DECLARATION

This is to certify that no material contained in this thesis has previously been submitted by me for a degree in this or in any other university.

D.M. Wright

Performance Measurement and the Introduction of Inflation Accounting in the Nationalised Industries, with Particular Reference to the Gas Industry.

ABSTRACT

This thesis presents a real rate of return on capital which it is believed provides a better indicator of performance in the nationalised industries than methods used hitherto. British Gas is used as an example of how this indicator may be used in practice.

In part one, alternative performance measures are discussed. The conclusion reached is that a real rate of return on capital provides the most suitable measure.

Income is defined as gains arising during the year which may be distributed whilst maintaining the purchasing power of balance sheet assets. Capital is regarded as the equivalent in terms of purchasing power at the end of the year of the balance sheet assets at the beginning.

The question of accounting for inflation and how this affects performance yardsticks is also considered.

In part two, inflation accounting in the nationalised industries and certain private industries is surveyed and appraised.

Part three presents estimates of the real rates of return on capital obtained by British Gas for the period 1960/61 to 1977/78, using the definition developed in part one.

PERFORMANCE MEASUREMENT AND INFLATION ACCOUNTING IN THE NATIONALISED INDUSTRIES: WITH PARTICULAR REFERENCE TO THE GAS INDUSTRY

THESIS SUBMITTED FOR THE DEGREE OF MASTER OF ARTS IN SOCIAL SCIENCE.

May, 1979.

To Maryse

ACKNOWLEDGMENTS

I would like to thank my supervisor Ivy Papps and Denis O'Brien for all their kind help whilst I was researching for this thesis.

I also thank the University of Durham for providing funds for certain expenses incurred in the preparation of this thesis.

There are others who must be mentioned whose encouragement kept me going and whose comments gave me valuable insights. They are: Rod Apps, John Ashworth, Mike Boxall, Geoff Cathcart, Adrian Darnell, Joost van Doorn, Lynne Evans, Norman Gemmell, Brian Hillier, Stewart Howe, Peter Johnson, Peter Manley, Rodney Mitchell, Bob Morgan, Dick Morley and Barry Thomas.

The Finance Department of British Gas Corporation also very kindly gave up their time to explain to me the mysteries of their inflation accounting system, and were helpful in answering my questions. Mr. G.B. Brook, District Valuer and Valuation Officer for Durham provided me with information on rateable values.

Thanks also to the well-known LA23 and JBM 370 for interrupting their breakdowns often enough for me to carry out the calculations.

Finally, many thanks to Maryse Sallondrouze for checking drafts and to Ann Loadman for translating, from the original Derbyshire script, and typing the final version.

CONTENTS

Part 1: Appendix II: An outline of the main issues involved in the practical application of marginal cost pricing and investment appraisal.

Part 1: Appendix III: Outline of inflation accounting proposals

Part 1: Appendix IV: Calculation of inflation adjustments.

Part 3: Appendix I: Letter to gas regions.

Part 3: Appendix II: Estimation of showroom numbers

Part 3: Appendix III: Land and buildings of BGC in 1975, based on telephone directories.

Part 3: Appendix IV: Supplementary Tables.

LIST OF TABLES

Pt.3.ch.2	Table	2		Pre-interest replacement cost profit of BGC
3	2	"	3	Comparison of Replacement Cost Depreciation Provisions
3	2.	"	4	Pre-interest Rates of Return of BGC- (bank overdraft included in assets).
3.	2.	"	5	Pre-interest Rates of Return of BGC - (excluding bank overdraft, inflation adjustments limited to depreciation cost of sales and replacement cost fixed asset valuation).
3.App.II		"	1	Predicted and Actual Showroom Numbers.
3	III	"	1	Land and Buildings of BGC in 1975
3.	IV	"	1a.	Replacement Cost of Assets of BGC - Gross Book Value - Specific Indices.
3.	IV	"	1b	Replacement Cost of Assets of BGC - Gross Book Value - General Index.
3.	IV	"	2	BGC - Annual Replacement Cost Depreciation - Specific Indices.
3.	IV	"	3a	Replacement Cost of Assets of BGC - Net Book Value - Specific Indices
3.	IV	"	3b	Replacement Cost of Assets of BGC - Net Book Value - General Index.
3.	IV	"	3c	BGC Gains on Holding Assets
3.	IV	"	4	Historic Cost Rate of Return Data.
3.	IV	"	5	Replacement Cost Rate of Return - replacement cost depreciation and cost of sales adjustments to profits and replacement cost asset valuation only.
3.	IV	"	6	Estimated Replacement Cost Rates of Return for Industry in General - by various institutions.

