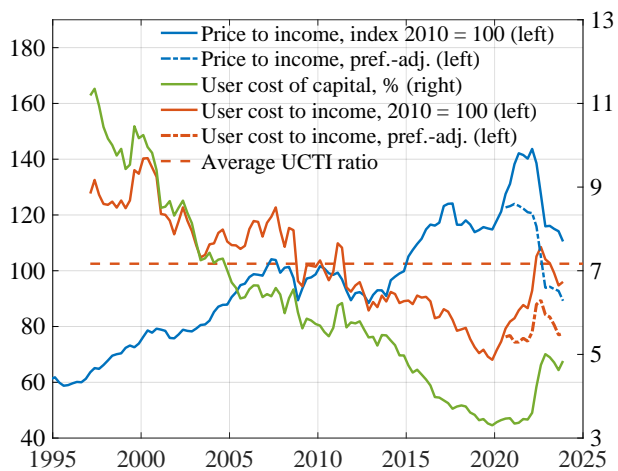
Figure 1.1 (repeated above) shows the corresponding percentage deviation of the PTI and UCTI ratios from their historical averages, which measure is independent of the base year of the indexation. This is discussed in section 1. According to this measure, in 2023q4, the actual and preference-adjusted UCTI ratio were, respectively, 8% and 24% below their historical average. In 2019q4, the UCTI ratio was 34% below its current historical average.

Figure 4.2 shows the UCC and indices of the PTR and UCTR ratios for rents—the analog of figure 4.1. Ratios for presumption rents are not shown—they are similar to the UCTI ratios because

⁵² See also Igan et al. (2022, graph 2, left panel, SE).

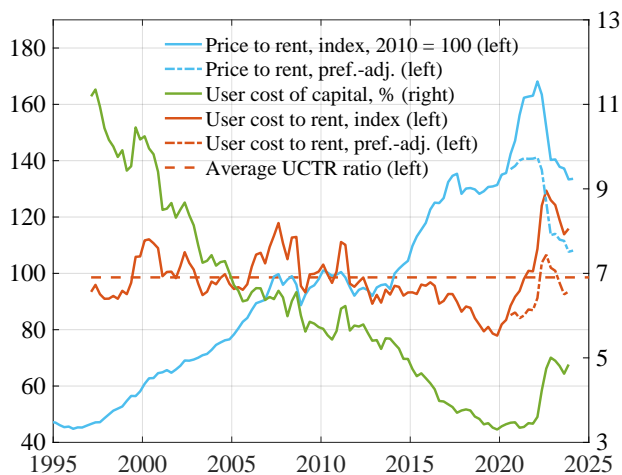
⁵³ The estimate of the user cost in figure 3.7 rejects the assumption made in Almenberg et al. (2022) that the user cost is exogenous and grows at a steady rate of 2%.

Figure 4.1: Price to income (index), user cost of capital (percent), and user cost to income (index). Index 2010 = 100.



Source and note: Figures 2.1 and 3.6 and own calculations. The “preference-adjustment” is explained the text.

Figure 4.2: Price-to-rent ratio (index), user cost of capital (percent), and user-cost-to-rent ratio (index). Index 2010 = 100.



Source and note: Figures 2.1 and 3.6 and own calculations. The historical average refers to 1997q1-. The “preference-adjustment” is explained the text.

the presumption rents follow disposable income relatively close. The UCTR ratios are calculated according to (1.3). The contrast between the large overvaluation indicated by the PTR ratio and the lack of any significant overvaluation by the preference-adjusted UCTR ratio is stark.

Figure 4.3 shows the deviation of the UCTR ratios from their historical averages—the analog of figure 1.1. The preference-adjusted UCTR ratio indicates a slight undervaluation in 2023q4. In 2019q4, the UCTR ratio indicated undervaluation of 21%.

Figure 1.1 (repeated). Price-to-income and user-cost-to-income ratios (percentage deviation from historical averages) and the user cost of capital (percent).

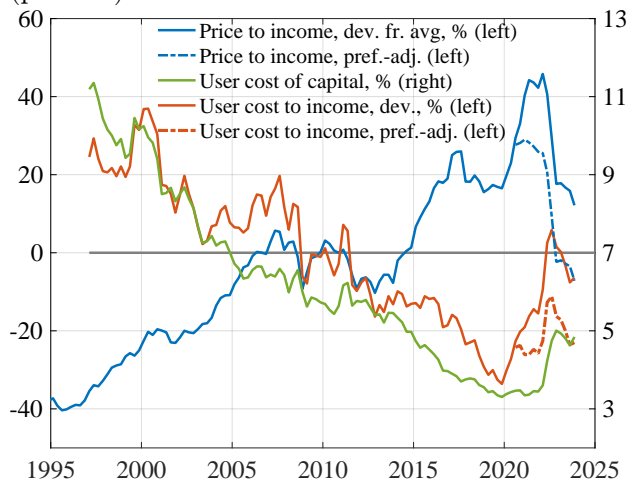
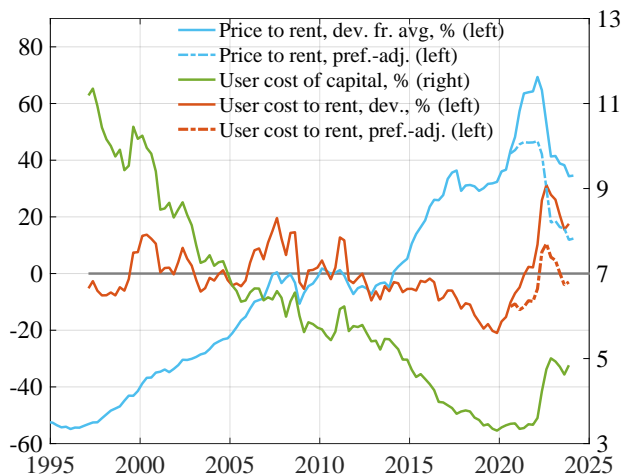


Figure 4.3: Price-to-rent and user-cost-to-rent ratios (percentage deviation from historical averages) and user cost of capital (percent).



4.1 Positive expected real 5-year after-tax capital gains

In figure 3.2, the mean of the observed expectations of 5-year nominal house-price appreciation expectations is 4.7%. This implies expectations of positive real after-tax capital gains. To examine whether the conservative assumption in this case imply a bias towards overvaluation, let me assume that household’s expectations of 5-year nominal house-price appreciation is 4% per year, a bit below the above mean. With a capital-gains tax of 0.22 and 5-year inflation expectations on average about 2%, this results in expected real after-tax capital gains on average about 1%.⁵⁴ In figure F.17, the dash-dotted purple line shows the negative of these expected real after-tax capital gains. The resulting UCC then shifts down by about 1 pp compared to the UCC in figure 3.6.

Figure F.18 shows that this lower UCC makes the UCTI line steeper after 2010, with a deeper trough in 2019q4. For the conservative assumption in figure 1.1, Swedish houses were undervalued by about 30% in 2019q4. According to figure F.18, Swedish houses were instead undervalued by more than 40% in 2019q4. The undervaluation in 2023q3 is also larger than in figure 1. Thus, in this case, the conservative assumption indeed implies a bias toward overvaluation (less undervaluation).⁵⁵

5 International organizations on overvaluation of Swedish housing

Several international organizations that monitor and comment on Swedish economic policy have for many years maintained that Swedish house prices are too high relative to fundamentals and that Swedish (owner-occupied) housing thus is overvalued. This section reports what the ECB and the ESRB, the European Commission, the OECD, and the IMF have said about Swedish housing overvaluation in their previous and recent reports. The assessments of overvaluation by the ECB and the ESRB also affect the magnitude of the negative house-price shocks assumed in the EBA stress tests of Swedish banks.

The ECB, ESRB and the European Commission have consistently maintained that Swedish housing is substantially overvalued as late as 2022. The OECD and the IMF have previously, in 2017–2019, warned about Swedish housing being overvalued. However, in recent reports of 2021–2023 they have not mentioned any overvaluation. The OECD has done substantial work on measures of housing affordability in the OECD countries. This work has expressed some skepticism of the suitability of the PTI indicator. The OECD has also concluded the Swedish “mortgage burden” costs (the interest and amortization payments on owner-occupied housing) have been among the lowest in the OECD. This is not consistent with Sweden housing being overvalued.

Separately, the European Commission has constructed a database of user costs of capital for the European Union countries, for the purpose of discussing housing-tax distortions (Grünberger et al., 2023). The Commission’s UCC for Sweden is similar to the UCC calculated in this paper. As we shall see, the implied Commission UCTI indicator thus indicates undervaluation rather than

⁵⁴ $(1 - 0.22) \times 4 - 2 = 1.12\%$.

⁵⁵ The shift down in the UCC line implies that any fall in the UCC along the line after 2010 is a larger percentage fall. This means that the effect on the UCTI curve is also a larger percentage fall. This explains why the fall in the UCTI ratio after 2010 is larger in figure F.18 than in figure 1.1.

overvaluation and contradicts the Commission’s official position on Swedish housing overvaluation. The implied UCTI indicator is also strongly negatively correlated with the PTI indicator. Implied UCTI indicators for several other European Union countries suggest that the problem of misleading indicators and overvaluation assessments—and resulting distorted warnings and recommendations—is not restricted to Sweden but concerns several other European Union countries.

5.1 The ECB and the ESRB

The ECB calculates four measures of housing overvaluation for several countries. It calculates deviations of the PTI and PTR ratios from benchmarks equal to their historical averages (from 1996 to the latest available observation) (ECB, 2015b) and the deviations of current prices from the estimates of two models, an inverted-demand model described in ECB (2015a) and ESRB (2022b, box 2) and a model based on an “asset-pricing” approach (ECB, 2011). The latter has to my knowledge not been published or described in any detail in these references. The results are reported in the form of the maximum and minimum valuation, the inverted-demand model valuation, and the average of the four in ECB (2023).⁵⁶

Figure 5.1: ECB estimates of residential property overvaluation: Sweden. latest observation 2022q4.

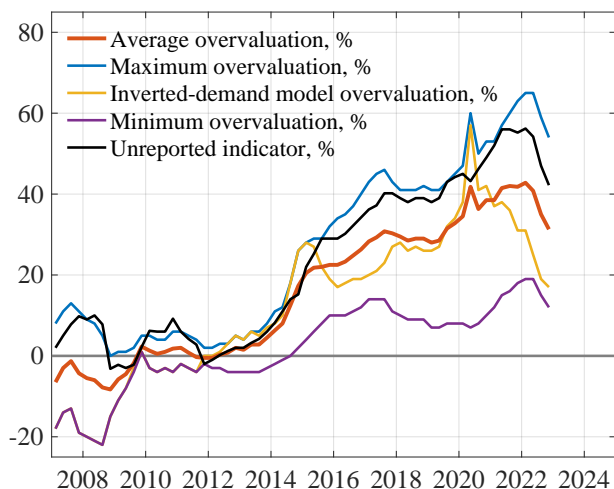
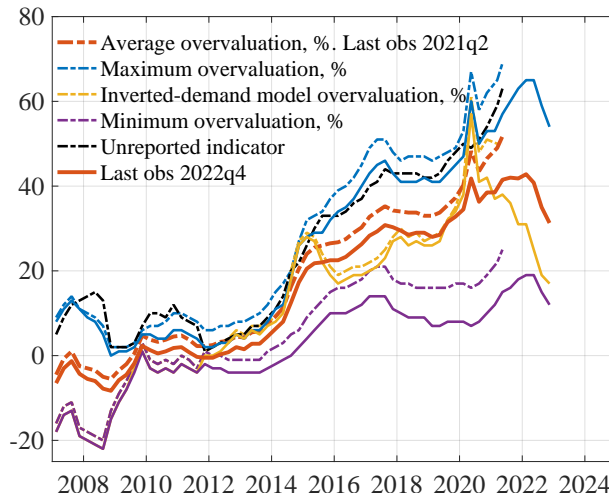


Figure 5.2: ECB estimates of residential property overvaluation: Sweden. Also real-time estimate with latest observation 2021q2.



Source and note: ECB (2023). Figure 5.1. Data downloaded in June 2023, with latest observation 2022q4, with inferred unreported indicator. Figure 5.2: Added dashed-dotted lines referring to real-time estimates with latest observation 2021q2. See figure F.27 for data downloaded in September 2023, with latest observation 2023q1, and very different model estimates (footnote 56).

Overvaluation measures for Sweden, downloaded in June 2023 from ECB (2023), are shown in

⁵⁶ Does the “asset-pricing approach” assume unrealistic equality between rents and user costs? Duca et al. (2021a) provide an extensive discussion and literature review of research on and models of the determination of house prices. In particular, they argue that the “asset pricing approach from finance” with a simple price-to-rent or rent-arbitrage approach in the form of an equality between rent and user cost is misleading (also Duca et al., 2021b) and exaggerates the sensitivity of house prices to mortgage rates. (What is called the user cost of capital (UCC) here is just called the user cost by Duca et al.)

Muellbauer and Murphy (1997) provide a detailed discussion of the inverted-demand model.

figure 5.1. According to the ECB’s measures, for 2022q4 the average of the valuation measures indicated an overvaluation of Swedish housing of 31%, with a maximum overvaluation of 54%, a minimum of 12%, and the inverted-demand-model overvaluation of 17%. If the inverted-demand model’s estimates fall strictly between the minimum and maximum measures, three indicators (two of which are unnamed) and the average of the four indicators are reported. Then one can infer that the unreported indicator. It is shown as the black line in figure 5.1, equal to 42% in 2022q4.⁵⁷

The most recent assessment of the ESRB of the overvaluation of Swedish housing is contained in ESRB (2022b), which assesses RRE vulnerabilities in the EEA countries (the EU27 as well as Iceland, Liechtenstein, and Norway). The ESRB to a considerable extent relies on ECB calculations of overvaluation.

ESRB (2022b, table 1, Scoreboard), reproduced as figure F.28, reports overvaluation measures estimated by the ECB, with latest observation 2021q2. For Sweden, it reports a PTI deviation from its historical average of 66% (row SE, column 3). How the ECB could arrive at such a large PTI deviation is not explained. In figure F.5, the real-time PTI deviation in 2021q2 was 49%, substantially less than the scoreboard number.^{58 59}

The scoreboard also reports an econometric model estimate of overvaluation of 51% (row SE, column 4). The latter is consistent with the dashed-dotted yellow line in figure 5.2, the estimated overvaluation from the inverted-demand model. ESRB (2022b, figure 10) (reproduced here as figure 5.3) reports Swedish overvaluation for 2021q2 at 59%, the average of the scoreboard’s 66 and 51.⁶⁰

5.1.1 The ESRB’s calculation of UCTI and UCTR ratios⁶¹

Also in this context, the right question is, “Are user costs high?”, rather than “Are house prices high?” Interestingly, ESRB (2022b, box 4) reports ESRB calculations of the UCTI and UCTR

⁵⁷ Estimates of the inverted-demand model seem unstable. Figure F.27 shows the valuation measures also for data downloaded in September 2023, with one additional data point, 2023q1 (dash-dotted lines). We see that the inverted-demand overvaluation estimate for 2022q4 drops from +17% to −17% (34 pp!), and the average overvaluation estimate drops from 31% to 16% (15 pp). This is difficult to explain.

Because the model valuation becomes the minimum valuation from 2021q4 onwards, the unreported indicator cannot be inferred for those quarters.

⁵⁸ A possible explanation can be inferred from the ECB’s real-time estimates in 2021q2, the dashed-dotted lines added in figure 5.2. The maximum overvaluation in 2021q2 was 69% and that of the unreported indicator was 63%. Perhaps the maximum overvaluation refers to the PTR indicator and the unreported indicator is the PTI indicator (the PTR indicator is above the PTI indicator in figure 2.2). Then we are close to 66%, but still much above the real-time PTI indicator in figure F.5.

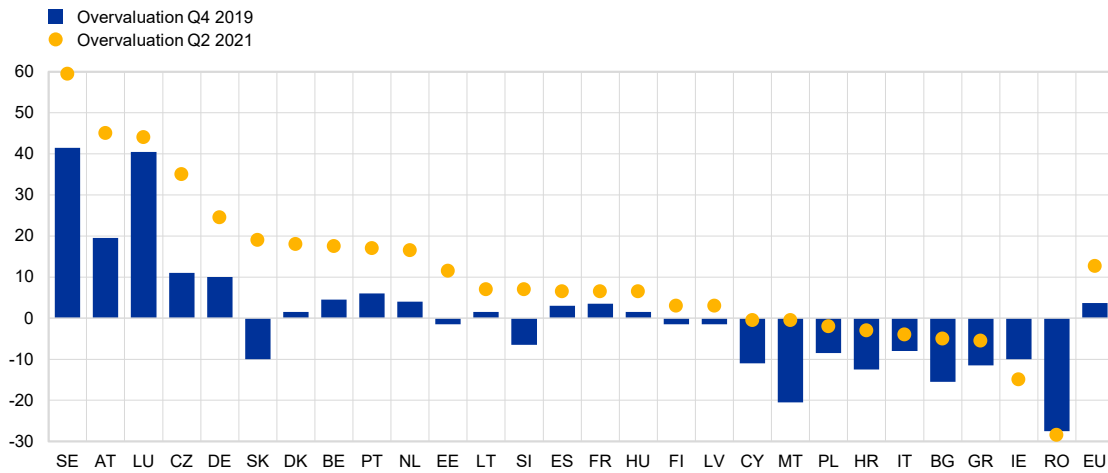
⁵⁹ Also, in figure 5.1, for 2020q2, there is a peak in the blue and yellow line but no such peak in figure 2.2, and no big drop in disposable income in figure F.2. This may indicate that the PTI ratios have not been calculated with disposable income per capita but perhaps with GDP per capita.

⁶⁰ ESRB (2022b, box 2, figure) reports additional estimates, including external ones, for the EEA countries for 2020q4. For Sweden, the inverted-demand ECB-model here reports 43% overvaluation. The European Commission model of Philipponnet and Turrini (2017) reports −1.9% (consistent with the European Commission (2021, table 2.2) numbers mentioned below in section 5.2). The Commission PTI ratio in terms of years, not much above 10, is also reported. (More on this in section 5.2.)

⁶¹ Full disclosure: As a member of the ESRB’s Advisory Scientific Committee from April 2019 to March 2023, I had some insight into the work on ESRB (2022b) and recommended—with reference to early versions of the present paper—the inclusion of and emphasis on the UCTI and UCTR indicators rather than the PTI and PTR indicators.

Figure 5.3: ESRB house-price overvaluation (ESRB, 2022b, figure 10).

(percentages)

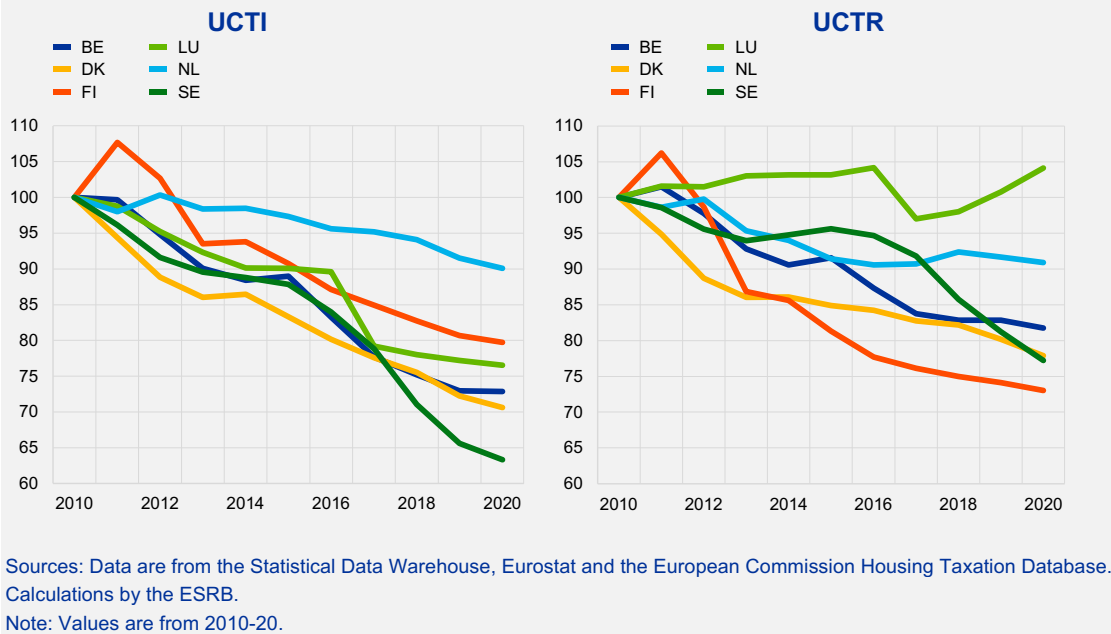


Source: ECB estimates.

Notes: The last data point is the second quarter of 2021, except for CY (the fourth quarter of 2020), DK, FI, HU, IE (the first quarter of 2021). The overvaluation is the simple average for the price-to-income and an inverted demand-based model estimates. The EU overvaluation is computed as the simple average across all EU countries.

Figure 5.4: ESRB estimates of user-cost-to-income and user-cost-to-rent ratios (ESRB, 2022b, box 4, figure B).

