

### **3.3.2 Accounting for depletion**

*by Henri Neuburger*

I have come to this debate much too late to avoid repeating the errors and heterodoxies of earlier participants. I am therefore going to start with AH's comments on AV, taking her interpretation of agreements and differences as authoritative.

I begin with where I think recent debate on the issue started - the issue of sustainability. It seems to me unlikely that the national accounts can answer the question of sustainability. Sustainability requires both a description of policy and some modelling to describe the consequences of policy. Sustainability is not a characteristic of an economy and its environment; it is a characteristic of a policy in the context of an economy and environment. Statistics may tell you whether the kind of economy and environment will make certain kinds of policy sustainable. However, one thing which I believe is common to most believers in sustainability is an absence of discounting. A positive discount rate therefore implies greater importance given to the present than the future. Concern with the - possibly indefinite and certainly far distant - future is a characteristic of the sustainability debate. People think of sustainability in terms of giving equal weight to the welfare of each generation. This implies a social time preference, the greater value of having something this year than next, of zero. A case could be made that the discount rate could be equal to the expected long term growth of output per person. Even if that were so, the discount rate would be very small. Nor do I think it is relevant in the case of subsoil assets, where the stock of such assets is expected to be used up and not be expandable by technical progress. A discount rate at or close to zero should therefore be the expectation when we are looking at issues of sustainability.

Against this background accounts would seem to be needed to tell you three things:-

- has the prospect of future income changed during the accounting period?
- have resources been devoted to changing the income prospect?
- how far have these resources established a claim on the change in income?

#### **Subsoil assets - points of agreement**

1. Importance of working within the SNA 93 framework. Of course this is a good idea, but it should not act as an over-riding constraint. Nor does it seem to me that either AV or AH stick rigidly to this doctrine; they are both looking to ways of developing it.

2. Separating owner and extractor I agree with both, but I wonder whether we should also have a prospector. This person produces knowledge which is an intermediate input into the extraction process. This does not mean that I think that converting hidden oil into known reserves is a production process, but that producing knowledge by prospecting for it is. Either the owner or the extractor can then buy this knowledge which provides a return to the prospecting capital, or else the prospector can be the owner or extractor in which case their return is, in part, return to such capital. In this case new discoveries come into the other volume changes, but the intangible asset representing knowledge of them would, in a non-SNA93 world, be included in the stock of intangible assets. This bears on disagreement 1. What I think I am suggesting is that this has implications for the asset boundary. We should start with statistically possible reserves created by some kind of projection from current exploration results, and then have different values for them as levels of certainty are added.

6. I am not sure about new discoveries being recorded in other volume changes. It depends whether you expect to make regular discoveries or not - more below.

7. Changes in reserves due to technology in this paragraph means change due to extraction technology. Changes in use technology will be reflected in price. BUT if changes in use technology are sufficiently widespread they may result in price changes. So if we find a substitute for coal, then this will write off the reserves irrespective of their rate of extraction. This should be treated in the same way as extraction technology I think. But then how do we distinguish between such technological changes and changes in the market eg clean air acts.

### **Subsoil assets points of disagreement**

1. Revaluation as realisation of asset approaches I am very unhappy with this concept. The apparent analogy is with a bond with a fixed redemption date. It increases in market value as its redemption date approaches. However in the case of a subsoil asset, the ability to extract oil is constrained by the machinery used to extract it or by demand. If there were more investment, then more would be extracted - the rate of extraction is therefore in the hands of the extractor not in the nature of the asset. The difference in the value of resource at different dates is attributable to the produced capital not the non-produced asset. The rental value of the subsoil asset should be independent of its attendant capital and of the planned rate of extraction. If the rate of extraction is demand constrained, this implies that the price is not a market price - pity, but one we have to stand in much more vexing circumstances.

As in agreement 2 above, I would argue that another asset held by someone is knowledge which is a produced asset. The issue of produced v non-produced seems to be rather unclear. It all depends how much you would normally expect to find. When people first threw seeds on the ground, they probably were surprised that they got corn and regarded it as a non-produced asset. after a while they got used to it and agriculture became production. If people keep finding more oil when they look then this will also become production.

We are thus assuming that the expected level of future discoveries is some projection of past discoveries. This is a more central estimate than one which assumes that future discovery rates are zero even though they have not been in the past. Where a resource is genuinely not augmentable, as in the case of rainforest, then the projected expected rate of discovery is zero.

If we have a zero discount rate then we preserve the concept of net present value, but don't discount.

