

Some Thoughts on Household Cost Indices

Martin Weale

King's College and ESCoE

The Household Cost Indices: Key Aims

- Constructed round a democratic cost index
- Include interest payments as an outgoing, with owner-occupied housing costs represented by mortgage interest payments
- Suggest capital costs of housing should also be included, at least for first-time buyers
- Aim to charge for goods and services when they are paid for rather than when they are consumed.
- Give costs of insurance weights based on premia rather than costs of providing insurance

A Basic Cost Index

- Aim to show the change in the cost of achieving a given level of welfare
- Based on consumer utility maximisation
- Max $U(\mathbf{q}) + \mu(W - \mathbf{p}'\mathbf{q} - T)$
- Here \mathbf{q} is a vector of goods or services, \mathbf{p} is their prices and T is the total amount paid out in taxes.
- If we now look at the derivatives, at the optimum
- $\frac{\partial U}{\partial p_i} = -\mu q_i$, $\frac{\partial U}{\partial T} = -\mu$ and $\frac{\partial U}{\partial W} = \mu$

- So the increase in money income needed to offset increases in price of Δp_i and taxes, ΔT , is
- $\Delta W = \Delta p'q + \Delta T$ and the percentage increase in the cost of living is
- $\Delta W/W = (\Delta p'q + \Delta T) / (p'q + T)$
- $= (\sum_i \left(\frac{\Delta p_i}{p_i}\right) p_i q_i + \left(\frac{\Delta T}{T}\right) T) / W$
- Here $p_i q_i / W$ is the share of outgoing spent on good i and T/W is the share of T in total outgoings.
- So there is nothing wrong in principle in other outgoings such as taxes in a cost of living index.
- Like all price indices this works exactly for very small changes. Beyond that there is always the question of choice of the index formula (Paasche, Laspeyers, Divisia, Fisher etc)

Interest payments

- These can be handled in the same way. If D is debt and r is the interest rate, the maximisation problem is
- $\text{Max } U(\mathbf{q}) + \lambda(W - \mathbf{p}'\mathbf{q} - rD)$
- $\Delta W = \Delta \mathbf{p}'\mathbf{q} + D\Delta r$
- so the increase in the cost of living is given by
- $\Delta W/W = (\Delta \mathbf{p}'\mathbf{q} + D\Delta r) / (\mathbf{p}'\mathbf{q} + rD)$
- $= (\sum_i \left(\frac{\Delta p_i}{p_i}\right) p_i q_i + \left(\frac{\Delta r}{r}\right) rD) / W$
- The percentage increase in the interest rate is weighted by the share of interest payments in the budget.

Interest Receipts

- The treatment of interest payments as a cost raises an issue over interest receipts.
- These are likely to accrue to different people from those making interest payments.
- But an overall price index is for the average of the population and needs to reflect the average.
- It is of course possible to produce price indices for subgroups, such as people with mortgages

Democratic Weights and their Implications

- The previous analysis was for an individual. There are two obvious ways of combining individuals
 1. Use shares in total aggregate expenditure. These are plutocratic weights because high spenders have more influence on the overall shares.
 2. Use the average of each household's share. These are democratic weights because each household has equal weight.
 3. Astin and Leyland prefer to call these household weights and expenditure weights but the terms democratic and plutocratic are used more widely.

A Cost Index for Ordinary People?

- The RPI weights excluded i) households above the 96th income percentile and ii) pensioner households who derive at least $\frac{3}{4}$ of their income from the state.
- The aim was to make it representative of a “typical” household.
- Muellbauer (Econometrica, 1976) showed how to estimate the percentile in the income distribution occupied by the household representative to a particular price index such as the RPI. Leaving out the top 4% of households may well be offset by leaving out poor pensioner households.
- A price index cannot be very suitable for uprating benefits if it excludes the spending of a large group of people who are dependent on benefits.
- An index needs to represent the average of a population or population subgroup.
- Care is needed not to adopt a definition which limits it to a subgroup while proposing it for general use.