(percentages, base year set to 2010)



ratios for the six countries (one of which is Sweden) that received ESRB recommendations in 2019. The calculations use the Commission’s Housing Taxation Database (Grünberger et al., 2023). The results from these indicators differ substantially from those of the PTI ratio and the other indicators. For Sweden, the dark green lines in the box’s figure B (reproduced as figure 5.4) shows that both

the UCTI and the UCTR ratio have fallen substantially between 2010 and 2020. This indicates undervaluation rather than overvaluation.⁶²

The mixed results on overvaluation may have somewhat moderated the ESRB conclusions about Swedish overvaluation (my emphasis):

House price growth has been picking up recently and residential property is still significantly overvalued **based on some estimates**, eroding the affordability of housing for households. . . . Rising RRE prices stemming from population and economic growth, supply shortages, tax incentives for home ownership, and a low interest rate environment over an extended period have led to overvalued house prices. . . . The house price-to-income-ratio was 56% above its average in 2020, and model-based evidence suggests that house prices were overvalued by 43% in 2020, although **these estimates are surrounded by uncertainty and will alter in accordance with the underlying assumptions made, the model chosen and the time period, or if the low interest rate environment is taken into account.** (ESRB, 2022b, pp. 77–78)

Overall, the ECB’s real-time estimate of the average overvaluation for Sweden in figure 5.2 is 52% for 2021q2. The ESRB reports several different numbers for different times, but it seems that its estimate of the average overvaluation for 2020 and 2021 is around 55%.

ESRB (2024), of February 2023, provides a relatively brief follow-up report on vulnerabilities in the residential real estate sectors of the EEA countries. On Swedish overvaluation, there are no details but just the statement:

Measures of overvaluation, which were high in 2021, dropped sharply and are now in neutral territory. (p. 69)

Apparently, the overvaluation has dropped from around 55% in 2021 to about zero in 2024. From 2021 to January 2023, house prices have fallen about 13%, far from 55% (figure F.8).

Figures 5.1 and 5.4 again illustrate the negative correlation between the PTI and UCTI ratios for Sweden in figure 1.2 (and with Commission estimates of the UCC and the PTI ratio in figure 5.11 below). Furthermore, from a comparison of figures 5.3 and 5.4, it is apparent that the problem of misleading overvaluation assessments is not restricted to Sweden. It concerns several countries in the European Union. Of the six countries in figure 5.4, according to figure 5.3 all except Finland have overvalued housing, by between 17% and 60%. But according to figure 5.4, with more reliable and relevant indicators, all six have undervalued housing relative to 2010.

Accordingly, the negative correlation between PTI and UCI ratios seems likely to hold for several EU countries. This is easy to check with the help of the Housing Taxation and HouseLev databases (Bricongne et al., 2019, Grünberger et al., 2023). This issue will be further examined in Svensson (2023).

⁶² The ESRB calculation of user costs takes into account that the OMRD need not be a constant share of house prices. It assumes that the OMRD initially is 2.5% of the house price—as in Poterba and Sinai (2008)—but then over time follows the HICP excluding energy and food. This results in the OMRD share falling over time for Sweden (ESRB, 2022b, figure A, panel Sweden).

5.1.2 The European Banking Authority EU-wide stress tests

The ECB and ESRB assessments of housing overvaluation have consequences for the EBA stress tests. The stress tests for Sweden have one of the largest negative house-price shocks among the EU countries. The reason is apparently that house-price shocks in the EBA stress tests are set according to the negative of ECB’s average overvaluation measure. ESRB (2020, p. 41) provides some details on how the house-price shocks are determined:

3.7 Residential real estate price shocks

The scenario entails an adverse adjustment of residential real estate prices. This assumption is consistent with a narrative where, despite the low level of interest rates, a repricing of assets is envisaged due to both an adverse demand effect and an increase in risk aversion. The calibration of the shocks to residential real estate prices started from a measure of over/undervaluation of residential real estate prices with respect to their fundamentals as evaluated by ECB staff.³⁹ The main valuation measure is the average of four indicators of house price valuations.⁴⁰ These measures were calculated on the basis of models and a comprehensive house price dataset provided by the ECB.⁴¹ This choice is consistent with the ECB’s internal assessment of residential real estate risks and it is also aimed at aligning the size of the shocks with the ESRB’s risk assessment of the residential real estate market.

³⁹ The data considered are public and can be found in the Statistical Data Warehouse. Pre-2007 data available at the ECB was also used in the calibration. [This apparently refers to the SDW overvaluation data shown in figure 5.1.]

⁴⁰ In a few cases, alternative house price valuations measures, also from [ECB (2023)], were considered in order to improve the alignment of the house price shock with the ESRB’s risk assessment of the residential real estate market.

⁴¹ Further methodological details are given, for instance, in ECB (2018) and further sources cited therein.

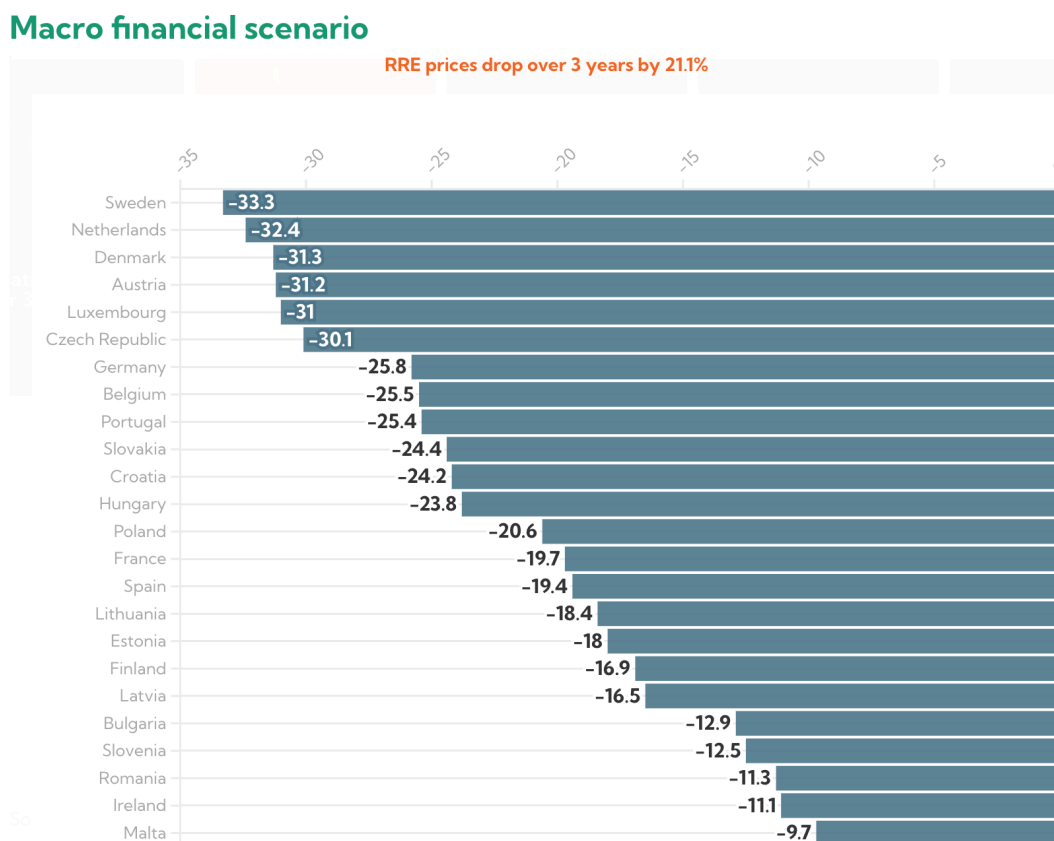
According to (ESRB, 2023, table 4.1.4, p. 15), the Swedish house-price shock for the 2023 EU-wide stress test was -33.3% . This is the largest in the EU, see figure 5.5. Nevertheless, Swedish banks managed the stress test quite well (FI, 2023).

If the reported house-price shocks are supposed to eliminate an existing overvaluation, the overvaluation is 50% , quite consistent with ESRB’s average overvaluation estimate of about 55% mentioned above.⁶³

Importantly, to provide serious and relevant tests of the resilience of EU banks, the EBA EU-wide stress tests need of course to assume substantial negative shocks, including negative house-price shocks. But the results of these tests are more informative if, beyond a substantial minimum size, the magnitude of these house-price shocks—and any differentiation across countries—is determined in the light of *relevant* indicators instead of the PTI and PTR ratios from their historical averages.

⁶³ If s denotes the negative price shock, the corresponding overvaluation v is the solution to the equation $v/(1+v) = s$.

Figure 5.5: EBA Macro Financial Scenario 2023, Residential Real Estate Prices (EBA, 2023), with Sweden being subject to the largest RRE price fall in the EU, 33.3%.



Source and note: Slide found on interactive web site EBA (2023) by clicking on “Macrofinancial scenario” and “RRE prices drop over 3 years by 21.1%”.

5.2 The European Commission

The European Commission has maintained that Swedish housing is substantially overvalued, more precisely by 29% in 2022.

The Commission regularly assesses any macroeconomic vulnerabilities and Swedish economic policy within its Macroeconomic Imbalance Procedure (IMP) (European Commission, 2023d). The recent in-depth review for Sweden (European Commission, 2023c) presents the main findings, including those for the Swedish housing market. The Swedish housing market is also discussed in a background horizontal thematic note on housing-market developments in the European Union (European Commission, 2023b). The Commission’s final assessment in the IMP is published in the 2023 Country Report for Sweden (European Commission, 2023a).

Regarding the assessment of any overvaluation of Swedish housing, the Commission uses the average of three indicators. More precisely, it uses the percentage deviation of the current price-to-income (PTI) and price-to-rent (PTR) ratios from benchmarks equal to their historical averages (from 1995 until the latest available observation). The third indicator is a model-based valuation gap, the percentage deviation of the current price from the price estimated by a model developed

Figure 5.6: European Commission house-price valuation gaps: Sweden.

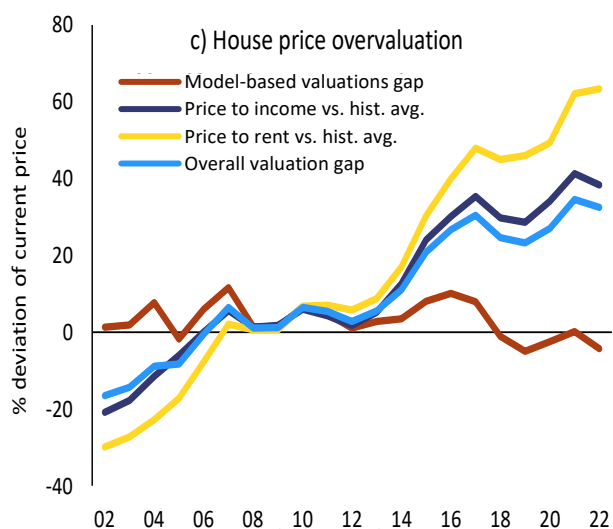
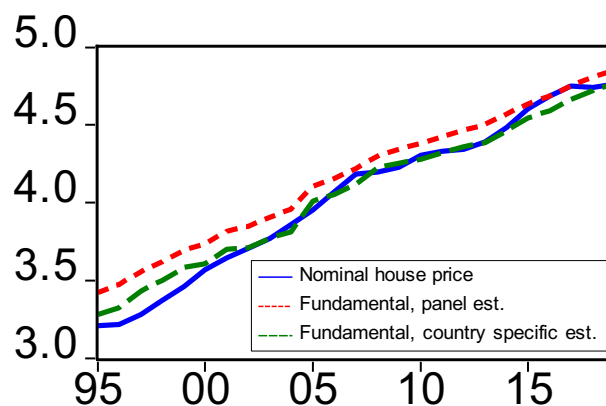


Figure 5.7: Log nominal house prices indices and Commission model benchmarks (panel and country specific estimate): Sweden.



Source and note: Figure 5.6: European Commission (2023c, chart 2.3c). The price-to-income and price-to-rent gaps are measured in deviation from the long-term average (from 1995 to 2022). The average house price gap is the simple average of the price-to-income, price-to-rent, and model-based valuation gaps. Figure 5.7: European Commission (2020, graph 3, panel SE). The latest observation is 2019.

by Philipponnet and Turrini (2017) and improved in European Commission (2020). The average of these three valuation gaps is then a summary measure of the degree of overvaluation.⁶⁴

Figure 5.6 reproduces European Commission (2023c, graph 2.3c) and shows the valuation gaps. Table 2.2 in European Commission (2023c) reports that, for 2022, the average overvaluation gap is 29% and the price-to-income gap is 34.5%. The PTR and model-based gaps are not reported. From the figure, the model-based valuation gap appears to be about -5% . It follows that the PTR gap is about $3 \times 29 - 34.5 + 5 = 57.5$.⁶⁵

Interestingly, the model-based valuation gap in figure 5.6 is very different from the (misleading) PTI and PTR gaps. It indicates only some modest average overvaluation before 2018 and some modest undervaluation after. Figure 5.7 reproduces European Commission (2020, graph 3, panel SE) and shows the log of an index of Swedish house prices and the Commission model estimates, for an EU-wide panel estimation and a country-specific estimation with latest observation 2019. For the country-specific estimation, there is hardly any indication of over- or undervaluation. For the EU-wide estimation, there is some indication of undervaluation.⁶⁶

In summary, according to the Commission (European Commission, 2023c, p. 5):

⁶⁴ In contrast to the ECB models, the Commission model is well documented in Philipponnet and Turrini (2017) and European Commission (2020); the latter is available upon request. The model valuation gap is estimated in a cointegration framework with nominal house prices as the dependent variable and five fundamental explanatory variables: total population, real housing stock, real disposable income per capita, real long-term interest rate and price deflator of final consumption expenditure.

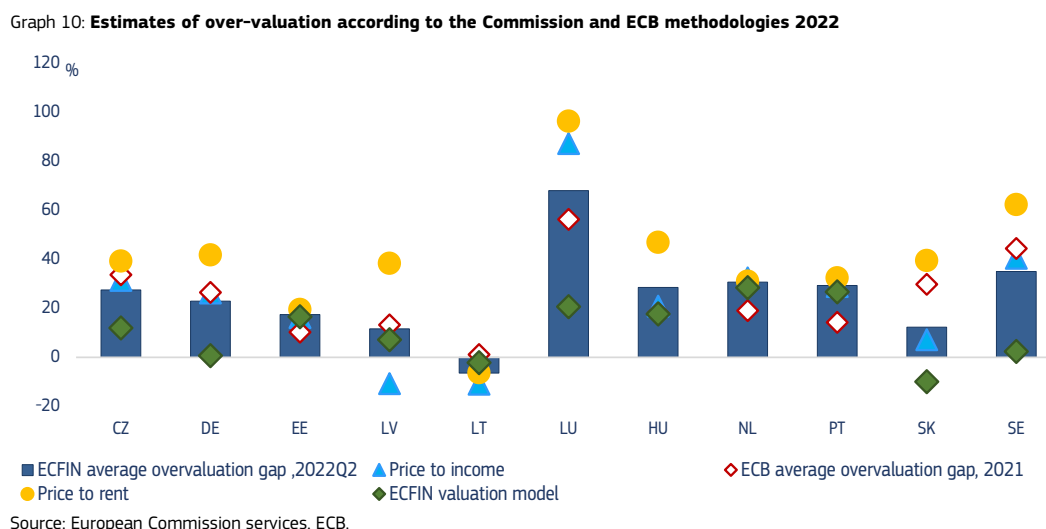
⁶⁵ Closer inspection of the y-axis in graph 2.3c (figure 5.6) reveals that it is not quite consistent with the numbers in table 2.2, although the absolute discrepancy for the model-based gap should be small because the gap is small.

⁶⁶ The EU-wide estimation makes the completely unrealistic assumption that the model parameters are the same for all EU countries.

Swedish house prices still seem overvalued. ... house prices were estimated to be around 29% overvalued... in 2022 (graph 2.3c [figure 5.6]).

For information, figure 5.8 reproduces [European Commission \(2023b\)](#), graph 10) in the background note and shows the Commission’s and the ECB’s estimates of overvaluation (the latter discussed in section 5.1) for several EU countries.

Figure 5.8: Estimates of over-valuation according to the Commission and ECB methodologies 2022 ([European Commission, 2023b](#), Graph 10).



Source and note: [European Commission \(2023b\)](#), Graph 10)

In conclusion, is rather obvious from the results in the present paper that there is a strong case for replacing the misleading PTI and PTR ratios in the Commission’s valuation methodology by the UCTI and UCTR ratios.

However, for Sweden the UCTR ratio is more or less irrelevant, given the dysfunctional rental market. This leaves the UCTI ratio for Sweden. In figure 1.1, the unadjusted and adjusted percentage deviation of the UCTI ratios during 2022 are 0% and –16%, respectively. If they would be combined with the Commission’s model-based gap of about –5%, the corresponding average valuation gap in 2022 would be –2.5% and –10.5%, respectively. The difference from the Commission’s average valuation gap of +29% is substantial, 31.5 and 39.5 pp, respectively.

5.2.1 The Commission’s UCC calculation and the corresponding UCTI results

The European Commission has collected a database, the Housing Taxation Database, of comparable time series of the main features of home ownership taxation and user cost of housing in the EU and the UK ([Barrios et al., 2019](#), [Grünberger et al., 2023](#)). The purpose of the database is not to assess any overvaluation of housing but to display the distortions of housing choices caused by taxation. Expression (3.3) is a somewhat simplified variant of the expression of the UCC presented there.⁶⁷

⁶⁷ What is called the user cost of capital (UCC) here is called the user cost of owner-occupied housing (UCOH) indicator in [Barrios et al. \(2019\)](#) and [Grünberger et al. \(2023\)](#).

However, the database can directly be used for estimation of the user cost and the UCTI ratios for valuation assessments in the EU. For example, the UCTI ratios can be constructed by multiplying the UCC estimates with the PTI ratios in the Commission’s HouseLev database (Bricongne et al., 2019). Indeed, the calculations of the UCTI ratios in ESRB (2022b, box 4) and figure 5.6 use these two Commission databases.

Figure 5.9: The European Commission’s user cost of capital for Sweden.

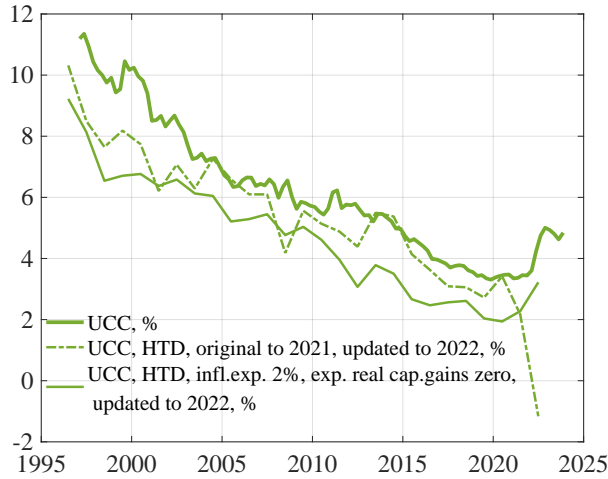
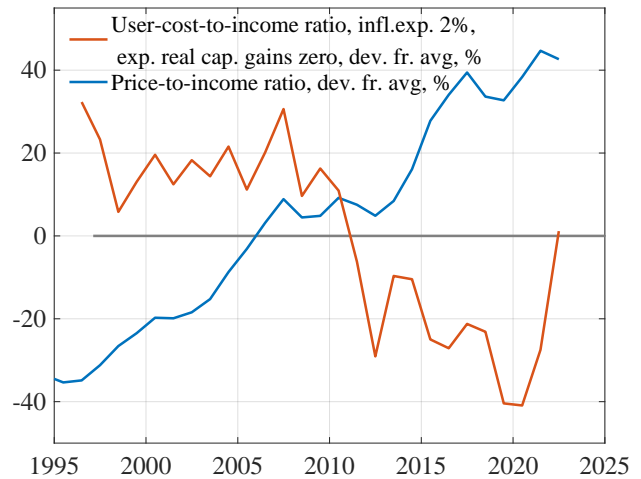


Figure 5.10: The Commission price-to-income and user-cost-to-income ratios for Sweden. Percentage deviation from historical average.



Source and note: Grünberger et al. (2023), and own calculations. Figure 5.9: The thick solid line is the UCC from figure 3.6. The dashed-dotted line is the original HTD UCC for Sweden updated to 2022. The thin solid line is a modified HTD UCC calculated with 2% inflation expectations and zero expected real after-tax capital gains. Figure 5.10: The PTI ratio is from HouseLev. The UCTI ratio is the product of the PTI ratio and the modified HTD UCC with 2% inflation expectations and zero expected real after-tax capital gains.

