

Capital Stock Conference
March 1997
Agenda Item III

Computation of Capital Stock Estimates in Singapore - A Methodological Note

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COMPUTATION OF CAPITAL STOCK ESTIMATES IN SINGAPORE - A METHODOLOGICAL NOTE

Introduction

1. This paper presents the methodology used to compute capital stock estimates in Singapore. It outlines the sources of data and types of assets used to compute the capital stock estimates as well as the types of price indices used. In addition, information on the asset service lives used, depreciation and survival functions are presented.

Measurement of Capital Stock- Perpetual Inventory Method (PIM)

2. The Department of Statistics (DOS) adopts the Perpetual Inventory Method (PIM) to estimate the capital stock in Singapore. The PIM involves adding, for each type of capital asset, capital formation to an initial estimate of the capital stock and subtracting capital assets that are withdrawn. The capital stock estimates of each asset type are then summed up to obtain the economy-wide capital stock estimates.

3. In order to apply the PIM, four types of information are needed for each type of asset: the value of stock in an initial period, capital formation in each year after the starting point, the length of time that the assets remain in the capital stock before being withdrawn and the changes in the prices of capital assets. In addition, to derive net capital stock, an estimate has to be made of depreciation (capital consumption).

Classification of Fixed Assets

4. For Singapore, the economy-wide capital stock estimates are derived from the following fixed assets:

1. Residential Buildings
2. Non-residential Buildings
3. Other Construction and Works
4. Ships and Boats
5. Aircraft
6. Road Vehicles
7. Machinery and Equipment

5. The gross and net capital stock estimates are computed using 1946 as the starting year and valued at book value, 1990 market prices and current replacement cost. It is assumed that prior to 1946, the value of capital stock in the economy is zero.

Data Sources

6. Estimates on capital expenditure on the above assets expressed in current and 1990 market prices from 1960 onwards are readily available from national accounts. However, estimates from 1946 (the starting year) to 1959 are not available from the accounts. Instead, they were generally estimated using methods such as linear regression and various assumptions. While such approaches may affect the estimates for the initial value of capital stock (starting in 1946), their "inaccuracy" would, in all likelihood, have a relatively small

impact on the reliability of capital stock estimates given the relatively low initial values of these assets and the fact the most of them would have been withdrawn by now.

7. For each asset category, capital expenditure estimates at 1990 market prices - to be used to derive the capital stock estimates at 1990 market prices -are, in principle, obtained by deflating current values of the various types of products within each category at as detailed a level as possible using appropriate price indices (Table 1). On the other hand, the capital stock estimates at current replacement cost for each asset category are obtained by the product of its capital stock estimates at 1990 market prices and corresponding implicit price deflator.

Table 1
Main Types of Price Indices Used To Derive Capital Expenditure at 1990 Market Prices

Type of Asset	Main Types of Price Index Used
Residential Buildings	Construction Price and Tender Price Indices
Non-residential Buildings	Construction Price Index
Other Construction and Works	Construction Price Index
Ships and Boats	Unit Price Index
Aircraft	Unit Price Index
Road Vehicles	Sub-indices of Wholesale Price Index
Machinery and Equipment	Sub-indices of Wholesale Price Index

8. In contrast to capital expenditure estimates, information on asset service lives (ie, the average length of time during which capital assets are present in useful economic production before retirement or withdrawal from capital stock occurs) and the rate of depreciation are not readily available from national accounts.

9. To estimate service lives of assets, the DOS, in principle, adopts the approach of examining the accounting practices of companies for asset lives, the schedule on working lives of assets in the Income Tax Act as well as the practices of other countries and uses them as a guide to arrive at some reasonably acceptable assumptions on asset service lives (Table 2). For computational simplicity, it is further assumed that all assets of a given type and vintage are retired simultaneously the moment they reach the average service life of the type of asset concerned. As an illustration, all road vehicles purchased for capital formation in 1986 would have been withdrawn from the capital stock at the end of last year (1996), since they would have reached the assumed life-span of 10 years.

Table 2
Average Service Lives of Capital Assets

Type of Asset	Asset Service Life (Years)
Residential Buildings	80
Non-residential Buildings	40
Other Construction and Works	40
Ships and Boats	20
Aircraft	15
Road Vehicles	10
Machinery and Equipment	15

10. As for the depreciation rate, the assumption of straight-line depreciation is used. This basically means that the value of an asset is taken to decline by equal amounts each year over its life until its net value is zero.

Conclusion

11. Like many other statistical agencies, the DOS uses the PIM to estimate capital stock in Singapore. There is nothing fundamentally wrong in the utilization of the PIM to estimate the stock of capital assets. However, the accuracy of the PIM in estimating capital stock is, to a large extent, a function of the accuracy with which asset service lives are measured and whether the assumed mortality function and depreciation pattern are compatible with economic reality.

12. One possible area of improvement the DOS is considering in future is the further classification of the machinery and equipment category into a larger number of asset types (for example, office equipment), with each one assigned its own service life. Such a breakdown is quite essential given the growing importance of computer and related equipment in gross fixed capital formation in machinery in the Singapore economy and may well serve to improve the quality of the present estimates.