Capital Stocks of Firms — Calculation on a Microeconomic Basis

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1. Definition of the Term “Capital”

One characteristic of capital theory is that there is a number of controversies about the term “capital”, its calculation and its relation to other important economic dimensions such as interest rate and private and social return on investment1. Particularly the term “capital stock” is frequently used (in the sense of total assets), but there is no clear concept of how to measure it empirically and (especially on the microeconomic level) hardly any empirical investigations. Before presenting our proposal for the calculation of capital stock, i.e. the determination of total assets of firms, we want to discuss the characteristics of “capital” and some concepts for its calculation, and we shall demonstrate how an alteration of premises and methods affects the results of economic studies.

The term “capital” is to somehow comprise the productive property, i.e. the produced industrial equipment. So in our analysis we define capital as the possession or stock of machines, plant and equipment2. In other words, capital is a multi-dimensional term be-

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2 Alternatively to this conception of produced equipment, capital can be defined — on a macroeconomic basis — as accumulated deferred demand or as a chronological order of consumption goods to bridge the discrepancy of effort and the completion of the consumption goods produced by this effort. Comp. Orosel and von Weizsäcker (1979), p. 119.
cause various goods and dates have to be taken into consideration. A one-dimensional measurement of capital can only be achieved by aggregation. In our analysis this problem of aggregation has basically been solved by the valuation of physical (or real) assets.

Considering capital as the stock of machines, plant and equipment, we exclude the problem of human capital and its estimate and base our analysis on the stock concept (in opposition to the flow concept), a common practice in economic literature. Capital accumulates with the investments placed in the course of time. To solve the aggregation problem it is necessary to value the gross increase of physical (or real) assets and to estimate the consumption or wear of capital (in the sense of real assets).

In this paper we intend to evaluate gross capital stocks. While net stocks cover the total of efficiency flows profitable in the next and all subsequent periods, the gross capital stock approximates only the profitable efficiency flow of the coming period. The result is what we call the productive capacity. In order to obtain this not only scrapping but also the loss of physical efficiency and the economic obsolescence of the installation still in use have to be considered as removal of assets.

To approximate capital stocks in macroeconomic analyses as well as in microeconomic investigations, the most commonly applied method is the "Perpetual Inventory Method" developed by Goldsmith. In this cumulative method the survival function concept is employed to balance the different annual investments; and it is intended to allow for any decrease of productivity already by the selection of the survival function. Formally this operation reads as follows:

\[
\text{CAP}_t = \sum_{i=1}^{\text{ND}} g(i) \text{INV}_{t-i},
\]

with \( \text{CAP} \) representing the capital stock at time \( t \), \( \text{INV}_{t-i} \) representing the investments at time \( t-i \), \( \text{ND} \) giving the maximum expected economic life ("Nutzungsdauer") and \( g(i) \) the specific survival function. The \( g(i) \) in this context indicates weighting factors for that part of investments of a particular year which at least comes up to the economic life \( i \).

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4 Compare Kirner (1968), p. 16.

5 Compare Goldsmith (1951).