Figure 5.9 shows the HTD’s original estimate for Sweden of the UCC (dash-dotted line), updated by me for the year 2022.⁶⁸ The rise in HICP inflation in 2022 makes the UCC drop to the negative range, corresponding to an expected large nominal capital gain. The thin solid line shows a modified HTD UCC, for which I assume that inflation expectations are 2% and that the expected real after-tax real capital gains are zero (thin solid line). The figure also shows the UCC estimated in this paper (thick solid green line).⁶⁹

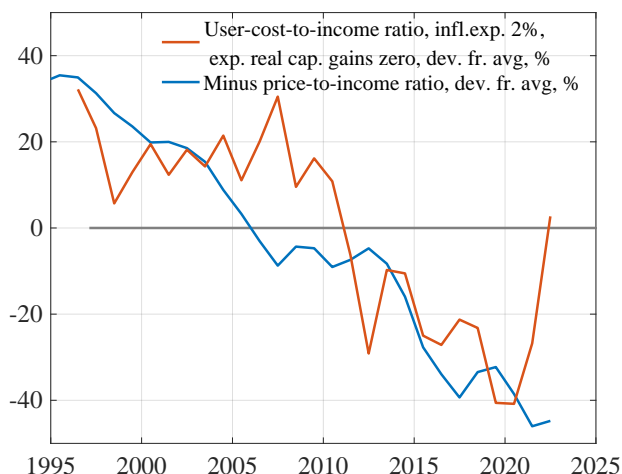
There is a similarity between the modified HTD estimates of the UCC and the estimate used in this paper. This means that, if the Commission would use these UCC estimates to calculate the user cost and the UCTI and UCTR ratios to assess the valuation of housing in Sweden, it would get results similar to the ones I get in this paper. Thus, the Commission results using the HTD would contradict its conclusions from figure 5.6.

⁶⁸ The update is explained in appendix A.

⁶⁹ I interpret Barrios et al. (2019, pp. 13–14) to assume that housing-price inflation in year $t + 1$ equals HICP inflation in year t . This is equivalent to assuming that inflation expectations are equal to current HICP inflation and that expected real capital gains are zero. In terms of equation (3.2), the original HTD assumes that $\pi_t^{he} = \pi_t^{HICP}$, where π_t^{HICP} denotes HICP inflation in year t . This makes for a volatile real interest rate, equal to the interest rate minus current HICP inflation, and thus a volatile UCC. The reasons for instead using 5-year inflation expectations or constant 2% expectations are discussed in section 3.3.

If the Commission would use its original UCC estimates, the negative UCC for 2022 would make the UCTI ratio fall and become negative in 2022. The modified UCC, which rises in 2022, makes more sense, in my mind.

Figure 5.11: The Commission user-cost-to-income ratio and the negative of the price-to-income ratio for Sweden, % deviation from historical average.



Source and note: See figures 5.9 and 5.10.

Figure 5.10 shows the PTI ratio for Sweden (from the HouseLev database) and the UCTI ratio, both in percentage deviation from their historical average. The UCTI ratio is the product of the PTI ratio and the modified HTD UCC in figure 5.9, to be compared with the unadjusted PTI and UCTI ratios in figure 1.1.

Figure 5.11 shows the same negative correlation between the Commission PTI and UCTI ratios as figure 1.2. The correlation coefficient is -0.8 . If the UCTI indicator is right, the PTI indicator is completely wrong, at least for Sweden.

5.3 The OECD

Previously, the OECD has warned about overvaluation of Swedish housing. For example:

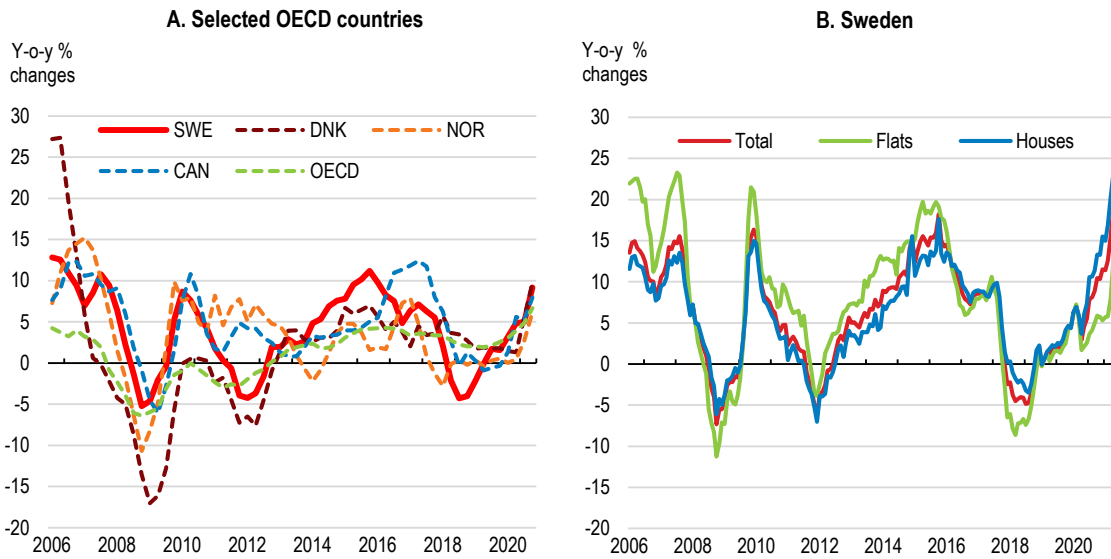
Buoyant house prices in some economies raise concerns about financial stability

...Some advanced economies have experienced rapid house price growth, including Canada, Sweden, Australia and the United Kingdom. In these countries, house prices are elevated relative to rents (i.e. rental yields are low), suggesting overvaluation. As past experience has shown, rapid house price growth can be a precursor of an economic downturn, especially when they occur simultaneously in a large number of economies. (OECD, 2017, pp. 43–44)

However, in the most recent OECD economic surveys of Sweden, OECD (2021b, 2023c), I have not found any suggestions of overvaluation:

Like in several other OECD countries, easy financing conditions and changing preferences have pushed up housing prices sharply during the pandemic (Figure 1.13, Panel A)

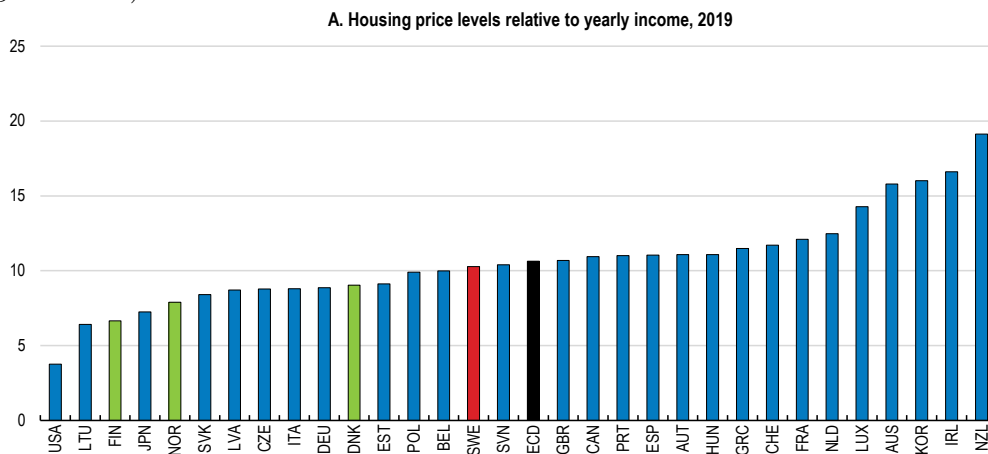
Figure 5.12: House prices have been rising at a fast pace (OECD, 2021b, figure 1.13).



Note: Panel A displays quarterly data adjusted for inflation using the private consumption deflator, up to 2020q4. Panel B displays nominal monthly data, up to April 2021. Source: OECD, House Price database and Valuedguard.

[reproduced as figure 5.12]. In contrast with previous recent upswings, houses have gained more value than apartments in 2020, likely reflecting demand for space, as people spend more time at home than before the pandemic (Panel B). **Average housing prices relative to income are close to the OECD average, but higher than in the other Nordics** (Figure 1.14, Panel A) [reproduced as figure 5.13]. (OECD, 2021b, p. 29–30, my emphasis)

Figure 5.13: The Swedish house-price-to-income ratio is close to the OECD average ... (OECD, 2021b, figure 1.14A).

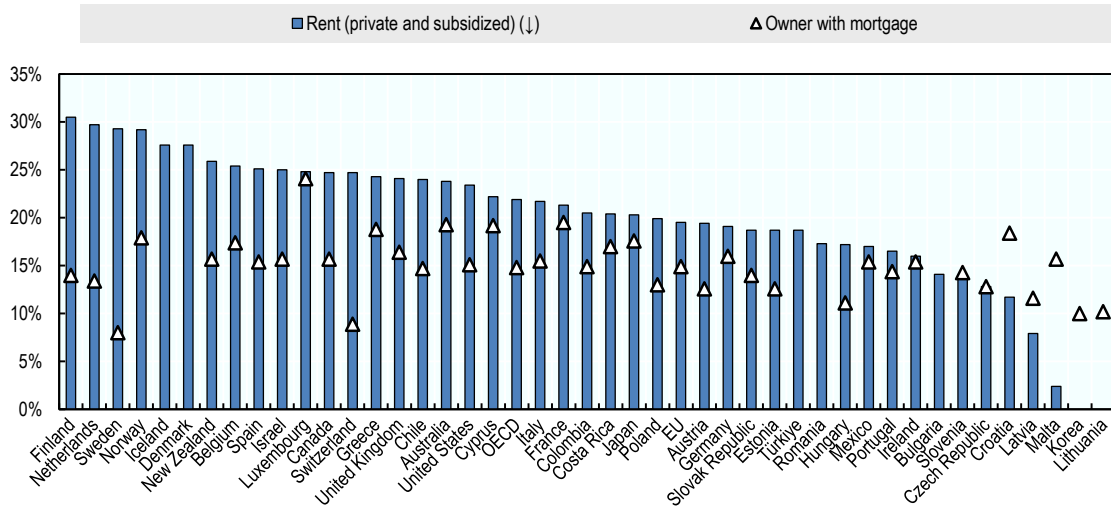


Note: The number of years of per capita gross disposable income needed to buy a 100 sqm dwelling (for more detail, see Bricongne et al., 2019). Source: HouseLev; OECD, House price database and OECD, National Accounts database.

Real housing prices increased sharply during the pandemic. A number of factors are estimated to have contributed, including the easing of financial conditions, a temporary lifting of the amortisation requirement for borrowers who applied for an exemption, and

a shift in demand towards larger apartments and houses outside of the city centres on the back of the expansion of teleworking. Swedish [real] home prices have fallen around 19% from their March 2022 peak, one of the steepest falls in the OECD, amid tightened financial conditions, and are likely to fall further this year. (OECD, 2023c, p. 24)

Figure 5.14: Households’ housing cost burden (mortgage and rent cost) as a share of disposable income (OECD, 2022a, figure HC1.2.1).



Note: Median mortgage burden (principal repayment and interest payments) or rent burden (private market and subsidized rent) as a share of disposable income, in percent, 2020 or latest year available. See (OECD, 2022a, figure HC1.2.1) for extensive notes.

5.3.1 Housing affordability

The OECD has done considerable work on housing affordability and constructed the OECD Affordable Housing Database (OECD, 2023b,a), with several indicators of housing affordability (OECD, 2021a), summarized in OECD (2021a, table HC.1.5.1). Interestingly—and much justified, in my opinion—in this work there is some skepticism against the use of price-to-income ratios.

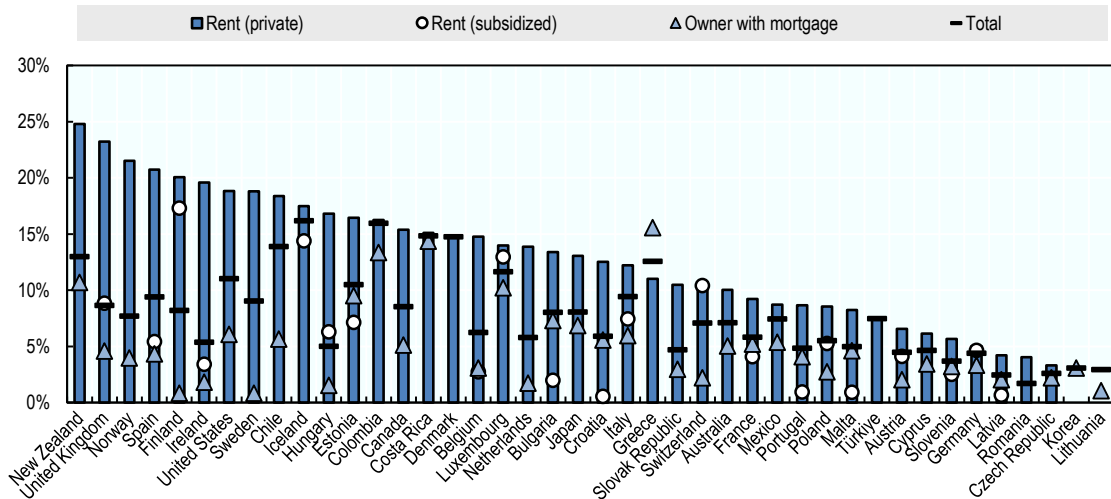
However, from a policy perspective, price-to-income ratios have their limits. Because they are calculated at the aggregate level, they say little about the distribution of housing costs and housing affordability. **They do not take into account household borrowing costs to acquire housing.** They do not provide information on who does and does not have access to affordable housing, or why, nor do they provide any indication of the quality of housing that households are paying for. Because these measures provide only a general indication of the extent to which housing is (un)affordable for a (median) household, they are ill suited to support policy makers in targeting housing supports to different groups. (OECD, 2021a, p. 1, my emphasis)⁷⁰

Instead, OECD (2021a) suggests expenditure-to-income ratios, for example, with a threshold of 30% of gross income, below which housing is considered “affordable”. A related measure is the

⁷⁰ This to some extent contradicts (OECD, 2022b, p. 1): “[H]ouse prices can be compared to income (price-to-income ratio) as a measure of the affordability of owning a dwelling. If the price-to-income ratio is above (below) their long-term average, house prices are considered to be overvalued (undervalued).”

housing overburden rate, which captures the share of households spending an unacceptably large share of income on housing (that is, above a given threshold); both Eurostat and the OECD set the overburden threshold at 40% of household disposable income (net of housing allowances). Residual-income measures are also discussed.⁷¹

Figure 5.15: Housing cost overburden rate for owners (with mortgage) and tenants (private rent and subsidized rent) (OECD, 2022a, figure HC1.2.3b).



Note: Share of population spending more than 40% of disposable income on mortgage and rent, by tenure, in percent, 2020 or latest year. In Denmark, the Netherlands, New Zealand and Sweden tenants at subsidized rate are included into the private market rent category due to data limitations. See (OECD, 2022a, figure HC1.2.3b) for extensive notes.

Regarding Sweden, the owner-occupiers’ median mortgage burden (principal repayment and interest payments) as a share of disposable income, it was at 8% the lowest in OECD in 2020 (OECD, 2022a, figure HC1.2.1, reproduced as figure 5.14). As for the owner-occupiers’ housing overburden rate, that of Sweden and Finland was at 0.9% the lowest in OECD in 2020 (OECD, 2022a, figure HC1.2.3b, reproduced as figure 5.15). See also appendix E and figures E.1 and E.2 on Swedish housing expenditure shares and disposable income by tenure.

It is difficult to see that these low numbers would be consistent with considerable overvaluation of Swedish housing. Rather they are consistent with some undervaluation.⁷²

⁷¹ The OECD housing costs (OECD, 2022a) can refer to: (1) a narrow definition based on rent and mortgage costs (principal repayment and mortgage interest); or (2) a wider definition that also includes the costs of mandatory services and charges, regular maintenance and repair, taxes and utilities, which are referred to “total housing costs”. They differ from user costs and rather represent households’ cash payments for housing.

⁷² A recent European Commission discussion paper, Frayne, Szczypińska, Vašiček, and Zeugner (2022), discusses housing developments in the euro area with a focus on housing affordability, thus not including Sweden. It suggests three different indicators of housing affordability, namely, the price-to-income ratio, the housing-cost overburden rate, and measures of the household borrowing capacity. Regarding the borrowing capacity, it makes the important distinction between the loan-service capacity and the capacity to buy the equity portion of the housing (p. 18). Nevertheless, it presents and appears to give equal weight to PTI ratio as to the other indicators, without commenting on the fact that the PTI ratios may give opposite messages from the other more relevant indicators and may even be negatively correlated with them, as for Sweden in figure 1.2. As mentioned, taking the average of the PTI and UCTI indicators is not a good idea.

5.4 IMF

Previous IMF Article-IV reports have warned about Swedish house prices being too high. For example, in the 2019 report:

24. High housing prices and high market rents increase vulnerabilities and inequality. Despite their recent moderation, house prices have tripled in real terms since the mid-1990s, lifting the price-to-income (PTI) ratio to almost 30 percent above its 20-year average, with Stockholm’s PTI nearly twice the national average and among the highest worldwide. New purchasers must take on high debts relative to income (DTI), typically at floating rates, a macrofinancial vulnerability. (IMF, 2019, pp. 13–14)

However, the 2021 Article-IV report of the IMF on Sweden, IMF (2021), does not mention any overvaluation of Swedish housing:

19. As in many countries, residential housing prices continued to strengthen, potentially raising some risks. Easing of macroprudential regulation and monetary policy, coupled with fiscal support and likely changes in housing preferences, have contributed to rising demand. Although the 2020 price increase was higher than in most countries, it was relatively mild compared to the experience over the past decade. Recent stress tests suggest that most households have sufficient buffers to service their debt in case of income loss or mortgage rate increases, and the loan-to-value ratio is quite low (at below 70 percent, an average). However, with continued price increases, a slow recovery, and the recent acceleration of consumer credit, the number of highly indebted borrowers could increase. Staff advised that more comprehensive data collection on households’ balance sheets would help improve monitoring these risks and welcomed the recently launched government inquiry on household balance sheet statistics. (IMF, 2021, p. 17)

Furthermore, the 2023 Article-IV and FSAP reports, IMF (2023a,b), do not mention any overvaluation of Swedish housing.

5.5 Model estimates: The ECB, the Commission, the Riksbank, and the National Debt Office

As noted, in addition to the statistical indicator PTI and PTR ratios, the ECB uses two empirical models. The ESRB reports the results of one of those models, the inverted-demand model, in its valuation assessment. As noted in section 5.1 this model seems problematic. We also see in figure 5.2 (yellow lines) that the estimates are quite volatile with some very high estimates and a substantial difference between real-time estimates. The inverted-demand model and its coefficient estimates are not documented in any detail. The “asset-pricing model” is not documented at all. It is therefore difficult to assess the models’ relevance and the appropriate weight on their results.

As mentioned, the Commission uses the model of Philipponnet and Turrini (2017), which is improved in European Commission (2020, available upon request). This model is well documented. It indicates some modest average overvaluation before 2018 and some modest undervaluation after (figure 5.6).

It is of some relevance to compare with the results of two other relatively recent, well-documented models of house prices in Sweden. They are constructed by Riksbank and National Debt Office staff, respectively. The models do not find any indication of overvaluation.

[Dermani, Lindé, and Walentin \(2016\)](#) of the Riksbank examine whether Swedish house prices can be explained by fundamental variables. In an international comparison, they estimate real house prices on data for a panel of seven countries: Denmark, Finland, Germany, Norway, Sweden, the UK, and the US. The explanatory variables are real disposable income per capita, real financial wealth, the real mortgage rate, annual CPI inflation, annual population growth, and residential investment as a fraction of GDP. They assume that the coefficients are the same across countries and make assumptions that allow individual countries to be over- or undervalued throughout the sample. On average over the sample, Swedish housing has been somewhat undervalued. More recently, it is undervalued after 2011.

[Dermani et al. \(2016\)](#) also examine possible over- or undervaluation in Swedish municipalities, with a different method, namely, by examining the UCTI ratios over time. They thus use the municipality user cost share of median income as an indicator of overvaluation.⁷³

Their summary conclusion is:

According to the methods we have used, there is no evident overvaluation of houses in Sweden, either in the country as a whole or in the municipalities for which we have data ([Dermani et al., 2016](#), p. 42).

[Bjellerup and Majtorp \(2019\)](#) of the National Debt Office present a thorough and granular analysis of the data and development of Swedish housing prices. In particular, they estimate a simple cointegrating vector of real house prices as a function of real disposable income and the real after-tax interest rate, with a dummy for the introduction of the 85% LTV cap in 2010q4. There is no evidence of overvaluation since 2011. Furthermore, the rise in real house prices during 1996–2017 is well explained by the fall in the real after-tax interest rate and the rise in real disposable income.

It makes sense to put more weight on the results of models that are well documented. With such a weighting, the average model results do not indicate any significant overvaluation.

More recently, [Sveriges Riksbank \(2021\)](#) has discussed the reasons behind the rapidly rising housing prices during the coronavirus crisis (see figures [F.19](#) and [F.20](#)). It suggests that the price rise is due to a preference shift in favor of larger housing and location outside the large cities. That is, the price rise is considered due to fundamental factors and not any indication of overvaluation.

6 Conclusions

The concluding section summarizes a main but simple methodological point and some factual points made in this paper. It also suggests some improvements of valuation assessments and mentions some qualifications.

The **methodological point** is, first, that the user-cost-to-income ratio is a natural indicator of valuation and affordability of owner-occupied housing. The user-cost-to-rent ratio is a natural

⁷³ Their measure of user cost excludes the OMRD and any expected capital gains.

indicator of the relative affordability of owner-occupied housing and rental housing—but it is less informative for Sweden, given rent control and a dysfunctional rental market. The user cost has scientific support in a large housing literature as a measure of the cost of living in owner-occupied housing. House prices do not at all represent that cost of living. In this context, “Are house prices too high?” is the wrong question. The right one is “Are user costs too high?”