LIST OF FIGURES

PERFORMANCE MEASUREMENT AND INFLATION ACCOUNTING IN THE NATIONALISED INDUSTRIES: WITH PARTICULAR REFERENCE TO THE GAS INDUSTRY

INTRODUCTION

This thesis begins from a basic conern that the performance of the nationalised industries should be measured in the optimum way. If not, the wrong conclusions may be drawn by commentators and policy makers, and the resulting decisions may also be wrong. Thus, our concern is that the nationalised industries should provide decision makers with the correct information on which to make their decisions. Similarly, decision makers should understand what are the correct yardsticks by which they should measure nationalised industry performance.

The first step in determining the correct yardstick is to consider the guidelines made by the government for measuring nationalised industry performance. These criteria, which increasingly have stressed that the nationalised industries should be run on commercial lines are outlined in part 1 appendix 1. Two of these criteria are marginal cost pricing and investment appraisal techniques. A detailed examination of these ex ante criteria is outside the scope of this thesis. However, the main problems concerning their use are presented in part 1 appendix II in the form of an annotated bibliography. These criteria are rejected because of their basic inapplicability, in general, to the problems of the real world - events often turn out differently than expected. The question then remaining to be answered is whether or not the government's ex post financial guidelines are the correct ones.

Accordingly, the possible ex post criteria are surveyed and appraised in part 1 chapter 1. From this it is possible to determine which method

is the most suitable for our purposes. Basically, a rate of return on capital employed is used. However, minor adjustments are made to the definitions used in the governmental White Papers on the Nationalised Industries (G2, G3, and G7). For example bank overdrafts are added back to the assets base. We also take an entity view of the firm, and the view that income should be defined as the gains which may be distributed whilst maintaining the "purchasing power" of the entity's assets. Capital is defined as the equivalent in terms of the purchasing power at the end of the year of balance sheet assets at the beginning. Thus concern is with maintaining the firm as a productive entity in terms of maintaining the real value of the income streams from the capital of the firm, rather than the physical assets of the firm.

This gives us the basic yardstick for measuring performance. However, it has been recognised for many years (see for example G2,p.5, para.8) that the existence of general inflation means that if the firm accepts the concepts of income and capital used here, account must be taken of the effects of the increased costs of replacing the physical assets and stocks of the firm. Similarly, inflation will affect the real value of the monetary assets or liabilities of the business. Any adjustments made for inflation will affect the component parts of our performance yardstick and the interpretation that we place on its results.

So, in part 1, chapter 2 the inflation accounting debate is surveyed and appraised. From this it is possible to develop the adjustments necessary to the basic rate of return criteria outlined above. This provides us with a model that can be used to measure performance in a meaningful way.

Before it is possible to use this model it is necessary to analyse the methods of inflation accounting which have been implemented in the accounts of the nationalised industries, since we wish to know what efforts have been

made already to provide more meaningful data for performance measurement. The results of this survey are presented in part 2 , chapter 1 . The second chapter in part 2 presents a survey of inflation accounting in selected comparable private firms and industries. This is necessary since if significant differences are observed in the methods of inflation accounting employed by the public and private industries,comparisons of performance will be distorted. It is seen from part 2 that a great diversity of methods of accounting for inflation have been introduced in both sectors. But, most importantly, the methods employed have often been half-hearted, piecemeal, confusing, and, it could be argued with some justification, designed for other purposes than assisting the measurement of performance. The evidence in part 2 strongly reinforces the argument that the correct information is not being provided to decision makers.

Given the above, the ground is now clear to use the model developed in part 1. Owing to the constraint of time and space it was decided that one nationalised industry should be used as a case study. The gas industry was chosen for three main reasons:

(i) It is an industry which has undergone a vast transformation over the last twenty years with the advent, initially, of new gasification processes (see for example 149 Ch.3 for a description), and, latterly, North Sea gas. Hence the effects of these changes on performance are of great interest.

(ii) As the evidence in part 2 demonstrates, it is the industry which has progressed the farthest in implementing inflation accounting.

(iii) In implementing inflation accounting it has encountered much criticism, especially with respect to its motives. Questions have also been raised concerning the revalued asset base on which supplementary depreciation has been calculated, and the extent to which the corporation has distorted comparisons

with its own past and with other industries.

Hence the task in part 3 was to produce comparable series of historic cost and replacement cost rates of return for the gas industry.

In order that the rates could be compared in any meaningful way it was necessary to choose a period of more than one year. In the event it was decided to choose the period 1960/61 to 1977/78. This provides a sufficiently long period of time to show the effects of various institutional changes on BGC. One of these changes has already been mentioned - the change to different sources of gas. But other factors must be recognised, for example: (i) the 1965 Gas Act which instigated the move to centralisation of control, which was formalised in 1973 with the formation of the British Gas Corporation. (ii) The effects of Government anti-inflation legislation in 1973/74 and 1974/75 which led to severe restrictions on pricing.

