

3/747 STAT

# THE MEASUREMENT OF CAPITAL

The Methodology of Capital Stock Estimates  
in OECD Countries

by

Michael Ward



ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

VB TU Darmstadt



51581709

## CONTENTS

Preface .....	5
Structure of the Report .....	7
Part I: Definitions and Measurement of Capital Stocks .....	9
Appendices A - D .....	49
Part II: Sources and Methods of Capital Stock Estimates in OECD countries .....	67
Appendix .....	140
Selected list of References .....	142

## TABLE OF CONTENTS

1.	THE MEASUREMENT OF CAPITAL .....	15
1.1.	General Concepts and Measures .....	15
1.2.	Definitions of Capital .....	18
1.2.1.	Stocks and Flows .....	19
1.2.2.	"Ex-post" and "ex-ante" .....	19
1.3.	Production Factor Analysis .....	20
1.3.1.	Production Function Problems .....	20
1.3.2.	Capital Data Requirements .....	20
1.3.3.	Problems of Capital Aggregation .....	21
2.	TYPES OF CAPITAL MEASUREMENT .....	22
2.1.	Stocks .....	22
2.1.1.	Gross Capital Stock .....	22
2.1.2.	Net Capital Stock .....	22
2.2.	Flows .....	23
2.2.1.	Capital Factor Inputs .....	23
2.2.2.	Capital Consumption .....	23
2.2.3.	Equivalent Annual Capital Inputs .....	23
2.2.4.	Potential Capital Services .....	24
3.	THE STATISTICAL MEASUREMENT OF REAL CAPITAL STOCKS .....	25
3.1.	Gross Capital Stock .....	25
3.1.1.	The Perpetual Inventory Model (PIM) .....	25
3.1.2.	Surveys of Physical Assets .....	25
3.1.3.	Surveys of Book Values .....	26
3.1.4.	Surveys of Insured Values .....	26
3.2.	Net Capital Stocks .....	26
3.2.1.	Direct Estimates .....	26
3.2.2.	Indirect Estimates .....	26

3.3.	Other Methods of Stock Measurement .....	27
3.3.1.	Composite Physical Index .....	27
3.3.2.	Accumulated Savings Model .....	27
3.3.3.	Stock Exchange Values .....	27
3.3.4.	Capitalization of Income Flows .....	28
3.4.	Standardized Accounting Systems .....	28
4.	THE MEASUREMENT OF CAPITAL FLOWS .....	29
4.1.	Production Factor Values .....	29
4.2.	Capital Consumption .....	29
4.3.	Potential Capital Services .....	30
5.	CENSUS AND SIMULATION RELATIONSHIP .....	31
6.	THE PERPETUAL INVENTORY MODEL .....	31
6.1.	Definitions .....	31
6.2.	Statistical Requirements .....	32
6.3.	Capital Expenditure Outlays .....	32
6.4.	Advantages of the Method .....	33
6.5.	Drawbacks to the Method .....	34
6.5.1.	Valuation Problems .....	34
6.5.2.	Definitional Rigidities .....	35
7.	THE AGE AND LIFETIMES OF CAPITAL ASSETS .....	36
7.1.	Length of Life Assumptions.....	36
7.2.	Survival Functions and Retirement Distributions ...	37
7.2.1.	Individual Assets .....	37
7.2.2.	Groups of Assets .....	37
7.2.3.	Industrial Applications and Vintage Modifications .....	39
7.3.	Secular and Cyclical Variations in Retirements ....	40
8.	OTHER LIMITATIONS TO THE PERPETUAL INVENTORY MODEL .....	40
8.1.	Fixed Functions .....	40
8.2.	Resales of Used Assets .....	40
8.3.	Capital Ownership and Use .....	41
8.4.	Investment Concentration .....	41
8.5.	Efficiency .....	41
8.6.	Utilization .....	41
8.7.	Technical Change .....	42
8.8.	Distribution of Capital Expenditures within a Year ..	42

8.9.	Land .....	42
8.10.	Inventories .....	43
9.	VALUATION, PRICES AND TECHNICAL CHANGE ....	43
9.1.	Problems of Valuing Real Capital .....	43
9.2.	Quality Changes and Technical Progress .....	43
9.3.	Impact of Inflation .....	45
10.	CAPITAL CONSUMPTION AND UTILIZATION .....	46
11.	VINTAGE CAPITAL STOCKS .....	47

Appendices:

A.	Real Output Measurement and Equivalent Annual Capital Inputs .....	51
B.	Perpetual Inventory Model: Theoretical Formulation ...	56
C.	Survival and Retirement Functions .....	60
D.	The Estimated Average Age of Capital Assets in Selected Countries .....	66