The UCTI and UCTR indicators may be expressed as percentage deviations from their historical averages, as indices with a particular base year, or as percentages of income and rents, respectively. The UCTI and UCTR ratios are the product of the user cost of capital and, respectively, the price-to-income and price-to-rent ratios. The UCC is the user cost as a percentage of the house price. It summarizes crucial information about the housing costs: the financing cost (mortgage and equity); the operation, maintenance, repair and depreciation costs; taxes; any risk premium; and expected capital gains.

Second, the PTI and PTR ratios on their own are misleading indicators of valuation and affordability. This is because house prices do not at all represent the cost of living in owner-occupied housing. The PTI and PTR ratios disregard the crucial information in the UCC and the resulting considerable variability in the UCC.

For Sweden, the UCTI and PTI ratios are strongly negatively correlated, with a correlation coefficient of -0.8 . Their larger percentage deviations from historical averages have opposite signs (figure 1.2). Then they give completely opposite messages about housing affordability and valuation. And the UCTI ratio has strong scientific support, whereas the PTI ratio has none.

Dwellings are unique in their location and the land they sit on. Dwelling prices are to a large extent determined by the location and other conditions in the local housing market. There is considerable heterogeneity between the housing market in large cities and in the countryside, in Sweden and in other countries, and the difference in prices between similar structures in different local housing markets can be large. The user-cost approach can easily be applied to local markets, such as the Stockholm inner city in (Flam, 2016). It can also be applied to quite specific types of dwellings, such as the owner-occupied and rent-controlled studios in Stockholm Municipality and County in Svensson (2020, 2021a,b). Studying critical local markets provides more precise information about affordability and any overvaluation, as well as more precise and relevant comparisons between user costs and rents in SEK rather than indices for similar dwellings.

This simple methodological point should be obvious and uncontroversial.

Regarding the **factual points**, according to ECB (2023) and the ESRB (2022b), Swedish owner-occupied housing (OOH) was overvalued by about 55% in 2021q2, the largest overvaluation in EU and EEA; according to the European Commission (2021), by at least 30% in 2020q4. These assessments affect warnings and recommendations issued for Swedish economic policy and shocks in EBA stress tests of Swedish banks.

However, this paper demonstrates that these large overvaluation assessments are mainly due to the use of the PTI and PTR valuation indicators. According to the UCTI indicator, Swedish owner-occupied houses have since 2010 instead become increasingly undervalued, not overvalued, with a trough in 2019q4 of about -35% . Since then, taking into account a preference shift during

covid toward larger and better homes and rising interest rates from 2022, the UCTI indicator has risen to reach about -25% in 2023q4. Thus, according to the UCTI indicator, in 2023q4 Swedish houses were still substantially undervalued.

If the ESRB and the Commission would be right about Swedish housing prices having been overvalued by 30–55%, one might think that a mortgage-rate rise of several percentage points in 2022 would trigger a correction of at least a similar magnitude as the proposed overvaluation, plus an additional adjustment due to the higher mortgage rates and user cost of capital. What has happened and will happen to house prices can thus be seen as a separate test and natural experiment of the ESRB’s and the Commission’s overvaluation thesis. So far, by monthly data, from a peak in March 2022, house prices fell by 16% in January 2022, far from a crash of 30–50% or more (figures F.8 and F.9).

From the ESRB’s own calculation of the UCTI and UCTR ratios for five other countries than Sweden (figure 5.4), it is clear that misleading assessments of overvaluation from the use of the PTI and PTR indicators is a problem that concerns several other countries in the EU than Sweden. Any misleading assessments will distort ESRB’s decisions about which countries should receive warnings and recommendations regarding real-estate vulnerabilities (ESRB, 2022a) and the relative severity of the EBA’s EU-wide stress tests; they will also distort the Commission’s decisions about which countries may have macroeconomic imbalances and need special monitoring in the so-called macroeconomic imbalance procedure (European Commission, 2022).

Regarding **improvements in housing valuation assessments**, the obvious (and now hopefully uncontroversial) suggestion is to use UCTI and UCTR indicators rather than the PTI and PTR ones, with the qualification that the relevance in informativeness of the UCTR indicator depends on the functioning of the rental market. It is easy to improve the housing valuation assessments this way. Figures such as 1.1, 4.3 (with a functioning rental market), and 3.6 (as well as the ESRB’s figure B reproduced as figure 5.4) provide substantial information. The Commission’s existing Housing Taxation and HouseLev databases make it simple to replicate these valuation assessments for most of the EU countries (Grünberger et al., 2023). These databases could be revised and extended to explicitly include UCTI and UCTR ratios for the EU countries. The OECD Housing Affordability database (OECD, 2023b) could be extended to explicitly include user costs and UCTI ratios as a complement to the current housing expenditure measures for OECD countries. These databases would be even more useful if they included quarterly data and were updated more frequently.

The international organizations also use various econometric models of house prices for valuation purposes. To assess their reliability and appropriateness, external scrutiny is necessary. To allow external scrutiny, the models need to be publicly documented in detail and ideally be accompanied by replication kits, as has become standard in many scientific journals. Such replication kits need to include both code and data, or links to public databases. Then researchers, other organizations, and interested parties can reproduce the results as well as update the results with new data. The use of publicly undocumented models prevents external scrutiny and risks prolonging the use of inappropriate or erroneous models.

Some simple “asset pricing” models assume that UCTR ratios (or UCTI ratios) are constant.

These simple models are rejected by the findings that UCTR and UCTI ratios are far from constant but fluctuate substantially due to inertia, frictions, and other market imperfections (Duca et al., 2021a,b).

Regarding **qualifications** of the analysis and results in the present paper, the simple user-cost approach applied here is appropriate for assessing whether a given combination of current and past house prices, user costs of capital, disposable incomes, and rents indicate that owner-occupied housing is overvalued or undervalued—in which case over- or undervaluation is measured in terms of the cost of living in owner-occupied housing relative to disposable incomes and to rents. But it is not a precise theory of how house prices depend on all the relevant fundamentals, and how house prices may change when those fundamentals change. Such a theory needs to take into account the supply of housing, the liquidity and credit constraints facing households, the role of housing cash payments for liquidity-constrained households as distinct from user costs, and other frictions and imperfections in the housing and mortgage markets. Simple house-price theories that assume that UCTI or UCTR ratios are constant are rejected for Sweden by the results of this paper.

Furthermore, the UCTI and UCTR indicators constructed depend on the assumptions made. But the assumptions are transparent and simple. They can easily be modified for sensitivity and robustness tests, or replaced by other assumptions considered more appropriate, depending on the country and housing and mortgage market being examined.

Appendix

A Data appendix

For Swedish house prices, the longest series is a quarterly price index for one- and two-dwelling houses for permanent living of [Statistics Sweden \(2024f\)](#). It excludes apartments. It is also reported with a lag of 2–3 months because it uses the date of the deed rather than the earlier date of the contract. From 2005, a monthly index, the HOX index, is provided for houses and apartments by [Valueguard \(2024\)](#). Figure [F.19](#) shows the different price indices. I use a linked quarterly price index consisting of the Statistics Sweden price index up to 2005q1 (adjusted for the lag in reporting) and a quarterly mean of the HOX index from 2005q1, shown in figure [F.7](#).⁷⁴

Income is net disposable income per capita, that is, net disposable income divided by the population ([Statistics Sweden, 2024d](#)). Net disposable income is a 4-quarter trailing moving sum of quarterly net disposable income.

There is a choice between using disposable income or disposable income per capita, and between gross and net disposable income (the latter is net of the depreciation of households' fixed capital). Here I use net disposable income per capita. International organizations often use gross in international comparisons because countries calculate fixed-capital depreciation differently. Figure [F.10](#) shows that for Sweden the difference between gross and net disposable income is small.

In the national accounts, Ukrainian refugees are included in Swedish households and population according to the European Union's activated Temporary Protection Directive ([Council of the European Union, 2001](#)).

⁷⁴ [SBAB Booli \(2024\)](#) has a monthly price index for apartments and houses from 2013.

The mortgage rate is a quarterly mean of a 5-year monthly rate from [SBAB \(2024\)](#). Mortgage-rate expectations are from [NIER \(2024\)](#). The expectations of house-price appreciation are from [Evidens \(2019, 2022\)](#).

The CPI is from [Statistics Sweden \(2024c\)](#) and inflation expectations are from [Kantar Sifo \(2024\)](#) and Refinitiv.

Rents are from [Statistics Sweden \(2024a, 4103 Main rental\)](#). Presumption rents (rents in newly constructed buildings) are from [Statistics Sweden \(2022b, 2023d\)](#).

Values of structures and land are from [Statistics Sweden \(2023a,c\)](#). Operation, maintenance, and repair costs are from [Statistics Sweden \(2023c\)](#). They are summarized in table [F.1](#). The values of structures and land are slightly smoothed; see figure [F.11](#). Prices of electricity; repair goods; home insurance; and water, sewage, and waste services are from [Statistics Sweden \(2024a, 4703 Electricity, 4605 Repair goods, 9801 Home insurance\)](#) and [Statistics Sweden \(2024b, 04.4 Owner-occupied housing: Water and dwelling services\)](#) (figure [F.23](#)).

Some additional data sources are reported in notes to figures and in the appendixes. Data sources from the ECB and the European Commission are reported in sections [5.1–5.2](#).

The Housing Taxation Database 1995–2021 ([Grünberger et al., 2023](#)) has been updated by me for 2022 by setting the parameters for 2022 equal those of 2021. The long-term interest rates and mortgage rates have been updated for 2022 using the same sources (Eurostat and SDW, respectively) that the database uses for 1995–2021.

B Cointegration and elasticities

Logs of the series PTI, PTR, P, and UCC are nonstationary (with and without the preference adjustment shown in figure [1.1](#)). That is, augmented Dickey-Fuller tests do not reject the hypothesis of a unit root. The first-difference of the logs of the series are stationary. If the levels are nonstationary and the first-differences are stationary, the logs of the series are integrated of order one, $I(1)$. The rest of appendix [B](#) uses the preference-adjusted PTI, PTR, and P series.

If the logs of the series are $I(1)$ and have a stationary linear combination, they are cointegrated. The demeaned logs of the series PTI, PTR, and P are cointegrated with the demeaned logs of the series UCC, with p-values for Engle-Granger cointegration tests (1 lag, no constant) equal to, respectively, 1.9%, 0.8%, and 2.5%.⁷⁵

If the series \log PTI and \log UCC are cointegrated, there is a stationary linear combination,

$$u_t = \log \text{PTI}_t - \beta \log \text{UCC}_t, \quad (\text{B.1})$$

where u_t equals the residual from a linear regression of \log PTI on \log UCC. Furthermore, the estimate of the coefficient, β , is superconsistent, meaning that it converges faster than OLS estimates with increasing number of observations ([Engle and Granger, 1987, Rajbhandari, 2016](#)).

Table [B.1](#) shows the estimated coefficients for regressions of logs of PTI and PTR on the log of UCC (the coefficient β in [\(B.1\)](#)). These can be interpreted as long-run elasticities with respect to UCC.

In order to show that in this case the deviation of the UCTI ratio from its average is approximately the negative of the deviation of the PTI ratio from its average, we note that from [\(1.2\)](#) the log of the UCTI ratio satisfies

$$\log \text{UCTI}_t \equiv \log \text{UCC}_t + \log \text{PTI}_t. \quad (\text{B.2})$$

⁷⁵ The test is done with the Matlab function `egcitest`, which uses the correct critical values, different from the standard critical values of the augmented Dickey-Fuller test.

Table B.1: The long-run elasticities of preference-adjusted PTI and PTR ratios and house prices with respect to the UCC.

	PTI	PTR	P
UCC	-0.48 (0.016)	-0.85 (0.020)	-1.24 (0.026)
Obs	106	106	106
R^2	0.90	0.95	0.96

Source and note: OLS regressions of demeaned logs of preference-adjusted PTI and PTR ratios and house prices P on the demeaned log of UCC. OLS standard errors in parenthesis. The constant is zero for demeaned series. Sample 1997q1–2023q2.

Figure B.1: Demeaned preference-adjusted log PTI and UCTI ratios and the stationary linear combination, the residual u_t .

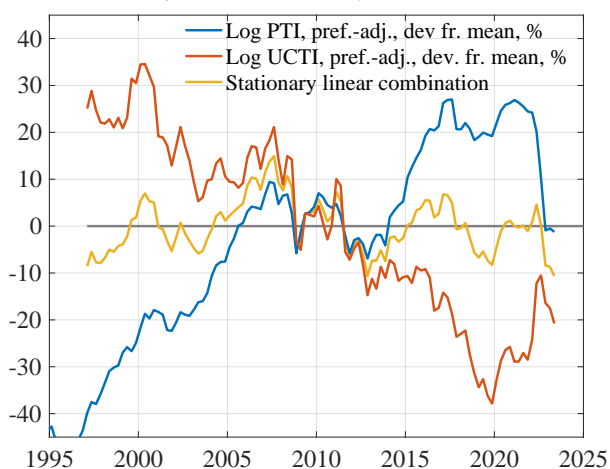
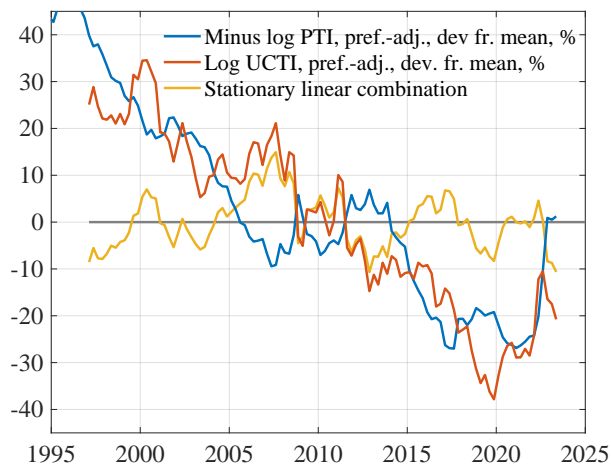


Figure B.2: Demeaned log UCTI ratio, the negative of the demeaned the log PTI ratio, and the stationary linear combination, the residual u_t .



Source and note: Own calculations. The ratios are preference-adjusted. The stationary linear combination is the u_t in (B.3).

This can be used to eliminate $\log UCC_t$ in the linear combination (B.1). This results in the following stationary linear combination,

$$u_t = (1 + \beta) \log PTI_t - \beta \log UCTI_t = 0.52 \log PTI_t + 0.48 \log UCTI_t. \quad (\text{B.3})$$

That is, the stationary residual u_t is (approximately) the mean of $\log PTI_t$ and $\log UCTI_t$. Taking the average of the two indicators is not a good idea.

We can rewrite (B.3) as

$$\log PTI_t = \frac{\beta}{1 + \beta} \log UCTI_t + \frac{1}{1 + \beta} u_t = -0.93 \log UCTI_t + \varepsilon_t, \quad (\text{B.4})$$

with $\varepsilon_t \equiv 1.93 u_t$.

Figure B.1 shows demeaned $\log PTI_t$ (blue) and $\log UCTI_t$ (red). The linear combination, the residuals u_t (yellow), is the (approximately) the average of the blue and red lines. Figure B.2 shows $\log UCTI_t$ and the *negative* of $\log PTI_t$, to illustrate their negative relation and (B.4). The linear combination u_t is then (approximately) half the difference between the red and blue curve.

The correlation coefficient between $\log PTI_t$ and $\log UCTI_t$ is -0.8 .

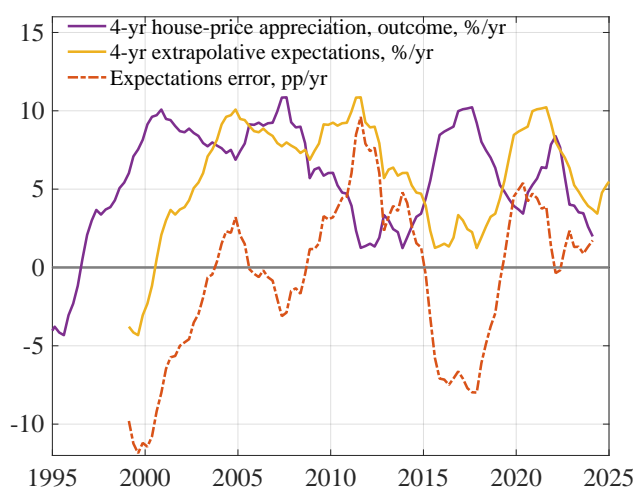
C Four-year extrapolative house-price expectations?

Muellbauer (2012) and Duca et al. (2021a, section 4.3) advocate 4-year extrapolative expectations of house-price appreciation.

While there is probably not a universal law of precisely how housing price expectations are formed, there is at least a hint from this set of evidence that econometric modellers should treat the lagged four-year rate of appreciation as an important candidate for measuring user cost. (Muellbauer, 2012, section 4.3)

What if Swedish households had such expectations? This case is shown in figure C.1.

Figure C.1: Actual 4-year nominal house-price appreciation, 4-year extrapolative household expectations, and the expectations error.



Source and note: [Statistics Sweden \(2024f\)](#), [Valueguard \(2024\)](#) and own calculations.

The purple line in the figure shows the actual 4-year house-price appreciation at an annual rate. The yellow line shows the expected outcome if households expect the annual rate of house-price appreciation the next 4 years to equal the current actual 4-year rate. This line is simply equal to the purple line shifted to the right 4 years.

As we can see, in this case, these are highly irrational and bad expectations. The correlation coefficient between the expectation and actual outcome is -0.3 . The dash-dotted red line shows the expectations error. The mean squared error is 25.

The Swedish households are better off with the stable expectations shown in figure 3.2. The mean squared error for constant 5% expectations is 12.

D Capital gains on owner-occupied houses

The UCC in section 3 is calculated under the assumption that expected real after-tax capital gains are zero. This is a conservative assumption in the sense that average ex-post real after-tax capital gains on Swedish housing have been substantial. The average is 3.3% for 1997q1–2023q4 and 0.8% for 2010q1–2023q4. It is also conservative in the sense of assuming that house buyers do not speculate in high capital gains. With on average positive actual capital gains, assuming they are zero introduces an upward bias in absolute user costs and UCTI and UCTR ratios and in that sense toward overvaluation. Thus, the cards are somewhat stacked in favor of finding overvaluation.

However, percentage deviations from historical averages are less or not affected, so there is less or no bias when overvaluation is measured in terms of such deviations.⁷⁶

Figure D.1: Nominal house prices actual nominal 5-year after-tax capital-gains rates, and averages rates from 1997q1 and 2010q1 to 2023q4.

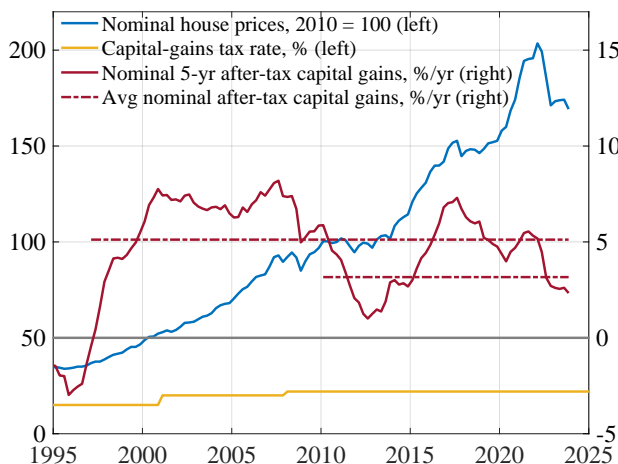
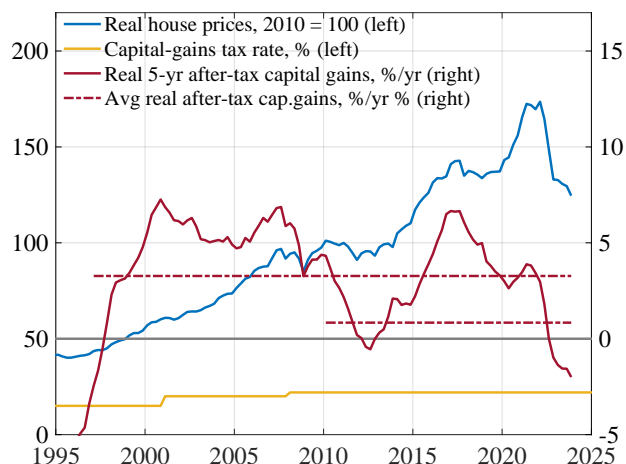


Figure D.2: Real house prices, actual real 5-year after-tax capital-gains rates, and averages rates from 1997q1 and 2010q1 to 2023q4.



Source and note: Englund (2020), Statistics Sweden (2024c,f), and own calculations. The nominal 5-year after-tax capital gains rate is calculated as $100\{[(1 + (1 - \tau_t^{cg})(P_t - P_{t-20})/P_{t-20})^{1/5} - 1]\}$. The average of the nominal after-tax capital-gains rate from 1997q3 to 2023q4 is calculated as $100 * \{[(1 + (1 - \tau_{23q4}^{cg})(P_{23q4} - P_{97q1})/P_{97q1})^{4/(23q4-97q1)} - 1]\}$. The real 5-year after-tax capital gains rate is calculated as $100\{[(1 + (1 - \tau_t^{cg})(P_t - P_{t-20}))/CPI_t] / [(1 + (1 - \tau_{t-20}^{cg})(P_{t-20}/CPI_{t-20}))^{1/5} - 1]\}$. The average real after-tax capital-gains rate for the two intervals is calculated by analogous deflation by the CPI.