Implications of Democratic Weights (i)

- Any value measure can be decomposed into prices and quantities. Suppose our value measure V is defined as
- $V=PQ$ and $W_i=P_iQ_i$ We want to find the quantity index that goes with the democratic price index when there are N households
- $\log V = \sum_i \log W_i / N$
- $\Delta V / V = (\sum_i \frac{\Delta W_i}{W_i}) / N$
- $\Delta P / P + \Delta Q / Q = (\sum_i \frac{\Delta P_i}{P} + \frac{\Delta Q_i}{Q_i}) / N$

Implications of Democratic Weights (ii)

- Now $\Delta P/P = (\sum_i \frac{\Delta P_i}{P_i}) / N$ is the growth of the democratic price index; averaging the weights means that the growth of each household's price index is averaged.
- So the quantity counterpart is $\Delta Q/Q = (\sum_i \frac{\Delta Q_i}{Q_i}) / N$
- This cannot be observed but we can calculate it as
- $\Delta Q/Q = \Delta V/V - \Delta P/P$
- $\Delta V/V$ is the growth of the geometric mean of household income.
- So the democratic price index should be used to deflate geometric means and not arithmetic means or medians. If log income is symmetrically distributed the median and the geometric mean are the same.
- The outcome is a democratic measure of real income growth.

Coherence Across the Distribution

- Suppose we produce measures of democratic real income growth for subgroups of the population.
- The democratic real income growth measure for the whole population is the average across the subgroups, weighted by the number of households in each.
- If we produce democratic real income figures by quintile, the democratic real income for the whole population is the geometric mean of the democratic real income of each quintile.
- The same is true if we look, say at old people and young people.
- The structure is coherent in a way that medians are not.

The Cost of Living and the Life-cycle

- The cost of living index should relate to the cost of obtaining a specific level of welfare. (Astin and Leyland disagree with this).
- If we do not want to relate it to current welfare there are a number of other possibilities
 - a) The total life-time welfare of a young person. To do this requires very strong assumptions about the future, so that prices of future consumption can be inferred.
 - b) Remaining life-time welfare. Except for very old people this also requires very strong assumptions about the future.
 - c) Past (and future) welfare enter only when associated with certain specific transactions. The HCl as proposed by Astin and Leyland is of this form. The choice of what to include could appear arbitrary. This, applied generally directs a focus to cash flow rather than income.

Charging for Stuff when it is paid for

- The principle if applied in general should be symmetric, charging for goods paid for in advance as well as in arrears.
- Saving is exactly that, but we do not know what people are going to buy or when they are going to buy it.
- We could assume they buy the goods component of the HCI, with the future price determined by the yield curve for indexed gilts. But some assumption is needed about when they are going to start consuming.
- We could look only at contractual saving (e.g. pensions) but that is arbitrary.
- How to address double-counting? If we account for future consumption today we should not also count it when the consumption paid for today is enjoyed.
- What do we do about errors? Prices turning out differently from what the yield curve implies.

Durable goods and services

- Current utility relates to a point in time. Some goods are durable.
- The flow of utility from a car or other durable goods is probably better matched to a stream of loan repayments than to a single cash purchase. Charging when stuff is paid for may take us closer to the truth- or to an imputed use charge- in this case.
- That may also be true of the education paid for by a student loan- education is in some sense a durable service.
- It is probably not true of a holiday paid for with a loan.
- If an increase in the price of education meant someone got less education, then, at least if we accept human capital theory, their current earnings and utility are lower.
- **The principle of charging when goods are paid for is easier to defend and manage in specific cases than as a generality. For durable goods less than perfect spreading over time is probably better than treating them like non-durable goods. One might do this for all durable purchases, and not just those made using credit.**

Housing and the Life-cycle

- Housing remains a vexed issue. Consider it from a life-cycle context.
- Assume that i) a house depreciates fully during someone's adult life, ii) the rental rate on housing net of depreciation is the same as the mortgage rate, iii) the population is in steady state and iv) people buy houses only once, on becoming adults.
- Four possible approaches:
 1. Net acquisitions (Eurostat had intended to use this, but it now seems they will not)
 2. Capital and interest mortgage charges.
 3. Imputed rent (with the gross rental rate representing depreciation as well as the return)
 4. Hills, Steurer and Waihl ([Graz Economics Paper](#) January 2018) suggest a user cost approach based on the assumption that people are indifferent between owning and renting. They recommend calculating the user cost from a long-term interest rate and estimates of depreciation and maintenance costs. The user cost is multiplied by an average house price to give a housing cost. In this simple steady state model that will be the same as (3).

