Comments on…

"Chapter 20: Capital services and the national accounts" and
"Annex to chapter 6: Separating storage production from holding gains and losses"

U.S. Bureau of Economic Analysis – May 31, 2008

We compliment the editor on a clear exposition of material that is new to the SNA. The text reads well and we liked the numerical examples. These two sections represent efforts to incorporate capital theory—essentially, the accumulation through time of resources diverted from consumption, and the discounting of expected future income flows—into national accounting. The efforts are welcome, as they further the movement of national accounting away from bookkeeping and toward economic theory.

Chapter 20 - Substantive comments

The draft should inform the reader that all of the tables shown in the chapter are either expressed in constant prices or assume no price change.

20.3 – Here non-financial assets, which contribute to production, are distinguished from valuables, which store value. Well and good, but a glance at the user-cost formula turns up an expected revaluation term alongside the interest rate and depreciation terms, so store-of-value issues matter for non-financial assets and should be given some scope.

It might also be relevant to mention consumer durable goods, which are not recognized as assets in the System, but which countries are encouraged to calculate and present as memorandum items.

20.4 – "*Changes due to unexpected events appear in the other changes in the volume of assets account.*" - Although most changes classified as other changes in the volume of assets are unexpected, so are some of the transactions shown in the current, capital, and financial accounts. The distinguishing feature of changes classified as other changes in volume of assets is that they are not transactions.
"*Other changes in value are treated as transactions and must be recorded elsewhere in the System.*" - We don't understand this statement.

20.5 – The capital services produced by fixed assets *can* be classified as services in the national accounts—specifically, when the asset is leased under an operating lease. The reason that capital services are not generally regarded as produced services is because most capital is owned and used by the same unit; hence the flow of capital services is internal to the unit. The estimation of capital services for fixed assets can be understood as another example of measuring an internal flow.

A related comment is that often capital services are motivated as what the enterprise would be willing to pay for the use of a capital asset in production for one period (essentially, an implicit rental). As with the discussion of rent on land, some cautions are needed, because market rentals

are not always the same as capital services. Nevertheless, we recommend that the chapter add a brief discussion of the possible relationship between an asset's capital services and its rental value.

20.14 and Table 20.2 – we note that this approach to solving for capital services doesn't work for geometric depreciation, because the asset never fully depreciates. If the author decides to give additional emphasis to geometric depreciation (as we recommend), perhaps we could help the author to put together an example to demonstrate the intuition of how the geometric profiles can be solved.

20.18 – "*It is easy to postulate a constant age-efficiency profile, but the corresponding age-price profile is much less intuitively obvious.*" We think this sentence overstates the case for starting with the age-efficiency profile. An intuitive example where one starts with the age-price profile is found in the case of the financial loan in Table 20.10. Also, all of the widely-used patterns of age-price profiles imply reasonable patterns of age-efficiency declines.

20.19 - This paragraph concludes a nice discussion of why non-increasing age-efficiency profiles are a better starting point for capital-asset accounting than non-increasing age-price profiles. But then a few quick cautions follow, some apparently directed toward practical estimation (e.g., "…it should be confirmed that the selected age-efficiency profile is consistent with the observed age-price movements"), but others suggesting, correctly, that the chapter isn't enough to guide practical estimation (e.g., "Also, in practice, assets are never valued individually but in cohorts and for similar but not necessarily identical types of assets. This brings other factors into consideration such as the distribution of asset retirements."). The cautions feel hasty, tacked on to acknowledge criticisms without genuinely addressing them. In fact, aggregation issues are very important in national- or industry- level capital accounting, *if* one begins from individual assets. Though sections A and B of the chapter partly follow the BLS approach to capital (but neglect revaluations and service-life distributions), most agencies that tabulate productive or wealth stocks dispense with individual-asset accounting altogether in favor of computationally simpler geometric depreciation of the whole mass of capital of a given type. That is the approach recommended in the OECD capital manuals (mentioned in paragraph **20.7**). We think that practitioners would do well to use the simpler geometric assumption except when it is explicitly at odds with the data.