Figure D.1 shows nominal housing prices, the tax rate on nominal capital gains, and the resulting ex-post 5-year nominal after-tax capital-gains rate and its averages from 1997 and from 2010.⁷⁷ Figure D.2 shows the corresponding ex-post real 5-year after-tax capital gains at an annual rate and their averages. We see that, whereas the ex-post real 5-year after-tax capital-gains rate has fluctuated substantially, it has only taken positive values except in 2012 and after 2022q3.

Figure D.3 adds the averages of the ex-post real after-tax capital-gains rate to figure 3.6. We see that the subtraction of the expectations of real after-tax capital-gains equal to the average of the ex-post real after-tax capital gains during 1997q1–2023q4 would result in an approximately zero UCC during 2019q1–2021q4, implying that the perceived cost of living in owner-occupied housing would be approximately zero. That is, owner-occupiers would expect to “live for free.” For expectations of capital gains equal to the average during 2010q1–2023q4, the UCC would remain positive.⁷⁸

The dash-dotted dark red line in figure D.4 shows the negative of the perfect-foresight 5-year forward real after-tax capital gains at an annual rate.⁷⁹ A house buyer with perfect foresight and a 5-year horizon—or using a 5-year horizon as an estimate of a longer horizon—could include this capital-gains rate in the calculation of the UCC, resulting in a UCC including perfect foresight

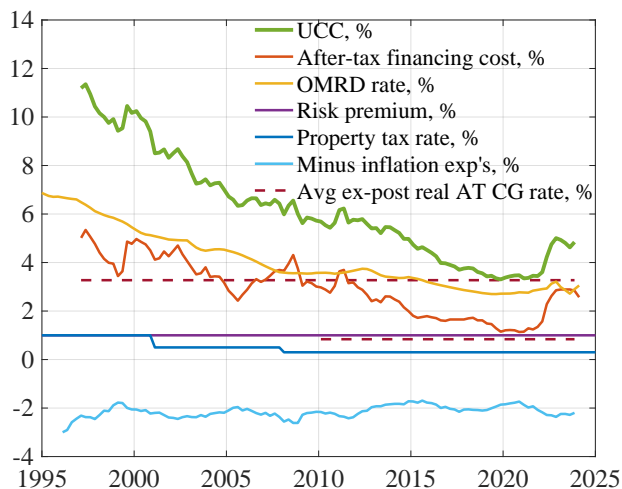
⁷⁶ For simplicity, it is assumed that the capital gains tax is paid every year. In practice, it can be postponed until the sale of the house, which reduces the present value of the tax (Englund, 2020).

⁷⁷ The capital-gains tax rate was 15% during 1994–2001, 20% during 2001–2007, and 22% from 2008 (Englund, 2020).

⁷⁸ That owner-occupation in Sweden ex post has resulted in a net profit during some periods has been discussed in Sandelin and Södersten (1978), Hansson (2019) and Englund (2020).

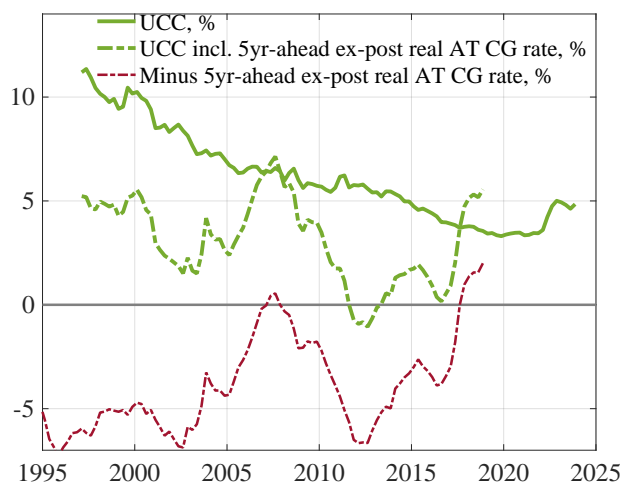
⁷⁹ It equals the negative of the real 5-year after-tax capital-gains rate in figure D.2, lagged 20 quarter. Values after 2018q4 are missing because the latest data point of house prices is 2023q4.

Figure D.3: The UCC, its components, and average real after-tax capital-gains rates from 1997q1 and 2010q1 to 2023q4.



Source and note: Sources and notes to figures 3.6 and D.2 and own calculations.

Figure D.4: The UCC excluding and including the perfect-foresight 5-year-ahead real after-tax capital-gains rate.



capital gains given by the dash-dotted green line. We see that this perfect-foresight UCC is quite volatile and close to zero in 2012 and 2016. We also see that the UCC under the conservative assumption is an approximate upper bound of the perfect-foresight UCC.

The fact that user costs and UCTI ratios *excluding* capital gains in figures 3.7 and 4.1 are relatively low and for the UCTI ratios even falling up to 2020 indicates that Swedish house buyers generally do not speculate in receiving large capital gains. High and rising UCTI ratios excluding capital gains might have indicated that such speculation occurs. It might have indicated that buyers thought the housing affordable only because they expected substantial capital gains.

Can housing capital gains be positive indefinitely, in a steady state with a constant real interest rate? The price of a dwelling is the sum of the value of the structure and the value of the land the dwelling sits on, including the value of the location of the dwelling. The value of the structure should be determined by the cost and productivity of and competition in the construction of structures. Depending on these factors, the real value of structures may very well be approximately constant in the long run, making nominal capital-gains rates positive and approximately equal to the CPI inflation rate. But the real value of land and location need not be constant in the long run. According to the classic Muth-Mills model (Brueckner, 1987, DiPasquale and Wheaton, 1996), the value of land in attractive locations may increase in steady state with real incomes or GDP, resulting in nominal capital-gains rates approximately equal to the growth rate of nominal incomes or GDP, that is, to the sum of the real growth rate and the rate of inflation. In such a steady state, the share of land and location in the value of housing will grow and the share of structures will fall, but nominal and real capital gains on housing will remain positive.

E Housing expenditures as a percentage of disposable income by tenure

Statistics Sweden (2014, 2022a) reports housing expenditures as a percentage of disposable income for rented, tenant-owned, and owner-occupied dwellings, averages in an older series for 2004–2013 and medians in a new series for 2015, 2017, and 2020. They are shown in figure E.1. For owner-

occupied dwellings, these housing expenditures include after-tax interest, amortization, and operation, maintenance, and repair expenditures. They correspond to housing payments (cash outflows) rather than user cost.

Figure E.1: Housing expenditure as a percentage of disposable income by tenure.

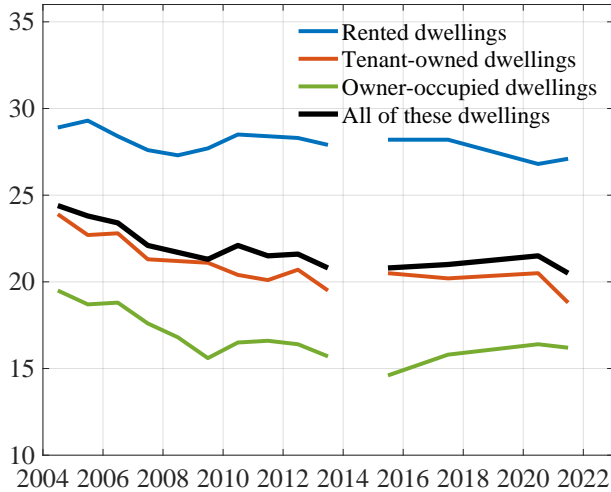
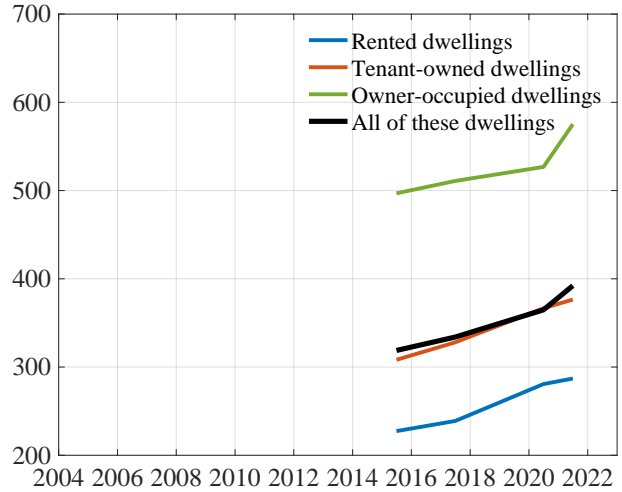


Figure E.2: Disposable income by tenure. SEK thousands.



Source and note: [Statistics Sweden \(2014\)](#), averages for housing expenditure 2004–2013; [Statistics Sweden \(2022a\)](#), medians for housing expenditure and disposable income for 2015, 2017, 2020, and 2021.

We see that households in rented dwellings have the highest expenditure shares. The expenditure shares for tenant-owned dwellings and, in particular, owner-occupied dwellings, are substantially lower than those for rented dwellings. This is to a substantial extent because owners have higher disposable incomes than renters (figure E.2). The expenditure shares of owners are low, do not show any upward trend, and do not indicate any overvaluation in the sense of housing payments becoming large relative to disposable income.⁸⁰

⁸⁰ See also section 5.3, figure 5.14, and OECD’s work on housing affordability discussed there.

F Additional figures and table

Figure F.1: Nominal house prices, disposable income, disposable income per capita, and rents, and population.

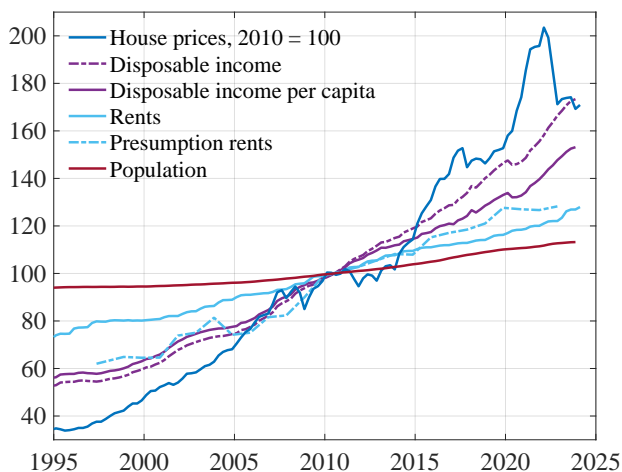
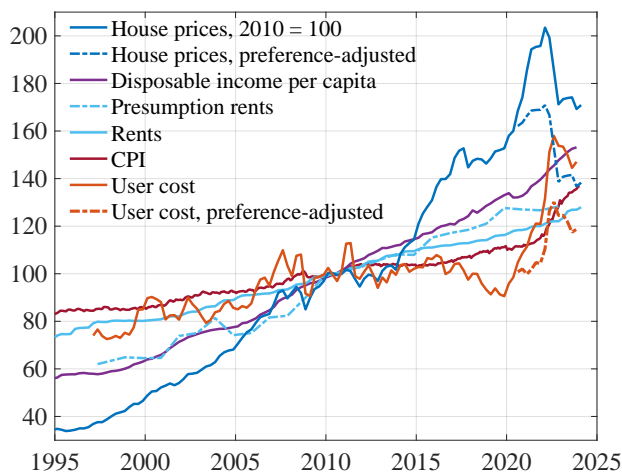


Figure F.2: Nominal house prices, disposable income per capita, rent, user cost, and the consumer price index.



Source and note: Figure F.1: [Statistics Sweden \(2024a,c,d,f\)](#) and own calculations. The linked house-price index is from figure F.7. Disposable income is net and a 4-quarter trailing moving sum. Rents are a 3-quarter centered moving average. Presumption rents, rents in newly constructed buildings, from [Statistics Sweden \(2023d, 2022b\)](#). Missing values for these rents in 2010 and 2012 have been replaced by interpolated values. The “preference-adjustment” is explained the text. Current prices, index 2010 = 100.

Figure F.3: Rent and presumption rent to income, index

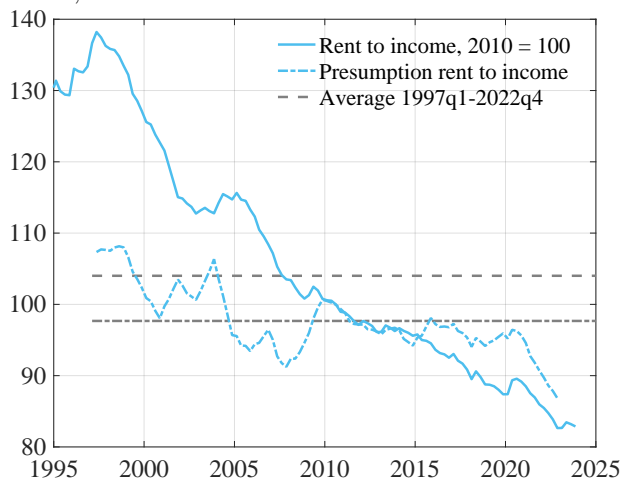
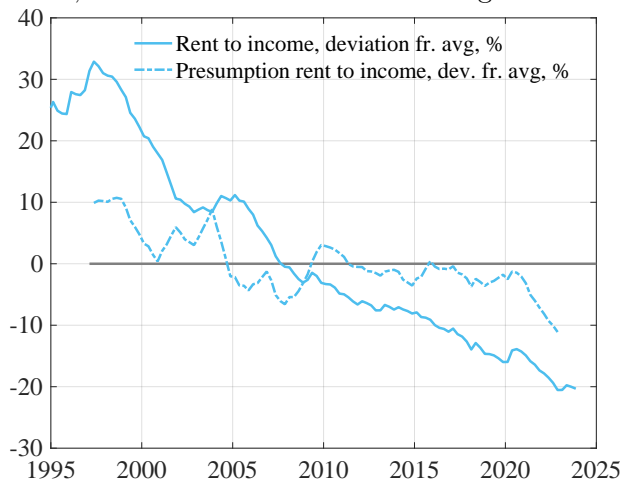
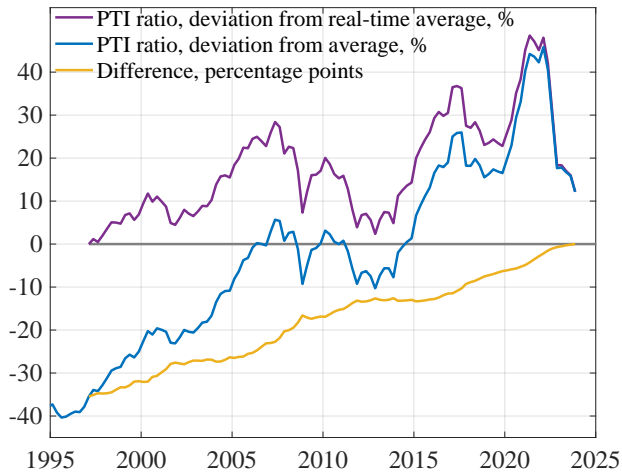


Figure F.4: Rent and presumption rent to income, deviation from historical average.



Source and note: [Statistics Sweden \(2024a,d,f\)](#).

Figure F.5: Price-to-income ratio. Deviation from 1997q1–2023q4 average and real-time average 1997q1– .



Source and note: Figure F.5: [Statistics Sweden \(2024d,f\)](#), [Valueguard \(2024\)](#), and own calculations. Figure F.6: See note to figure 3.7

Figure F.6: User-cost-to-income ratio, preference-adjusted. Deviation from 1997q1–2023q4 average and real-time average 1997q1– .

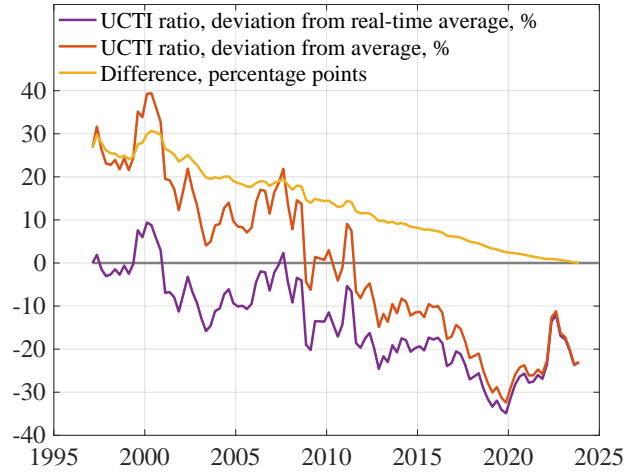


Figure F.7: Statistics Sweden house prices, HOX house prices; and the linked house-price index.

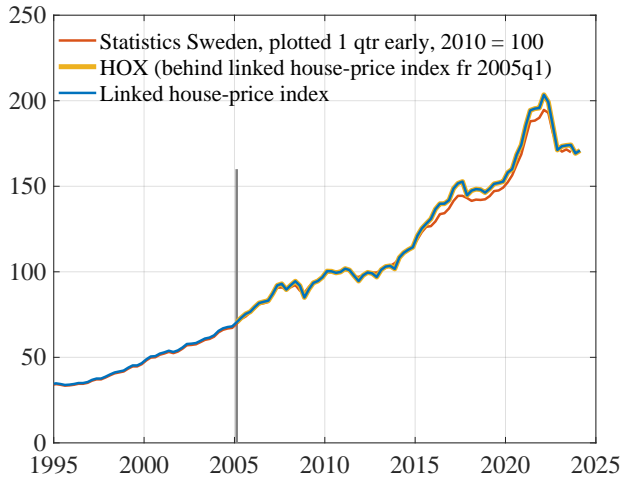
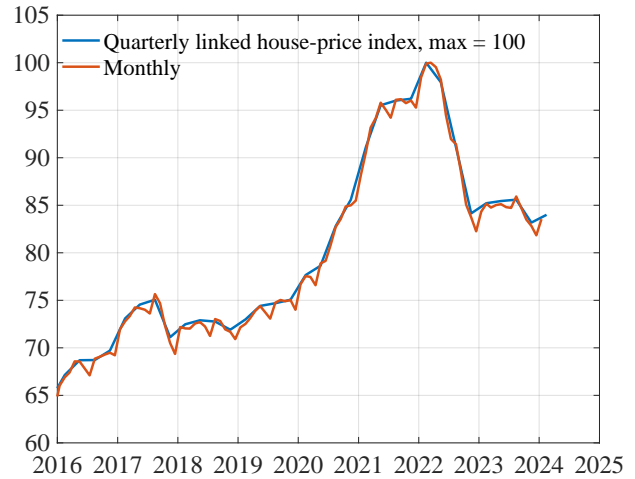


Figure F.8: The quarterly linked and monthly HOX house-price index, max = 100.



Source and note: [Statistics Sweden \(2024f\)](#), and [Valueguard \(2024\)](#). Index = 100 for 2010. The HOX price index is not available before 2005q1 (marked by the vertical gray line). The linked house-price index equals the Statistics Sweden house-price index (led by 1 quarter) up to 2005q1 and the HOX (quarterly) house-price index from 2005q1 (marked by the vertical gray line). The yellow line of the HOX price index is therefore hidden by the blue line of the linked price index. The Statics Sweden index is led by 1 quarter (plotted 1 quarter earlier) because it is dated by the date of the deed, which is normally 2–3 months later than the date of the contract.

Figure F.9: HOX price indices for Sweden and the Greater Stockholm Area. Max = 100.

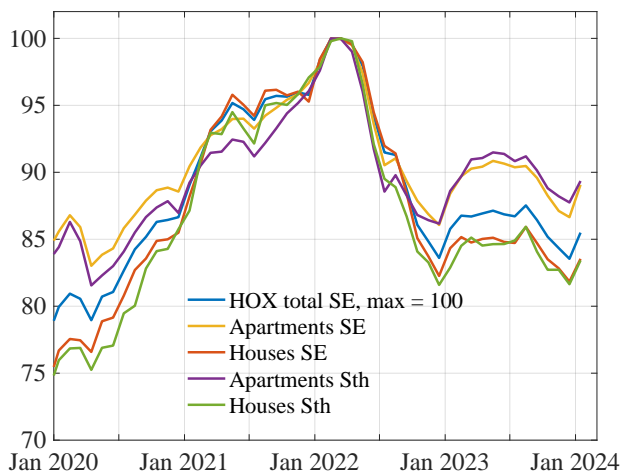
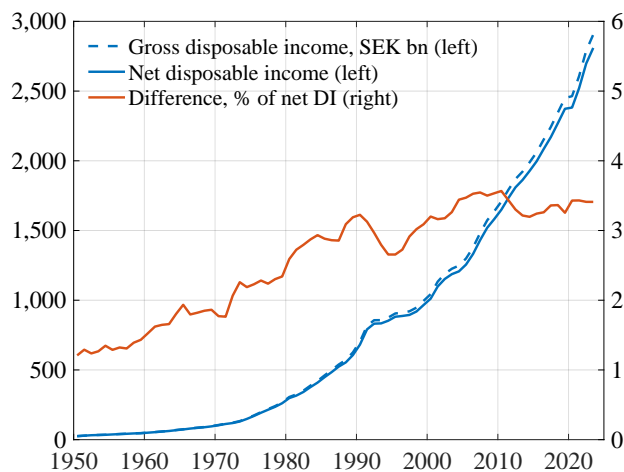


Figure F.10: Disposable income, gross and net, and percentage difference.