3. By economists' view of income I assume AH means Hicks's concept. I am not sure it would be embraced by all economists. I certainly don't think that economists' rather than normal people's views should decide this issue. I am not sure I know what conclusions this leads me to, but I do not think Hicks helps with sustainability. One particular conclusion which may possibly help to clarify this disagreement is that Hicks's concept is net concept - that is income net of capital consumption. I am not sure that both AV and AH are talking about income in this sense.

If they are, and if, contrary to my earlier argument I were to accept a positive discount rate, then the Hicksian definition would require that the consumption of fixed capital in

any given period was the equivalent of a sinking fund which could be applied restoring the original capital stock at the beginning of the period. Thus in the first period of any piece of capital whether subsoil or not, we progress from a new unused piece of capital to one that is a year older and a year nearer the remaining period of its operation. This is not the same thing as a one year old piece of capital not available for a year. So the capital value of a piece of capital after a year is not just the amount of it that is used up, but, in the strange world created by a positive discount rate, the difference between that equipment being available immediately and available one year later. The discomfort arises because this is arithmetically equivalent to the present value of advancing all the benefits from the capital one year.

The paradox can be described in terms of depreciation. Straight line would appear to imply that a piece of capital loses the same fraction of its original value each year. This does not mean that its value declines by a constant fraction until it dies unless the discount rate is zero. With any positive discount rate the decline in value each year will be less than the fraction by which the capital is used up. The decline in value must be the amount by which gross income is adjusted to give net income.

### CFC

I agree with AH that separating the returns to assets which are indissolubly linked is not possible. What I still do not understand is why anyone wants to do it. Once a piece of installed equipment is unavailable for any use other than the extraction of a specific subsoil asset, then its return and that of the asset itself are inseparable. For the purpose of constructing a total balance sheet there is no need to separate them. Similarly for calculating the consumption of fixed capital, there is no need to value the items separately unless the produced capital will not last as long as the non-produced capital. If the whole field will run out together, then its consumption can be measured in one piece. If more equipment has to be installed, or some of the equipment will cost money to scrap, then the (possibly discounted) value of this additional expenditure needs to be subtracted from the value of the resource to be extracted.

Some time ago Prashant Vaze and I proposed a system of valuing the whole of the current assets involved in subsoil asset extraction by distinguishing between fields currently in operation and those not started. The former would be valued by looking at both the equipment and the remaining stock of oil. The latter would be valued by subtracting the value of the equipment need to extract the oil from the sale value of the oil. All these could be discounted if you like. If we adopt this scheme, then all the uncertainty is attributed to what economists, though possibly not national accountants, call the rental on the unvariable assets.

CFC is clearly important. Net concepts are what people want to know; but gross concepts are what people currently use. The problems of measurement are so severe that people have little confidence on CFC and net output measures.

The problem is that there are three magnitudes:

- the scale of provision for the future
- the inheritance of provision from the past.
- the claim on shares of current gross operating surplus

They are linked only at one point, but they are separated by depreciation, revaluation and other changes in assets. The relatively simple notion of depreciation which involved the wearing out of a machine has got confused by considerations of obsolescence which would be more conventionally handled in other changes in assets arising from technology.

The notion of depreciation is not too bad for sub-soil assets, but when we try to apply it to intangibles or equipment with rapidly changing technology it gets worse. Only if you are trying to separate total factor productivity from factor improvement is it important to distinguish the contribution made to the present production from old machines and new techniques. From the point of view of policy it matters how much provision you make for the future. But if we accept neo-classical endogenous growth theory or its more sensible ancestors like learning by doing, then this distinction is impossible to make.

I think the conclusion that I am creeping toward is that the PIM needs extensive development. What we need is a scheme for depreciation which is linked entirely to the opening and closing capital stocks and only fixed capital formation in the current year is relevant. We depreciate from where we got to, not from where we started. If we are replacing capital in the current year with more effective capital, then that should be identified as an increase in the capital stock. There is a danger in the present system that we replace old computers by new cheaper ones that we shall record this as a fall in the capital stock. Quality adjustment or deflation needs to ensure that the new capital is valued appropriately relative to the old. The old stock is still of value even if not as powerful. It may not represent a claim on income or have a market value, but still has a use. I am currently writing this on a 386.

Changes in the market value of marketable assets are only of importance for the allocation of wealth to sectors, industries or other subdivisions of the economy. If one sector owns all the old machines and another owns all the new ones, then we need the valuation in order to allocate claims on gross operating surplus.