Housing

- CPIH represents housing costs by imputed rent. RPI uses mortgage interest payments and imputes a depreciation charge (which is (mis)calculated from the value of land as well as buildings). Thus both CPIH and RPI include imputed charges.
- Price index statisticians are reluctant to use imputation.
- An increase in imputed rent has, of course, no impact on living standards of current home-owners and that may be a reason for feeling uncomfortable with it. The same would be true if housing costs of owner occupiers were measured with reference to current house prices.
- Astin and Leyland propose that mortgage and capital costs of housing should be represented in the index.
- They acknowledge that it is difficult to identify the capital costs of anyone except first-time buyers and suggest that in practice only these should be included.
- This means presumably that people who move from house A to a similar house B will no longer have their mortgage capital payments counted, while if they had stayed in house A they would see them counted.

Net Acquisitions and Imputed Rent over the Life Cycle

- A young person spends $\text{£}H$ on buying a house. If adult life lasts N years, then the share of housing in the price index is computed from $\text{£}H/N$
- The rental rate is $R=r+\delta$. All house-owners face either actual or imputed rent. For the owners, the relevant expenditure is computed from RH .
- With linear depreciation if $r=0$, then $RH=H/N$ - expenditure given by the net acquisition approach.
- If $r>0$, then $RH>H/N$
- So net acquisition gives a lower weight to housing than does imputed rent in a cost of living index for the whole population, at least if the rate of return on housing is positive.
- If a mortgage is repaid over fewer than N years, then the weight lies between the imputed rent and the net acquisitions case. If it is repaid over N years the result is as with imputed rent, while if it is repaid straight away the result is as with net acquisitions. Mortgage payment also understate the life-time cost of housing but by less than net acquisitions.

- It is much easier to justify including capital costs if houses in broad terms last a life time but no longer.
- Accounting for housing by means of capital and interest costs underweights housing costs over the life cycle and thus for the whole population.
- But it is more coherent for people with mortgages if housing costs are seen as similar to a tax, and we consider short-term utility maximisation taking housing as given.
- Seen in utility terms, the issue is whether we consider short-term or long-term decision-making.
- **Do we want HCIs to relate to people with mortgages or to the whole population?**

Interest Payments and Receipts

- Astin and Leyland propose including interest payments but not interest receipts.
- If the index describes a representative household, then perhaps we need to take account of receipts as well as payments.
- If income data were available to the same frequency as price data it would be possible to produce up to date “real” income data with interest receipts going into income.
- Since that is not the case, if only payments are included, an increase in interest rates will lead to the impact on the representative household being overstated.
- Note that with democratic weights interest receipts are likely to be much less important than with plutocratic weights.
- **Do we want the HCI to be representative or to be an index of costs for debtors?**

Insurance

- The proposal to work with gross payments has much to commend it. The prices of insurance are in any case measured gross.
- For output purposes it is sensible to treat an increase in risk as a quantity effect, not a price effect.
- But to compare living standards over different periods, an increased risk of loss does imply a reduction in living standards.
- The resolution of this dichotomy is not clear, but for the time being it is sensible to see risk effects as price effects.

A Suggestion

- Deaton (Journal of Economic Perspectives, 1998)
- Am I “too quick to embrace the cost of living approach”
- As an alternative “we would do better by compiling a list of properties that we want from a CPI”.

My list

- Each household's experience should be treated equally, pointing to democratic weights.
- The full cost of insurance should enter because the transfer income associated with insurance claims makes good a loss but does not increase welfare beyond that.
- All direct taxes should be included (why leave income tax out?).
- Symmetry test should be satisfied (e.g. interest receipts and interest payments or things paid for in arrears and things paid for in advance).
- As far as possible charges for durable goods should be associated with use and not purchase.
- But more thought needs to go into the treatment of housing. An issue is that homeowners are unaffected by increases in house prices, while prospective buyers are extremely affected. Do we need to separate the two and have a price index for home-buyers?.
- **Do we want an index which is "right" in the long run but does not do a good job at showing short-term movements in living costs, or one which is right in the short-term but weak in the long term?**

Conclusions

- The HCI makes a valuable contribution to our understanding of price movements.
- The fact that its growth is currently very little different from HCPI is neither here nor there. That may not always be true.
- The use of democratic weights is particularly important and should be linked to geometric means of household income in order to give a democratic measure of real income growth.
- There is no theoretical obstacle to extending the price index to include taxes and interest payments. It is not clear why income taxes should be left out.

Conclusions (continued)

- A number of proposals risk limiting the scope of the index from one relevant to an average household, to one relevant only to a subgroup of households.