Source and note: [Valueguard \(2024\)](#).

Figure F.11: Value of structures and land and the share of structures in house prices: Original and smoothed.

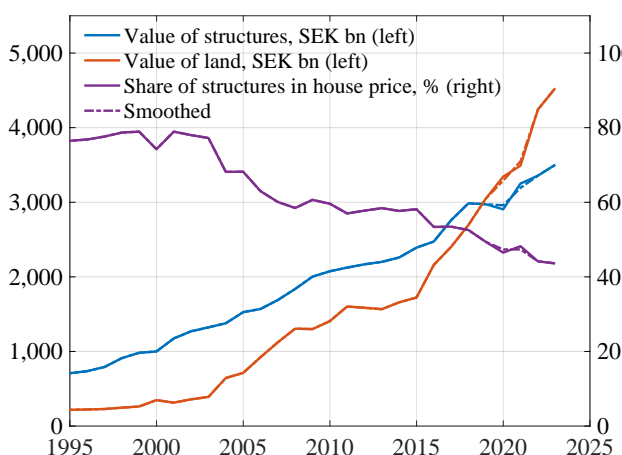
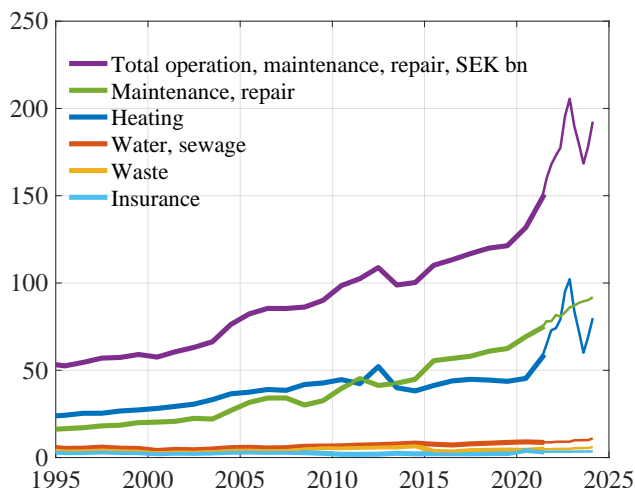
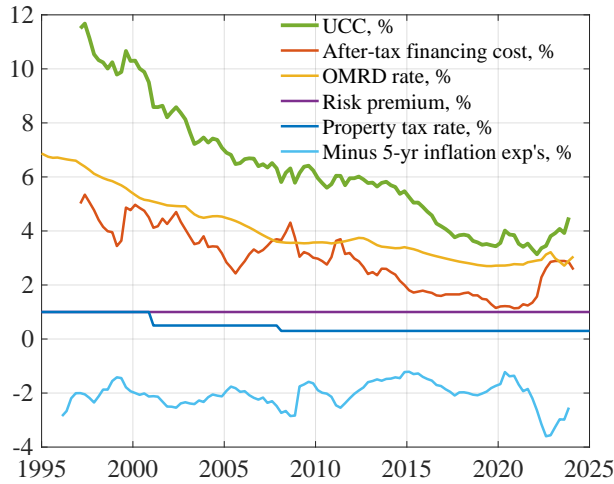


Figure F.12: Operation, maintenance, and repair costs.



Source and note: See appendix A. Figure F.11: The smoothed variant removes a difficult-to-explain down-and-up blip for December 2019 and 2020 but keeps the total value constant. Figure F.12: The thick lines are data. The thin lines are extrapolations for 2021 and 2022. Heating, insurance, and maintenance and repair are extrapolated with the electricity, insurance, and repair goods prices in figure F.23. The costs of water and sewage and of waste collection are linearly extrapolated.

Figure F.13: The UCC and its components. Average 5-year inflation expectations.



Source and note: See notes to figures 1.1 and 3.6. Average 5-year inflation expectations are used instead of expectations of annual inflation 5 years ahead. Own calculations.

Figure F.14: Price-to-income and user-cost-to-income ratios (percentage deviation from historical averages) and the user cost of capital (percent). Avg 5-yr inflation expectations.

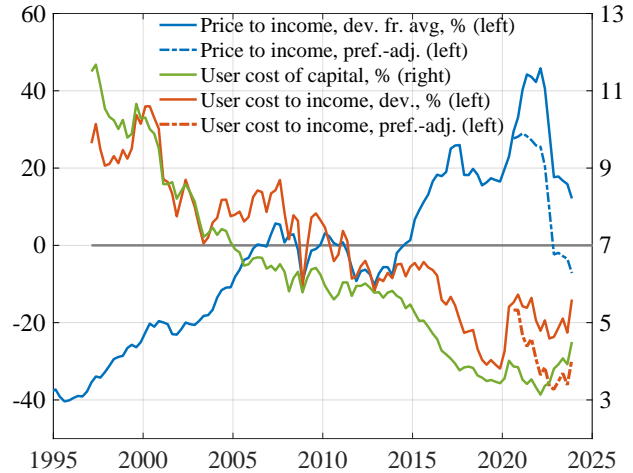
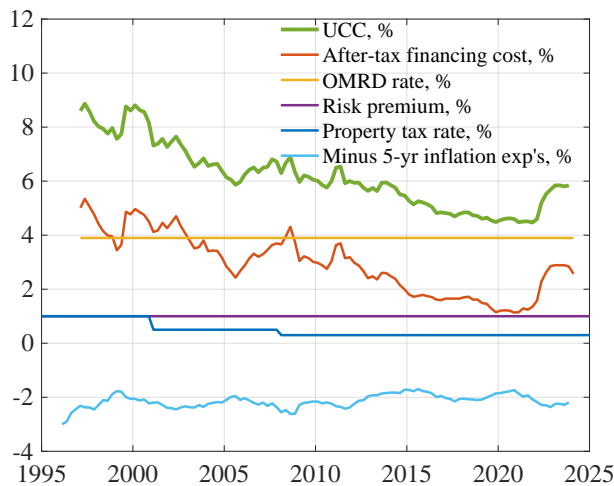


Figure F.15: The UCC and its components. Constant OMRD rate.



Source and note: See notes to figures 1.1 and 3.6. The OMRD rate is assumed to equal its mean during 1997q1–2023q4. Own calculations.

Figure F.16: Price-to-income and user-cost-to-income ratios (percentage deviation from historical averages) and the user cost of capital (percent). Constant OMRD rate.

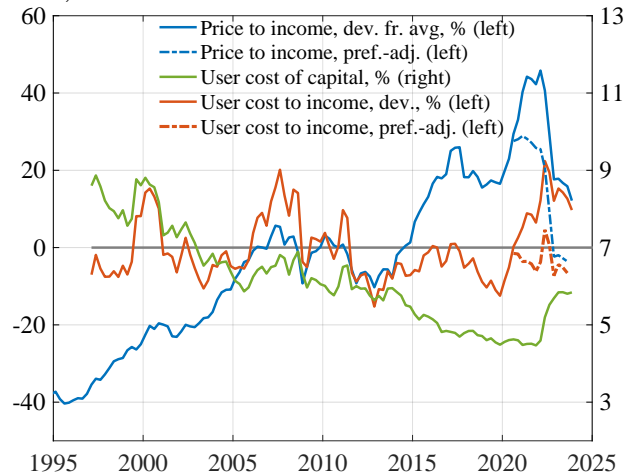
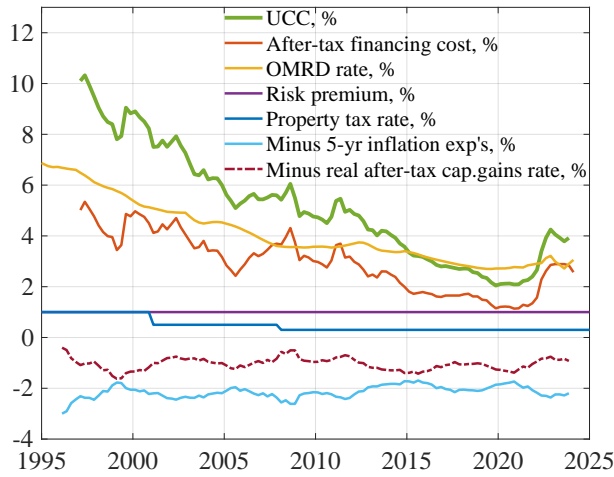


Figure F.17: The UCC and its components. Expected nominal before-tax capital-gains rate equal to 4%.



Source and note: See notes to figures 1.1 and 3.6. The expected nominal before-tax capital-gains rate is 4% instead of the expected real after-tax capital-gains rate being zero. Own calculations.

Figure F.18: Price-to-income and user-cost-to-income ratios (percentage deviation from historical averages) and the user cost of capital (percent). Expected nominal before-tax capital-gains rate equal to 4%.

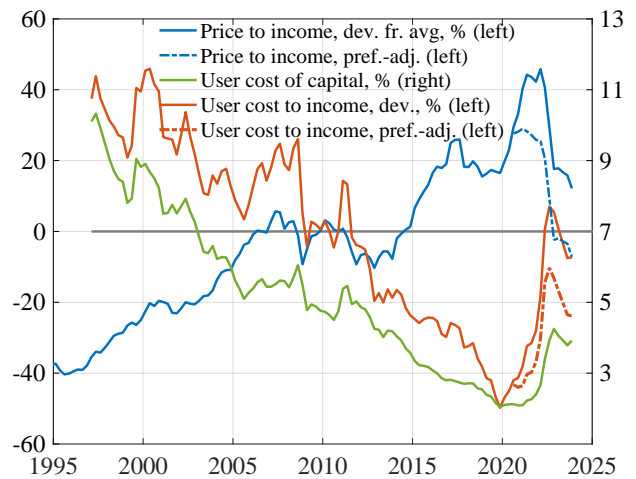
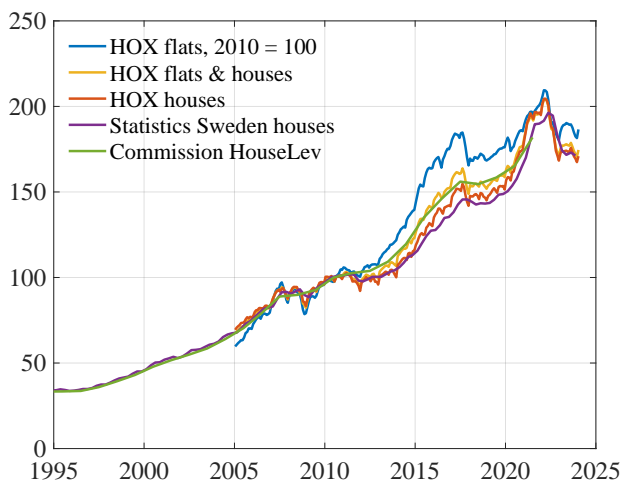


Figure F.19: Housing prices. Index.



Source and note: Bricongne et al. (2019), Statistics Sweden (2024f), and Valueguard (2024). Index = 100 for 2010.

Figure F.20: The price of houses relative to apartments. Index.

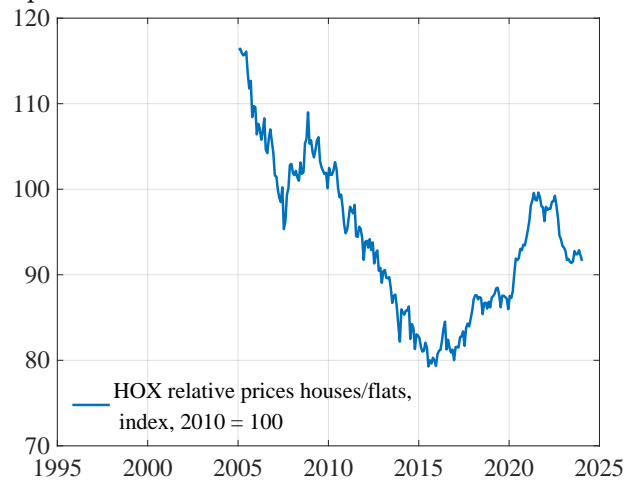


Figure F.21: The SBAB 5-year and the Statistics Sweden 5+-year mortgage rates.

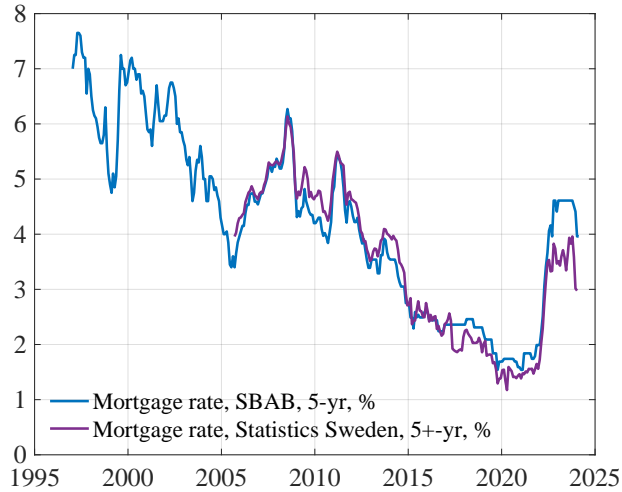
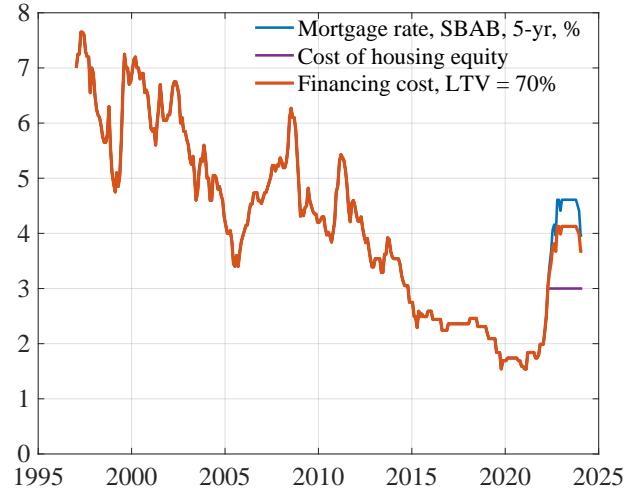


Figure F.22: The SBAB 5-year mortgage rate, the cost of equity, and the resulting financing cost.



Source and note: SBAB (2024) and Statistics Sweden (2023b). The mortgage rates refer to new and renegotiated loans.

Figure F.23: Electricity prices; repair-goods prices; water, sewage, and waste costs; and insurance fees: Owner-occupied housing. Index.

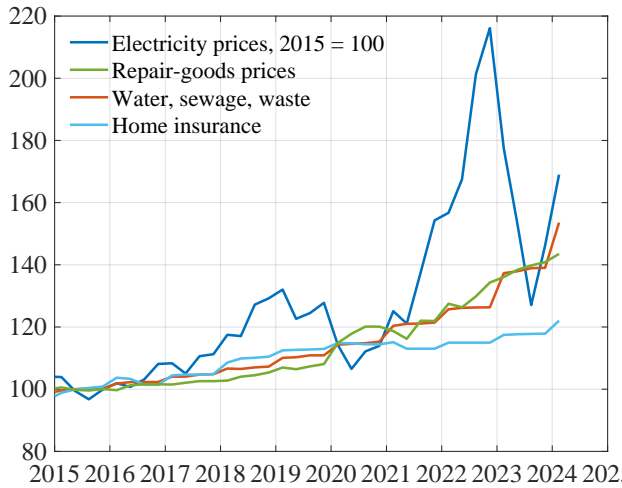
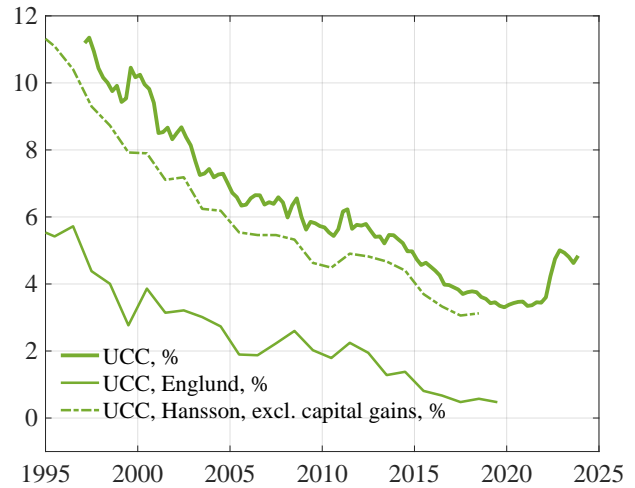


Figure F.24: The user cost of capital of Hansson (2019, figure 7, excl. capital gains) and Englund (2020, diagram 9).



Source and note: Figure F.23: Statistics Sweden (2024a, 4703 Electricity, 4605 Repair goods, 9801 Home insurance), Statistics Sweden (2024b, 04.4 Owner-occupied housing: Water and dwelling services). Figure F.24: Hansson (2019, figure 7, excl. capital gains) and Englund (2020, diagram 9). The thick green line is the UCC from figure 3.6. Hansson's UCC is shown excluding expected real after-tax capital gains. It is calculated for a 2% depreciation rate of the value of structures and a zero risk premium. Englund's UCC is calculated for a zero OMRD rate and risk premium. The calculation of the relevant taxes is more detailed than in this paper. One-year capital gains are equal to firms' one-year inflation expectations (NIER, 2023) up to 1997 and 2% thereafter. A 5-year mortgage rate is used from 1997 and 5-year mortgage bonds plus 1 pp is used before.

Figure F.25: Average new mortgage rate, policy rate, and spread.

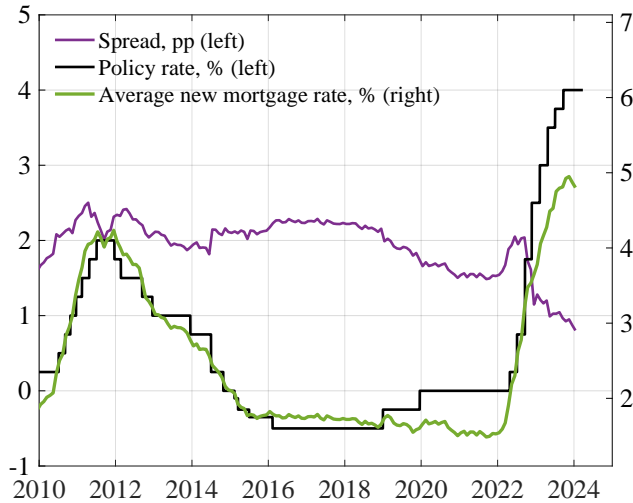
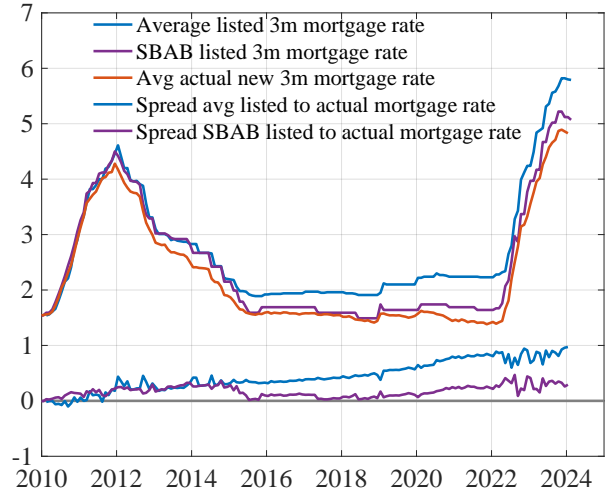
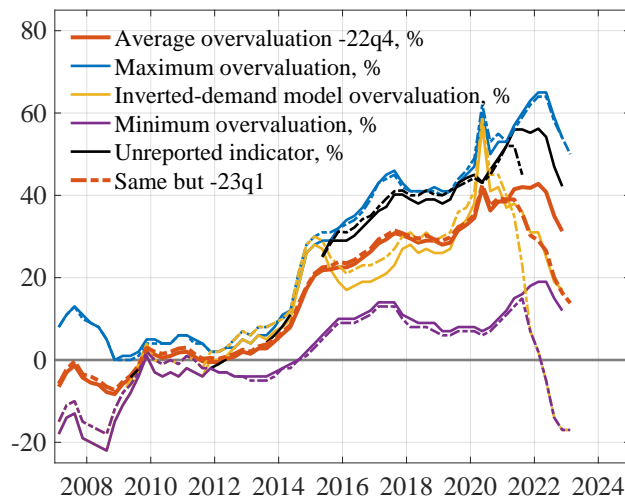


Figure F.26: The average listed, SBAB listed, and average actual 3-month mortgage rates, and the corresponding spreads.



Source and note: Figure F.25: [Statistics Sweden \(2023b\)](#). Figure F.26: [NIER \(2024\)](#), [SBAB \(2024\)](#), and [Statistics Sweden \(2023b\)](#).

Figure F.27: ECB estimates of residential property overvaluation: Sweden. Latest observation 2022q4 and 2023q1, respectively.



Source and note: Data downloaded from [ECB \(2023\)](#) in June 2023 with latest observation 2022q4 (solid) and in September with latest observation 2023q1 (dash-dotted).

Figure F.28: The ESRB's Scoreboard (ESRB, 2022b, table 1, Scoreboard, part 1).