20.21 – Except for the discussion of mixed income in paragraphs 20.35-20.36, this chapter identifies capital services with gross operating surplus. However, manuals such as the OECD's *Measuring Productivity* (paragraphs 105, 144, and Implementation Sheet 8 on pages 112-113), the second draft of the revised *Measuring Capital* manual (e.g., paragraph 297), government statistics such as those produced by the U.S. Bureau of Labor Statistics in its estimates of multifactor productivity (see chapter 10 of *BLS Handbook of Methods*, p. 93, footnote 16, http://www.bls.gov/opub/hom/pdf/homch10.pdf), and the academic literature on capital services all assume that property taxes and other taxes on the use of fixed assets are paid from capital services; consequently the calculation of capital services includes these types of taxes.

Consequently, we recommend that capital services should be assumed, on average, to be approximately equal to gross operating surplus *less* rent on leased land and imputed rent on

owned land used in production *plus* recurrent taxes on land, buildings, or other structures *plus* taxes on the use of fixed assets or other activities (motor vehicles). Discussion of this issue may require adding another paragraph or two.

20.24 – Two of our reviewers provided comments on this paragraph which perhaps say pretty much the same thing—the first less technically, the second with full mathematical expression. We provide both comments:

- Comments of reviewer 1: The author writes that efficiency patterns are known or estimated. I believe that they are almost always assumed. The author also writes that the user cost can be expressed in terms of "*the real cost of financial capital, a general inflation index, and a depreciation factor*." I believe that this is wrong. The correct wording is "the price of the asset multiplied by the sum of the nominal rate of return, the asset's rate of depreciation, and the asset's rate of price deflation (the negative of its rate of inflation)."

- Comments of reviewer 2: This paragraph presents the user cost, though with an odd introduction: "*…the factors underlying the relationship between start- and end-year values and the reasons for the decline*." Could these include maintenance, extraordinary use, and other *substantive* causes? No, only the terms of the user cost, and these are misstated: "*the real cost of financial capital, a general inflation index and a depreciation factor*." Without tax terms, the continuous-time user cost u is:

$$u = p(i + \delta - \mathbf{E}\,\hat{p})$$

with p the nominal purchase-price of a new asset and $\mathbf{E}\,\hat{p}$ the expected instantaneous rate of change of the new-asset purchase-price, $i>0$ the nominal rate of return on the best alternative use of funds with the same risk, and $\delta>0$ the instantaneous rate of decline in the resale price of the asset as it passes from new to no-longer new. Subtracting and adding $\mathbf{E}\,\hat{\pi}$, the expected rate of general inflation, inside the parentheses and then re-grouping, gives:

$$u = p[(i - \mathbf{E}\,\hat{\pi}) + \delta - \mathbf{E}(\hat{p} - \hat{\pi})]$$

so that $i - \mathbf{E}\,\hat{\pi}$ is now a real cost of capital, while $\mathbf{E}(\hat{p} - \hat{\pi})$ is the expected departure of the asset's inflation rate from the general. A further rearrangement:

$$u = p[(i - \mathbf{E}\,\hat{\pi}) + (\delta - \mathbf{E}\,\hat{p}) + \mathbf{E}\,\hat{\pi})]$$

puts things into terms compatible with the chapter, but now the composite depreciation-less-nominal-revaluation term, $\delta - \mathbf{E}\,\hat{p}$, is a strange composite that can easily go negative.

20.25 – The paragraph is too strong. Yes, precise balance-sheet dating is needed, but capital services, gross operating surplus, and consumption of fixed capital are flows, for which a middle-of-year figure is only an approximation. BEA uses similar approximations, but the text should recognize that the middle of the period is not necessarily the same as the average for the period.

20.31 – "*The fact that land usually earns more under buildings than when it is farmed, explains why building land is typically more highly valued than farm land.*" Several observations suggest that this statement is less obviously true than it may seem: (a) Measuring the value (or earnings) of land under buildings is extraordinarily difficult, which makes the statement hard to verify. (b) If the land is in a similar location (e.g., rural land) and its use is not restricted, economic theory suggests that the income from marginal land used for farming should be equal to the income from marginal land used under buildings. (c) On the other hand, most land under buildings is located in urban areas, whereas most farm land is located in rural areas. Urban land generally is more valuable than rural land because many activities benefit from proximity to each other and to transportation infrastructure. Nevertheless, it is not clear that vacant urban land is necessarily less valuable than similar urban land under a building; for example, if the building is at the end of its service life, the vacant land may be more valuable because the buyer of the vacant land will not have to incur demolition costs prior to commencing with new construction. (d) Government land use regulation (such as zoning) often restricts the supply of land available for buildings, thus creating a scarcity of supply. All of these considerations suggest that the presence or absence of a building on land may not be as important as other factors in determining its earnings and value.