Country	Indicators						
	Collateral stretch				Lending stretch		
	Residential real estate price index, 36m real growth, average %	Residential price index relative to trend	House price to income ratio (deviation from average, %)	Econometric model (overvaluation, %)	Loans to households for house purchases, 36m real growth, average %	Loans to households for house purchases relative to trend	Household loan spread
AT	5.2	1.14	52.0	33.0	4.2	1.01	1.4
BE	4.7	1.02	24.0	14.0	7.9	1.16	1.7
BG	3.8	1.18	-5.0	-10.0	13.1	1.08	2.7
CY	1.5	0.97	0.0	5.0	-8.2	0.75	2.1
CZ	8.1	1.16	36.0	30.0	5.2	0.99	1.9
DE	7.1	1.20	23.0	19.0	4.6	1.08	1.7
DK	4.8	1.09	27.0	11.0	1.3	0.96	2.4
EE	5.2	1.16	13.0	17.0	5.3	1.12	1.7
ES	2.7	1.03	12.0	12.0	-1.9	0.80	1.4
FI	0.8	0.96	5.0	1.0	1.9	0.94	0.7
FR	3.8	1.00	17.0	-3.0	5.7	1.04	1.1
GR	6.3	1.10	-1.0	-2.0	-10.9	0.61	2.7
HR	8.1	1.21	1.0	-9.0	7.0	1.17	2.5
HU	7.5	1.17	12.0	-1.0	6.9	1.07	3.5
IE	2.3	1.10	-6.0	-20.0	-3.8	0.83	3.1
IS	5.4	1.20	3.7		8.2	1.04	2.3
IT	0.6	0.98	-3.0	-1.0	1.4	0.92	0.9
LI							
LT	7.0	1.26	4.0	14.0	6.7	1.04	2.1
LU	12.3	1.17	68.0	48.0	7.7	1.09	1.4
LV	5.8	1.27	4.0	-18.0	0.3	1.16	2.3
MT	4.1	1.05	26.0	-25.0	8.6	1.08	1.5
NL	6.8	1.15	19.0	14.0	0.5	0.95	1.5
NO	3.8	1.03	28.9		4.6	0.99	1.5
PL	5.8	1.12	5.0	-6.0	2.8	0.89	2.7
PT	8.7	1.27	22.0	6.0	0.7	0.86	0.8
RO	0.6	1.12	-23.0	-34.0	7.5	1.03	3.1
SE	4.0	1.04	66.0	51.0	4.1	1.00	1.3
SI	7.0	1.24	16.0	3.0	4.5	0.94	1.6
SK	10.2	1.23	17.0	13.0	7.6	1.05	0.9
EEA average	5.3	1.1	16.0	6.0	3.6	1.0	1.9
EEA median	5.2	1.1	13.0	5.0	4.6	1.0	1.7
Low	2.5	1.00	4.0	0.0	3.0	1.05	1.0
Medium	5.0	1.04	10.0	6.0	6.0	1.10	1.5
High	7.5	1.08	16.0	12.0	9.0	1.15	2.0

Source: ECB, the national authorities of Iceland and Norway, the Banque centrale du Luxembourg, the Central Bank of Malta.
Notes: The latest observation is the second quarter of 2021 for the indicators in the collateral stretch, August 2021 for those in the funding stretch and the first quarter of 2021 for those in the household stretch (with some exceptions). Official data from the National Statistics Office of Malta on disposable income are only available up to the second quarter of 2017 and the quarterly values for the first quarter of 2021 are based on Central Bank of Malta projections. Official data from STATEC on disposable income are only available on an annual basis up to 2020 and quarterly values for 2021 are Banque centrale du Luxembourg projections. The overvaluation figures are estimated by the European Central Bank.

Table F.1: Operation, maintenance, and repair costs for one- and two-dwelling houses, 1993–2021, and values of structures of and land under one- and two-dwelling houses, 1993–2022. SEK mn.

Year	Heating	Water and sewage	Waste collection	Insurance	Maintenance and repair	Structures	Land
1993	22,252	6,295	4,457	3,392	14,740	745,371	203,302
1994	23,637	6,358	4,503	3,427	15,969	708,213	217,784
1995	24,224	5,227	3,703	2,818	16,544	735,587	221,942
1996	25,371	5,372	3,804	2,894	17,111	791,819	228,324
1997	25,390	5,975	4,232	3,220	18,151	910,037	246,576
1998	26,668	5,394	3,820	2,907	18,566	982,077	262,155
1999	27,307	5,212	3,689	2,806	20,028	1,000,017	347,343
2000	28,146	4,051	2,867	2,182	20,312	1,174,945	313,730
2001	29,324	4,685	3,317	2,524	20,778	1,270,733	358,410
2002	30,598	4,475	3,166	2,408	22,469	1,323,026	390,310
2003	33,182	4,926	3,488	2,652	22,071	1,378,078	644,097
2004	36,516	5,687	4,024	3,061	26,969	1,526,517	712,291
2005	37,470	5,907	4,178	3,179	31,572	1,569,493	922,352
2006	38,986	5,495	3,884	2,956	34,117	1,689,467	1,122,720
2007	38,498	5,683	4,016	3,058	34,135	1,837,440	1,305,104
2008	41,853	6,466	5,006	2,785	30,101	2,002,840	1,299,996
2009	42,735	6,577	5,733	2,435	32,571	2,074,961	1,406,283
2010	44,634	6,711	5,659	1,881	39,628	2,124,164	1,602,512
2011	42,341	7,153	5,902	1,834	45,268	2,168,065	1,585,716
2012	52,131	7,358	6,106	1,933	41,305	2,201,094	1,566,710
2013	39,972	7,766	6,103	2,463	42,560	2,259,862	1,658,557
2014	38,178	8,286	6,785	2,145	44,864	2,391,597	1,722,808
2015	41,270	7,632	3,528	2,215	55,497	2,473,288	2,160,025
2016	43,895	7,195	3,225	2,185	56,803	2,760,793	2,403,395
2017	44,819	7,867	3,951	2,156	58,054	2,985,953	2,696,819
2018	44,393	8,218	4,157	2,272	60,935	2,973,678	3,048,997
2019	43,668	8,679	4,281	2,283	62,457	2,904,938	3,343,306
2020	45,347	8,982	4,132	4,103	69,277	3,251,351	3,491,044
2021	58,961	8,664	4,832	3,215	75,140	3,355,987	4,241,439
2022						3,501,628	4,528,353

Source and note: [Statistics Sweden \(2023c\)](#) and [Statistics Sweden \(2023a, AN1112 One- or two-dwelling buildings, AN2111A2 Land underlying one- or two-dwelling buildings\)](#) .

References

- Almenberg, Johan, Mattias Ankarhem, Karl Blom, and Thomas Jansson (2022), “House Prices and Interest Rate Expectations,” Economic Commentary No. 10, September 20, 2022, Sveriges Riksbank, <https://www.riksbank.se/globalassets/media/rapporter/ekonomiska-kommentarer/engelska/2022/house-prices-and-interest-rate-expectations.pdf>.
- Anundsen, André K. (2021), “House Price Bubbles in Nordic Countries?” *Nordic Economic Policy Review 2021*, <https://norden.diva-portal.org/smash/get/diva2:1549014/FULLTEXT01.pdf>.
- Bäckman, Claes, and Natalia Khorunzhina (2023), “Interest-Only Mortgages and Consumption Growth: Evidence from a Mortgage Market Reform,” *International Economic Review* <https://onlinelibrary.wiley.com/doi/10.1111/iere.12682>.
- Barrios, Salvador, Cécile Denis, Viginta Ivaškaitė-Tamošiūnė, Andriana Reut, and Estefanía Vázquez Torres (2019), “Housing Taxation: A New Database for Europe,” JRC Working Papers on Taxation and Structural Reforms No. 08/2019, European Commission, Joint Research Centre, Seville, <https://joint-research-centre.ec.europa.eu/system/files/2019-10/jrc118277.pdf>.
- Bergman, U. Michael, and Peter Birch Sørensen (2021), “The Interaction of Actual and Fundamental House Prices: A General Model with an Application to Sweden,” *Journal of Housing Economics* 54, 101792, <https://doi.org/10.1016/j.jhe.2021.101792>.
- Birch Sørensen, Peter (2013), “The Swedish Housing Market: Trends and Risks,” Report to the Fiscal Policy Council 2013/5, Finanspolitiska rådet—The Fiscal Policy Council, <https://www.fpr.se/download/18.28ce3f32184f580967d67f/1670594036583/2013-5%20S%C3%B8rensen%20-%20The%20Swedish%20housing%20market%20Trends%20and%20risks.pdf>.
- Bjellerup, Mårten, and Lina Majtorp (2019), “The Development of Swedish Housing Prices,” Focus Report November 15, 2019, Riksgälden—The National Debt Office, <https://www.riksdagen.se/contentassets/123d8a09ad2a46d6b2f5024d959477ad/2019-11-15-focus-report-the-development-of-housing-prices.pdf>.
- Blackley, Dixie M., and James R. Follain (1996), “In Search of Empirical Evidence That Links Rent and User Cost,” *Regional Science and Urban Economics* 26(3), 409–431, Proceedings of the Conference “Public Policy and the Housing Market”, [https://doi.org/10.1016/0166-0462\(95\)02122-1](https://doi.org/10.1016/0166-0462(95)02122-1).
- BLS (2024), “Measuring Price Change in the CPI: Rent and Rental Equivalence,” web page,, Bureau of Labor Statistics, <https://www.bls.gov/cpi/factsheets/owners-equivalent-rent-and-rent.htm>.
- Boije, Robert (2019), “Swedish Household Debts at Risk: The Council Ignores Research,” presentation at the European Commission’s Swedish Representation, Stockholm, June 12, 2019, <https://bloggen.sbab.se/swedish-household-debts-at-risk-the-council-ignores-research/>.
- Bricongne, Jean-Charles, Alessandro Turrini, and Peter Pontuch (2019), “Assessing House Prices: Insights from ‘HouseLev’, a Dataset of Price Level Estimates,” European Economy Discussion Paper 101, European Commission, database updated to 2022, https://ec.europa.eu/info/publications/assessing-house-prices-insights-houselev-dataset-price-level-estimates_en.
- Brueckner, Jan K. (1987), “Chapter 20 The Structure of Urban Equilibria: A Unified Treatment of the Muth-Mills Model,” in *Urban Economics*, vol. 2 of *Handbook of Regional and Urban Economics*, Elsevier, pages 821–845, [https://doi.org/10.1016/S1574-0080\(87\)80006-8](https://doi.org/10.1016/S1574-0080(87)80006-8).

- Case, Karl E., and Robert J. Shiller (2003), “Is There a Bubble in the Housing Market?” *Brookings Papers on Economic Activity* 2:2003, 299–362, https://www.brookings.edu/wp-content/uploads/2003/06/2003b_bpea_caseshiller.pdf.
- Claussen, Carl Andreas (2013), “Are Swedish Houses Overpriced?” *International Journal of Housing Markets and Analysis* 6(2), 180–196, <https://doi.org/10.1108/IJHMA-12-2011-0056>.
- Council of the European Union (2001), “Council Directive 2001/55/EC on Temporary Protection,” *Official Journal of the European Communities* L 212/12, 12–23, <http://data.europa.eu/eli/dir/2001/55/oj>.
- Cournède, Boris (2005), “House Prices and Inflation in the Euro Area,” OECD Economics Department Working Paper No. 450, OECD, <https://doi.org/10.1787/037842735074>.
- Dermani, Emilio, Jesper Lindé, and Karl Walentin (2016), “Is There an Evident Bubble in Sweden?” *Sveriges Riksbank Economic Review* 2016:2, 7–55, https://www.riksbank.se/globalassets/media/rapporter/pov/filer-fore-2017/artiklar/rap_pov_artikel_1_160922_eng.pdf.
- Díaz, Antonia, and María José Luengo-Prado (2008), “On the User Cost and Homeownership,” *Review of Economic Dynamics* 11(3), 584–613, <https://doi.org/10.1016/j.red.2007.12.002>.
- Diewert, W. Erwin (2013), “Elements for a Conceptual Framework,” in *Handbook on Residential Property Prices Indices (RPPIs)*, chap. 3, Eurostat, pages 22–36, <https://ec.europa.eu/eurostat/documents/3859598/5925925/KS-RA-12-022-EN.PDF>.
- DiPasquale, Denise, and William C. Wheaton (1996), “Chapter 3 The Urban Land Market: Rents and Prices,” in *Urban Economics and Real Estate Markets*, chap. 3, Prentice-Hall, Englewood Cliffs, N.J., pages 35–59.
- Dougherty, Ann, and Robert Van Order (1982), “Inflation, Housing Costs, and the Consumer Price Index,” *The American Economic Review* 72(1), 154–164, <http://www.jstor.org/stable/1808582>.
- Duca, John V., John Muellbauer, and Anthony Murphy (2016), “How Mortgage Finance Reform Could Affect Housing,” *American Economic Review* 106(5), 620–24, <https://www.aeaweb.org/articles?id=10.1257/aer.p20161083>.
- Duca, John V., John Muellbauer, and Anthony Murphy (2021a), “What Drives House Price Cycles? International Experience and Policy Issues,” *Journal of Economic Literature* 59(3), 773–864, <https://doi.org/10.1257/jel.20201325>.
- Duca, John V., John Muellbauer, and Anthony Murphy (2021b), “What Drives House Prices: Lessons from the Literature,” VoxEU Column, September 13, 2021, <https://voxeu.org/article/what-drives-house-prices-some-lessons-literature>.
- EBA (2023), “EU-Wide Stress Testing: 2023 EU-Wide Stress Test Results, Macro Financial Scenario, RRE Prices Drop over 3 Years by 21.1%,” web site, interactive, European Banking Authority, <https://www.eba.europa.eu/risk-analysis-and-data/eu-wide-stress-testing>.
- ECB (2011), “Tools for Detecting a Possible Misalignment of Residential Property Prices from Fundamentals,” *Financial Stability Review*, June 2011, Box 3, 57–59, https://www.ecb.europa.eu/pub/financial-stability/fsr/focus/2011/pdf/ecb~5179a0aa86.fsrbox201106_03.pdf.

- ECB (2015a), “A Model-Based Valuation Metric for Residential Property Markets,” *Financial Stability Review*, November 2015, Box 3, 45–47, <https://www.ecb.europa.eu/pub/pdf/fsr/financialstabilityreview201511.en.pdf>.
- ECB (2015b), “Statistical Valuation Metrics for Residential Property Markets,” *Financial Stability Review*, May 2015, Box 3, 44–46, <https://www.ecb.europa.eu/pub/pdf/fsr/financialstabilityreview201505.en.pdf>.
- ECB (2018), *Financial Stability Review*, May 2018, European Central Bank, <https://www.ecb.europa.eu/pub/pdf/fsr/ecb.fsr201805.en.pdf>.
- ECB (2023), “Residential Property Valuation - RESV,” dataset in ECB Data Portal, European Central Bank, <https://data.ecb.europa.eu/data/datasets/RESV?dataset%5B0%5D=Residential%20Property%20Valuation%20%20%28RESV%29&filterSequence=dataset&advFilterDataset%5B0%5D=Residential%20Property%20Valuation%20%20%28RESV%29>.
- Engle, Robert F., and Clive W. J. Granger (1987), “Co-integration and Error Correction: Representation, Estimation, and Testing,” *Econometrica* 55, 251–276, <https://www.jstor.org/stable/1913236>.
- Englund, Peter (2011), “Swedish House Prices in an International Perspective,” in *The Riksbank’s Inquiry into the Risks in the Swedish Housing Market*, Sveriges Riksbank, pages 23–66, http://archive.riksbank.se/Upload/Rapporter/2011/RUTH/RUTH_chapter1.pdf.
- Englund, Peter (2020), “En ny bostadsbeskattning [A New Taxation of Housing],” research report, SNS, <https://snsse.cdn.triggerfish.cloud/uploads/2020/10/en-ny-bostadsbeskattning.pdf>.
- ESRB (2020), “Macro-Financial Scenario for the 2020 EU-wide Banking Sector Stress Test,” Document submitted to the EBA in January 2020, European Systemic Risk Board, https://www.esrb.europa.eu/mppa/stress/shared/pdf/esrb.stress_test200131~09dbe748d4.en.pdf?d461d78898770edd35129a6eb6c09d5c.
- ESRB (2021), “Macro-Financial Scenario for the 2021 EU-wide Banking Sector Stress Test,” Document submitted to the EBA in January 2021, European Systemic Risk Board, https://www.esrb.europa.eu/mppa/stress/shared/pdf/esrb.stress_test210120~0879635930.en.pdf.
- ESRB (2022a), “ESRB issues new warnings and recommendations on medium-term residential real estate vulnerabilities,” press release, February 11, 2022, European Systemic Risk Board, <https://www.esrb.europa.eu/news/pr/date/2022/html/esrb.pr220211~9393d5e991.en.html>.
- ESRB (2022b), “Vulnerabilities in the Residential Real Estate Sectors of the EEA Countries,” report, February 2022, European Systemic Risk Board, https://www.esrb.europa.eu/pub/pdf/reports/esrb.report220211_vulnerabilities_eea_countries~27e571112b.en.pdf.
- ESRB (2023), “Macro-Financial Scenario for the 2023 EU-wide Banking Sector Stress Test,” Document submitted to the EBA in January 2023, European Systemic Risk Board, https://www.esrb.europa.eu/mppa/stress/shared/pdf/esrb.stress_test230131~c4980ac646.en.pdf.
- ESRB (2024), “Follow-up Report on Vulnerabilities in the Residential Real Estate Sectors of the EEA Countries,” report, February 2024, European Systemic Risk Board, <https://www.esrb.europa.eu/pub/pdf/reports/esrb.report.vulnerabilitiesresidentialrealestatesectors202402~df77b00f9a.en.pdf>.

- European Commission (2019), “Country Report Sweden 2019, Including an In-Depth Review on the Prevention and Correction of Macroeconomic Imbalances,” Commission Staff Working Document SWD(2019) 1026 final, Brussels, February 27, 2019, European Commission, https://ec.europa.eu/info/sites/default/files/file_import/2019-european-semester-country-report-sweden_en.pdf.
- European Commission (2020), “Refining the House Price Valuation Methodology: Using Housing Stocks and Nominal House Price,” Note for the attention of the Economic Policy Committee LIME Working Group, European Commission, available upon request.
- European Commission (2021), “In-Depth Review for Sweden,” Commission Staff Working Document SWD(2021) 412 final, Brussels, June 2, 2021, European Commission, https://ec.europa.eu/info/sites/default/files/1_en_autre_document_travail_service_part1_v3_0.pdf.
- European Commission (2022), “Macroeconomic Imbalance Procedure (MIP) – Overview,” web page,, European Commission, <https://ec.europa.eu/eurostat/web/macroeconomic-imbalance-procedure>.
- European Commission (2023a), “2023 Country Report: Sweden,” Institutional paper 251, June 2023, European Commission, https://economy-finance.ec.europa.eu/publications/2023-country-report-sweden_en.
- European Commission (2023b), “Housing Market Developments: Thematic Note to Support In-Depth Reviews,” Institutional paper 197, April 2023, European Commission, https://economy-finance.ec.europa.eu/publications/housing-market-developments-thematic-note-support-depth-reviews_en.
- European Commission (2023c), “In-Depth Review for Sweden,” Commission Staff Working Document SWD(2023) 644 final, Brussels, May 24, 2023, European Commission, https://economy-finance.ec.europa.eu/system/files/2023-05/SE_SWD_2023_644_17_EN_autre_document_travail_service_part1_v1.pdf.
- European Commission (2023d), “Macroeconomic Imbalance Procedure (MIP) – Overview,” web page,, European Commission, <https://ec.europa.eu/eurostat/web/macroeconomic-imbalance-procedure>.
- European Systemic Risk Board (2022), “Vulnerabilities in the Residential Real Estate Sectors of the EEA Countries,” report, February 2022, European Systemic Risk Board, https://www.esrb.europa.eu/pub/pdf/reports/esrb.report220211_vulnerabilities_eea_countries~27e571112b.en.pdf.
- Evidens (2019), “Hushållens långsiktiga förväntningar på bostadsprisutvecklingen [Households’ Longer-Term Expectations about Housing Prices],” presentation, February 2019, Evidensgruppen, <https://larseosvensson.se/files/papers/evidens-19-hushallens-langsiktiga-forvantningar-pa-bostadsprisutvecklingen.pdf>.
- Evidens (2022), “Hushållens förväntningar på bostadsmarknaden—bostadsmarknaden vid en brytpunkt? [Households’ Expectations about the Housing Market—the Housing Market at a Breakpoint?],” presentation, May 2022, Evidensgruppen, <https://larseosvensson.se/files/papers/evidens-19-hushallens-langsiktiga-forvantningar-pa-bostadsprisutvecklingen.pdf>.
- FI (2021), “Large Swedish Banks Show Resilience in EU Stress Test,” news item, August 2, 2021, Finansinspektionen—Sweden’s financial supervisory authority, <https://www.fi.se/en/published/news/2021/large-swedish-banks-show-resilience-in-eu-stress-test/>.

- FI (2022a), *The Swedish Mortgage Market 2022*, Finansinspektionen—Sweden’s financial supervisory authority, <https://www.fi.se/en/published/reports/swedish-mortgage-reports/the-swedish-mortgage-market-2022/>.
- FI (2022b), *The Swedish Mortgage Market 2022, Data Appendix*, Finansinspektionen—Sweden’s financial supervisory authority, <https://www.fi.se/en/published/reports/swedish-mortgage-reports/the-swedish-mortgage-market-2022/>.
- FI (2023), “Large Swedish Banks Show Resilience in EU Stress Test,” news item, July 31, 2023, Finansinspektionen—Sweden’s financial supervisory authority, <https://www.fi.se/en/published/news/2023/large-swedish-banks-show-resilience-in-eu-stress-test/>.
- Flam, Harry (2016), “Har vi en bostadsbubbla? [Do We Have a Housing Bubble?],” *Ekonomisk Debatt* 44(4), 6–15, <https://www.nationalekonomi.se/wp-content/uploads/2016/05/44-4-hf.pdf>.
- Flavin, Marjorie, and Takashi Yamashita (2002), “Owner-Occupied Housing and the Composition of the Household Portfolio,” *American Economic Review* 92(1), 345–362, <https://www.aeaweb.org/articles?id=10.1257/000282802760015775>.
- Fox, Ryan, and Peter Tulip (2014), “Is Housing Overvalued?” Research Discussion Paper RDP 2014-06, Reserve Bank of Australia, <https://www.rba.gov.au/publications/rdp/2014/pdf/rdp2014-06.pdf>.
- Frayne, Christine, Agnieszka Szczypińska, Bořek Vašíček, and Stefan Zeugner (2022), “Housing Market Developments in the Euro Area: Focus on Housing Affordability,” Discussion Paper 171, September 2017, European Commission, https://economy-finance.ec.europa.eu/publications/housing-market-developments-euro-area-focus-housing-affordability_en.
- Garner, Thesia I., and Randal Verbrugge (2009a), “The Puzzling Divergence of Rents and User Costs, 1980–2004: Summary and Extensions,” in Diewert, W.E., B.M. Balk, D. Fixler, K.J. Fox, and A.O. Nakamura (eds.), *Price and Productivity Measurement, Volume 1: Housing*, chap. 8, Trafford Press, pages 125–146, http://www.indexmeasures.ca/V1_FCh8_2009_03_04_Garner_Verbrugge.pdf.
- Garner, Thesia I., and Randal Verbrugge (2009b), “Reconciling User Costs and Rental Equivalence: Evidence from the US Consumer Expenditure Survey,” *Journal of Housing Economics* 18(3), 172–192, special Issue on Owner Occupied Housing in National Accounts and Inflation Measures, <https://doi.org/10.1016/j.jhe.2009.07.001>.
- Greenwald, Daniel L. (2018), “The Mortgage Credit Channel of Macroeconomic Transmission,” working paper, Sloan School of Management, MIT, <https://ssrn.com/abstract=2735491>.
- Grünberger, Klaus, Alberto Mazzon, and I. José Tudó Ramírez (2023), “Housing Taxation Database 1995–2021, v. 4.1,” dataset, European Commission, Joint Research Centre (JRC), <https://data.jrc.ec.europa.eu/dataset/c5d53660-1a6b-4bac-85ff-87c98d531f50>.
- Guðnason, Rósmundur, and Guðrún R. Jónsdóttir (2009), “Owner Occupied Housing in the Icelandic CPI,” in Diewert, W.E., B.M. Balk, D. Fixler, K.J. Fox, and A.O. Nakamura (eds.), *Price and Productivity Measurement, Volume 1: Housing*, chap. 9, Trafford Press and <http://www.indexmeasures.ca>, pages 147–150, http://www.indexmeasures.ca/V1_FCh9_2009_03_04_Guonason_Jonsdottir.pdf.

- Haffner, Marietta, and Kristof Heylen (2011), “User Costs and Housing Expenses. Towards a more Comprehensive Approach to Affordability,” *Housing Studies* 26(04), 593–614, <https://doi.org/10.1080/02673037.2011.559754>.
- Hansson, Bengt (2019), “Kostnaden för att bo [The Cost of Living in Owner-Occupied Housing],” Report 2019:14, Boverket—The Swedish National Board of Housing, <https://www.boverket.se/sv/om-boverket/publicerat-av-boverket/publikationer/2019/kostnaden-for-att-bo/>.
- Harding, John P., Stuart S. Rosenthal, and C.F. Sirmans (2007), “Depreciation of Housing Capital, Maintenance, and House Price Inflation: Estimates from a Repeat Sales Model,” *Journal of Urban Economics* 61(2), 193–217, <https://doi.org/10.1016/j.jue.2006.07.007>.
- Himmelberg, Charles, Christopher Mayer, and Todd Sinai (2005), “Assessing High House Prices: Bubbles, Fundamentals and Misperceptions,” *The Journal of Economic Perspectives* 19(4), 67–92, <https://www.jstor.org/stable/4134955>.
- Hjalmarsson, Erik, and Pär Österholm (2017), “Households’ Mortgage-Rate Expectations—More Realistic than At First Glance,” *Sveriges Riksbank Economic Review* (2), 57–64, http://archive.riksbank.se/Documents/Rapporter/POV/2017/rap_pov_artikel_3_171116_eng.pdf.
- Hjalmarsson, Erik, and Pär Österholm (2019), “A Micro-Data Analysis of Households’ Expectations of Mortgage Rates,” *Economics Letters* 185, 108693, <https://www.sciencedirect.com/science/article/pii/S0165176519303453>.
- Hjalmarsson, Erik, and Pär Österholm (2020), “Heterogeneity in Households’ Expectations of Housing Prices – Evidence from Micro Data,” *Journal of Housing Economics* 50(2), 1051–1377, <https://doi.org/10.1016/j.jhe.2020.101731>.
- Hjalmarsson, Erik, and Pär Österholm (2021), “Anchoring in surveys of household expectations,” *Economics Letters* 198, 109687, <https://doi.org/10.1016/j.econlet.2020.109687>.
- Hott, Christian, and Pierre Monnin (2008), “Fundamental Real Estate Prices: An Empirical Estimation with International Data,” *Journal of Real Estate Finance and Economics* 36(4), 427–450, <https://link-springer-com.ez.hhs.se/article/10.1007/s11146-007-9097-8>.
- Igan, Deniz, Emanuel Kohlscheen, and Phurichai Rungcharoenkitkul (2022), “Housing Market Risks in the Wake of the Pandemic,” BIS Bulletin No. 50, BIS, <https://www.bis.org/publ/bisbull50.htm>.
- IMF (2019), “Sweden: Staff Report for the 2019 Article IV Consultation,” Staff Report, International Monetary Fund, <https://www.imf.org/en/Publications/CR/Issues/2019/03/26/Sweden-2019-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-46709>.
- IMF (2021), “Sweden: Staff Report for the 2021 Article IV Consultation,” Staff Report, International Monetary Fund, <https://www.imf.org/en/Publications/CR/Issues/2021/03/24/Sweden-2021-Article-IV-Consultation-Press-Release-and-Staff-Report-50303>.
- IMF (2023a), “Sweden: Financial System Stability Report,” IMF Country Report No. 23/113, International Monetary Fund, <https://www.imf.org/en/Publications/CR/Issues/2023/03/16/Sweden-Financial-System-Stability-Assessment-530943>.
- IMF (2023b), “Sweden: Staff Report for the 2023 Article IV Consultation,” IMF Country Report No. 23/111, International Monetary Fund, <https://www.imf.org/en/Publications/CR/Issues/>

- [2023/03/16/Sweden-2023-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-530937](#).
- Kantar Sifo (2024), “Inflation Expectations,” Prospera inflation expectations, Kantar Sifo, <https://www.kantarsifo.se/erbjudande/prospera/inflation-expectations>.
- Katz, Arnold J., and Shelby W. Herman (1997), “Improved Estimates of Fixed Reproducible Tangible Wealth, 1929–95,” *Survey of Current Business* (69-92), <https://apps.bea.gov/scb/pdf/national/niparel/1997/0597niw.pdf>.
- Kelly, Jemima (2019), “Alphaville Spent 36 Hours on the Island of Sark. Here’s How It Went.” Alphaville article, January 30, 2019, Financial Times, <https://ftalphaville.ft.com/2019/01/30/1548828002000/Alphaville-spent-36-hours-on-the-island-of-Sark--Here-s-how-it-went/>.
- Kuchler, Theresa, Monika Piazzesi, and Johannes Stroebe (2022), “Housing Market Expectations,” Working Paper 29909, National Bureau of Economic Research, <https://www.nber.org/papers/w29909>.
- Lind, Hans (2021), “Comment on M. A. Bergman and S. Nyberg: Housing Prices, Construction Costs and Competition in the Construction Sector – A Swedish Perspective,” *Nordic Economic Policy Review* 2021, 115–119, <https://pub.norden.org/nord2021-022/nord2021-022.pdf>.
- Liu, Haoyang, David Lucca, Dean Parker, and Gabriela Rays-Wahba (2021), “The Housing Boom and the Decline in Mortgage Rates,” Liberty Street Economics blog post, September 7, 2021, Federal Reserve Bank of New York, <https://libertystreeteconomics.newyorkfed.org/2021/09/the-housing-boom-and-the-decline-in-mortgage-rates/>.
- Meen, Geoffrey (2001), *Modelling Spatial Housing Markets: Theory, Analysis and Policy*, Springer, 10.1007/978-1-4615-1673-6.
- Mølbak Ingholt, Marcus (2022), “Multiple Credit Constraints and Time-Varying Macroeconomic Dynamics,” *Journal of Economic Dynamics and Control* 143, 104504, <https://doi.org/10.1016/j.jedc.2022.104504>.
- Muellbauer, John (2012), “When Is a Housing Market Overheated Enough to Threaten Stability,” in Heath, Alexandra, Franck Packer, and Callan Windsor (eds.), *Property Markets and Financial Stability*, Reserve Bank of Australia, pages 73–105, <https://www.rba.gov.au/publications/confs/2012/pdf/conf-vol-2012.pdf>.
- Muellbauer, John, and Anthony Murphy (1997), “Booms and Busts in the UK Housing Market,” *The Economic Journal* 107(445), 1701–1727, <https://doi.org/10.1111/j.1468-0297.1997.tb00076.x>.
- Mulheirn, Ian (2019), “Tackling the UK Housing Crisis: Is Supply the Answer?” report, UK Collaborative Centre for Housing Evidence, <https://housingevidence.ac.uk/publications/tackling-the-uk-housing-crisis-is-supply-the-answer/>.
- NIER (2023), “Total Industry, Quarterly Series, Expected Inflation within the Next 12 Months,” table in Statistical Database, National Institute of Economic Research, https://statistik.konj.se/PxWeb/pxweb/sv/KonjBar/KonjBar__ftgkvartal/Bartotq.px/.
- NIER (2024), “Households, Interest Rates, and Inflation,” table in Statistical Database, National Institute of Economic Research, http://statistik.konj.se/PXWeb/pxweb/en/KonjBar/KonjBar__hushall/HushallInfRant.px/.

- OECD (2005), “Box 2.4. Illustrative Estimates of the Impact of Owner-Occupied Housing Costs on inflation,” in *OECD Economic Surveys: Euro Area 2005*, OECD, pages 57–58, https://www-oecd-ilibrary-org.ez.hhs.se/economics/oecd-economic-surveys-euro-area-2005_eco_surveys-euz-2005-en.
- OECD (2017), *OECD Economic Outlook, June 2017*, OECD, https://www-oecd-ilibrary-org.ez.hhs.se/economics/oecd-economic-outlook-volume-2017-issue-1_eco_outlook-v2017-1-en.
- OECD (2021a), “HC1.5. Overview of Affordable Housing Indicators,” memo, OECD, <https://www.oecd.org/els/family/HC1-5%20Overview%20of%20affordable%20housing%20indicators.pdf>.
- OECD (2021b), *OECD Economic Surveys: Sweden*, OECD, https://read.oecd-ilibrary.org/economics/oecd-economic-surveys-sweden-2021_f61d0a54-en#page1.
- OECD (2022a), “HC1.2. Housing Costs Over Income,” memo, OECD, <https://www.oecd.org/els/family/HC1-2-Housing-costs-over-income.pdf>.
- OECD (2022b), “HM1.2 Housing Prices,” memo, OECD, <https://www.oecd.org/els/family/HM1-2-Housing-prices.pdf>.
- OECD (2023a), “Housing Conditions,” web page, OECD, <https://www.oecd.org/housing/data/affordable-housing-database/housing-conditions.htm>.
- OECD (2023b), “OECD Affordable Housing Database,” webpage, OECD, <https://www.oecd.org/housing/data/affordable-housing-database/>.
- OECD (2023c), *OECD Economic Surveys: Sweden*, OECD, https://www.oecd-ilibrary.org/economics/oecd-economic-surveys-sweden-2023_ceed5fd4-en.
- Office of Policy Development and Research (2000), “The User Cost of Homeownership,” *U.S. Housing Market Conditions* (August 2000), U.S. Department of Housing and Urban Development, <https://www.huduser.gov/periodicals/ushmc/summer2000/summary-2.html>.
- Österholm, Göran, and Pär Österholm (2023), “En prognosutvärdering av hushållens ränteförväntningar [A Forecast Evaluation of Households’ Interest Rate Expectations],” *Ekonomisk Debatt* 51(8), 59–68, <https://www.nationalekonomi.se/wp-content/uploads/2023/11/51-8-Osterholm.pdf>.
- Philipponnet, Nicolas, and Alessandro Turrini (2017), “Assessing House Price Developments in the EU,” Discussion Paper 048, May 2017, European Commission, https://ec.europa.eu/info/sites/info/files/dp048_en.pdf.
- Poterba, James M. (1984), “Tax Subsidies to Owner-Occupied Housing: An Asset Market Approach,” *Quarterly Journal of Economics* 99, 229–252, <https://www.jstor.org/stable/1883123>.
- Poterba, James M. (1992), “Taxation and Housing: Old Questions, New Answers,” *The American Economic Review* 82(2), 237–242.
- Poterba, James M., and Todd Sinai (2008), “Tax Expenditures for Owner-Occupied Housing: Deductions for Property Taxes and Mortgage Interest and the Exclusion of Imputed Rental Income,” *The American Economic Review* 98(2), 84–89, <https://www.jstor.org/stable/29730000>.

- Prescott, Edward C. (1997), “On Defining Real Consumption,” *Federal Reserve Bank of St. Louis Review* (May/June), 47–54, <https://doi.org/10.20955/r.79.47-54>.
- Rajbhandari, Ashish (2016), “Cointegration or Spurious Regression?” blog post, September 6, 2016, Stata, <https://blog.stata.com/2016/09/06/cointegration-or-spurious-regression/>.
- Sandelin, Bo, and Bo Södersten (1978), *Betalt för att bo. Värdestegring och kapitalvinster på bostadsmarknaden [Paid to Live. Appreciation and Capital Gains in the Housing Market]*, Raben & Sjögren, Stockholm.
- SBAB (2024), “Historiska boräntor [Historical Mortgage Rates],” website, SBAB Bank, https://www.sbab.se/1/privat/vara_rantor.html#/rantor.
- SBAB Booli (2024), “SBAB Booli Housing Price Index,” web page, SBAB Booli, https://www.sbab.se/1/analys__rapporter/sbab_booli_housing_price_index.html.
- Sinai, Todd, and Nicholas S. Souleles (2005), “Owner-Occupied Housing as a Hedge Against Rent Risk*,” *The Quarterly Journal of Economics* 120(2), 763–789, <https://academic.oup.com/qje/article/120/2/763/1933972>.
- Statistics Sweden (2014), “Average Housing Expenditures as a Percentage of Disposable Income Per Household by Region, Tenure, and Household Type. Year 2004–2013,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__HE__HE0103__HE0103E/Boendeutgift/.
- Statistics Sweden (2022a), “Housing Expenditures as a Percentage of Disposable Income, Disposable Income and Residual Income per Household by Region, Tenure and Type of Household. Year 2015–2021,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__HE__HE0202/HE0202T05/.
- Statistics Sweden (2022b), “Rents in Newly Constructed Buildings. Year 1997–2013,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__BO__BO0404__BO0404C/BoHyraNyprod1/.
- Statistics Sweden (2023a), “Balance Sheets (ESA2010),” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__NR__NR0103__NR0103K/SektorENS2010ArBR/.
- Statistics Sweden (2023b), “Lending Rates to Households for Housing Loans, Break-down by Fixation Periods. Month 2005M09–,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__FM__FM5001__FM5001C/RantaT04N/.
- Statistics Sweden (2023c), “Operation, Maintenance, and Repair Costs of One- and Two-Dwelling Houses, Year 1993–2021,” data available upon request, Statistics Sweden.
- Statistics Sweden (2023d), “Rents in Newly Constructed Buildings (Rented Dwellings) by Region, Investor and Dwelling Type. Year 2014–2022,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__BO__BO0404__BO0404A/HyresrattBygghLgh/.

- Statistics Sweden (2024a), “Consumer Price Index (CPI) by Product Group, 1980=100. Month 1980M01–,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__PR__PR0101__PR0101A/KPI19Bas1980/.
- Statistics Sweden (2024b), “Consumer Price Index (CPI) by Product Group (COICOP), 1980=100. Month 1980M01–,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__PR__PR0101__PR0101A/KPICOI80MN/.
- Statistics Sweden (2024c), “Consumer Price Index (CPI), Total 1980=100. Month 1980M01–,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__PR__PR0101__PR0101A/KPItotM/.
- Statistics Sweden (2024d), “Institutional Non-Financial Sector Accounts (ESA2010), Current Prices, SEK mn. Quarter 1980K1–,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__NR__NR0103__NR0103C/SektorENS2010Kv/.
- Statistics Sweden (2024e), “Number of Dwellings by Region, Type of Building and Tenure (including Special Housing). Year 1990–2021,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__BO__BO0104__BO0104D/BO0104T04/.
- Statistics Sweden (2024f), “Real Estate Price Index for One- and Two-Dwelling Buildings for Permanent Living by Region. Quarter 1986K1–,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__BO__BO0501__BO0501A/FastpiPSRegKv/.
- Statistics Sweden (2024g), “Savings Barometer,” web page, Statistics Sweden, <https://www.scb.se/en/finding-statistics/statistics-by-subject-area/financial-markets/financial-accounts/savings-barometer/>.
- Statistics Sweden (2024h), “Sold One- and Two-Dwelling Buildings for Permanent Living by Region. Year 2000–2023,” table in Statistical Database, Statistics Sweden, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__BO__BO0501__BO0501B/FastprisPSRegAr/.
- Svensson, Lars E.O. (2019), “Housing Prices, Household Debt, and Macroeconomic Risk: Problems of Macroeconomic Policy I,” working paper, Stockholm School of Economics, <https://larseosvensson.se/2018/12/16/housing-prices-household-debt-and-macroeconomic-risk-problems-of-macroprudential-policy-i/>.
- Svensson, Lars E.O. (2020), “Macroprudential Policy and Household Debt: What is Wrong with Swedish Macroprudential Policy?” *Nordic Economic Policy Review* 2020, 111–167, includes Online appendix, <https://larseosvensson.se/2019/12/05/macroprudential-policy-and-household-debt-what-is-wrong-with-swedish-macroprudential-policy/>.
- Svensson, Lars E.O. (2021a), “Amorteringskraven snedvrider och utestänger, även i Stockholms län [The Amortization Requirements Distort and Exclude, Also in Stockholm County],” *Ekonomistas* blog post, September 28, 2021, <https://ekonomistas.se/2021/09/28/amorteringskraven-snedvrider-och-utestanger-uppdatering-stockholms-lan/>.

- Svensson, Lars E.O. (2021b), “Amorteringskraven snedvrider och utestänger: Uppdatering [The Amortization Requirements Distort and Exclude: Update for Stockholm Municipality],” Ekonomistas blog post, April 13, 2021, <https://ekonomistas.se/2021/04/13/amorteringskraven-snedvrider-och-utestanger-uppdatering/>.
- Svensson, Lars E.O. (2022a), “A Note on Housing Depreciation,” note, Stockholm School of Economics, <https://larseosvensson.se/files/papers/a-note-on-housing-depreciation.pdf>.
- Svensson, Lars E.O. (2022b), “A Simple Frictionless Model of User Cost and User-Cost-to-Income and User-Cost-to-Rent Ratios,” note, Stockholm School of Economics, <https://larseosvensson.se/files/papers/simple-frictionless-model-user-cost.pdf>.
- Svensson, Lars E.O. (2023), “House Prices and User Costs in the European Union: Why Price to Income Is a Misleading Valuation Indicator,” in progress, Stockholm School of Economics.
- Sveriges Riksbank (2021), “Rapidly Rising Housing Prices despite the Corona Virus,” *Monetary Policy Report April 2021* Box 2, 67–77, <https://www.riksbank.se/globalassets/media/rapporter/ppr/fordjupningar/engelska/2021/rapidly-rising-housing-prices-despite-the-coronavirus-crisis-article-in-monetary-policy-report-april-2021.pdf>.
- Turk, Rima A. (2015), “Housing Price and Household Debt Interactions in Sweden,” IMF Working Paper WP/15/276, International Monetary Fund, <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Housing-Price-and-Household-Debt-Interactions-in-Sweden-43494>.
- Valueguard (2024), “Valueguard-KTH Housing Index (HOX),” website, Valueguard, <https://www.valueguard.se/beskrivning>.
- Verbrugge, Randal (2008), “The Puzzling Divergence of Rents and User Costs, 1980–2004,” *Review of Income and Wealth* 54(4), 671–699, <https://doi.org/10.1111/j.1475-4991.2008.00295.x>.