20.33-34 – It is strange to form expectations of the future harvests from a forest, since harvests are a decision variable, dependent on the exogenous growth rate of trees and the interest rate (c.f. Hotelling). Also, the wording of the mining case is rough: how much of the digging out should be considered income, and how much attributed to depletion?

20.38 – The statement: "*The decline in the value of the asset including the residual value is lower year by year than the decline in the capital services to be rendered in these four years because there is an income element coming from the fact that the residual value increases as the time for disposal of the asset gets closer*" is incorrect as written. *Any* individual asset with a finite service life will exhibit an age-price profile that falls faster than the age-efficiency profile, even if there is no residual value, solely because of finite discounting.

Table 20.6 is not necessarily wrong, but it is forced. In particular, the capital owner doesn't just decide to dispose of the asset for $300. In a thick used-asset market, the residual value would equal the sum of anticipated earnings subsequent to the disposal date, discounted to the disposal date. (If, however, the used-asset markets are "thin," the timing of disposals would matter.)

20.43 - The example given for terminal costs, when compared with the similar example given in paragraph 20.37, appears to imply that having terminal costs results in a smaller value of consumption of fixed capital. This stems from the author's keeping the value of capital services the same regardless of whether there are any terminal costs. In fact, having terminal costs causes the value of consumption of fixed capital to be higher by the value of these terminal costs.

20.46 - To calculate equal-valued investments that come to $200 over four years, solve (depending on the timing convention) for x between

$$200 = (1.05 + 1.05^2 + 1.05^3 + 1.05^4)x \qquad \rightarrow x = 44.19$$

and:

$$200 = (1 + 1.05 + 1.05^2 + 1.05^3)x \qquad \rightarrow x = 46.40$$

It makes no sense to divide variously-discounted stocks by four, since the sought-after x's are flows.

20.47 – This paragraph is hard to understand. The author may only be trying to state that when data on actual rents is unavailable, rental values can be imputed using a user cost measure. If that is the intention, she should state it in a more direct manner.

20.52 – Again, we quibble with the "general preference for an age-efficiency approach" (of course, with geometric profiles we don't have to choose!) and the importance of the age-price profile (which is needed for consumption of fixed capital and balance sheets) is perhaps understated.

Copy editing comments

20.3 delete "the" before "covered by this chapter"

20.5 – fifth sentence – did the author intend to add "not just" before "the return to capital"?

20.45 - The reference to table 20.5 might be a holdover from an earlier draft.

Annex to chapter 6

Recall the user-cost includes an expected revaluation term, and so implicitly values the agreed-upon instantaneous storage services of an asset's user-renter. (Actual revaluations, above or below expectations, would constitute dumb-luck holding gains or losses.) There are also current charges, of the sort mentioned in paragraph **6A.2**, that would count as depreciation were they not actually paid for as part of current expenses (C.f. comments on **20.28**, above). The Annex, however, draws a distinction between revaluations brought about by some work or attendance on the part of the asset-holder (e.g., long production leads, fermentation, seasonal planning) and those that "just happen": the former represent genuine storage, while the latter is a holding gain—neutral or not, depending on the asset's appreciation against a general deflator. Paragraph **6A.16** gives the cleanest statement, concluding, "This is a quite different motivation from holding items in store for *purely speculative reasons* [emphasis added] when there is no pattern established for the probable increase in prices and no predetermined time over which the goods might be held."

As should be plain, the user-cost approach relies, in principle, on the market to distinguish storage services from holding gains—so speculators play an active, positive role, essentially transporting assets through time to, on average, more productive uses—while the appendix substitutes the author's considered judgment (and demotes speculation to guessing). What the user-cost approach does not do is tell the accountant how to discern expectations from among the noisy data of *ex post* revaluations: the three-way transformation test in the appendix is one way to do this, but purely statistical approaches (such as BLS's simple moving average of new-asset inflation rates) are another. Nor should the option of treating all revaluations as if they had been

expected be ruled out. Still, the appendix approaches the user-cost point of view in paragraph **6A.13**.