The calculation of a replacement cost rate of return also provides an independent check on the method used by B.G.C. Moreover, the data presented here provided information where none is available from BGC themselves, in particular replacement cost asset values and cost of sales adjustments.

Initially it was hoped that access could be gained to unpublished raw data on the numbers of and costs/values of land and buildings, cars, etc. so that the most accurate estimate of the replacement cost of assets, and hence replacement cost depreciation could be obtained. Whilst BGC were very helpful in explaining their methodology they declined to provide any unpublished material. So recourse was made to data published in the accounts of BGC and, prior to 1972/73, the Gas Council. Apart from the usual problems with accounting data, (see partl, chapter 1 for a discussion of these problems), we were faced with the task of estimating age profiles from the published annual investment data. There were certain problems here since for assets with long age profiles (e.g. mains, services) data on annual investments

had to be estimated prior to 1949/50 since no data are available pre-vesting day. A second problem was that because of the reorganisation consequent upon the introduction of natural gas, many asset lives fluctuated over the period under study, since older plant was being made obsolete before its estimated depreciation life had expired. Hence published data on the estimated average length of depreciation lives could not be used.

Notwithstanding these problems it was possible to make estimates of the replacement cost rate of return for the period under study. But it is well to bear these problems in mind when analysing the results presented in part 3 chapter 2 that the estimates produced here prove to be reasonably close to the estimates made by BGC. Comparison of the replacement cost and historic cost series using our model are presented in part 3 chapter 2.

It is also appropriate to compare the replacement cost series for BGC obtaine obtained by our method with replacement cost series for industry in general, since it is important to know the position of BGC relative to industry in general, on the grounds that if resources in the public sector do not earn a comparable rate of return to that earned by resources employed in the private sector this may be indicative of a misallocation of resources. As the replacement cost data for industry in general is not calculated on the same basis as the model used here it was necessary to produce a further replacement cost series for BGC on a basis comparable to that for general industry. Adjustments could not be made to the general industry series as the raw data could not be obtained. The adjusted BGC and general industry series are presented in part 3, chapter 2. These series show the relative performances of BGC and industry in general, in real terms. The limitations of adjustments for inflation based solely on depreciation and stock appreciation should be borne in mind when studying these series.

Finally, the conclusions of the study are presented in part 4.

PART 1 : THEORY

Part 1: Ch.1: A Review of Measures of Performance and Efficiency with Particular Reference to the Nationalised Industries.

Introduction

The choice of the best measure of performance is not easy. To a great extent the choice will depend on the purpose at hand. Furthemore, it is unlikely that one measure alone will tell us all we need to know about a firm's performance. This chapter reviews the various measures available and attempts to suggest which one might be most useful for the measurement of performance in the nationalised industries.

That discussion is necessary of the kind presented here is evidenced by the difficulties encountered by the government in achieving a consensus of opinion on the best measure of performance and efficiency criteria for the nationalised industries. As Appendix I to this chapter makes clear it has taken almost thirty years to develop comprehensive, useable and relevant guidelines. It is against this background that the following discussion should be seen.

To discuss in detail the arguments of whether or not the nationalised industries should be run according to criteria of commercial efficiency would be outside the central theme of this thesis. It is evident from Appendix I that governmental guidelines have increasingly been moving towards a recognition that the nationalised industries should indeed be bound by criteria of commercial efficiency. Further, as Papps (130) among others, has argued, if the nationalised industries are to undertake "socially desirable" activities they should receive direct grants from the government and be left free to run themselves as efficiently as possible. Thus we take as our starting point the assumption that the nationalised industries should strive to achieve maximum efficiency. The subject of this chapter is,

then, to investigate which measure or measures are most suitable for measuring this.

Whilst pricing and investment techniques are not central to a discussion of performance measurement and efficiency criteria they are discussed here (Appendix II) because the government White Papers have laid great emphasis on ex ante criteria. The main argument in this area is that if pricing and investment policies are correct then the financial objectives will be satisfied. But, as the discussion in Appendix II makes clear, although these methods have been developed to a high degree of sophistication, in an imperfect world with uncertainty, their use must be limited. Under such conditions it may be impossible to get pricing and investment correct. Accordingly ex post criteria need to be considered in preference to ex ante.

Ratio Analyses as Measures of Performance and Efficiency Criteria

The use of ratios to asses performance relies almost entirely on published balance sheet and profit and loss acount data. Before proceeding to discuss the various measures that may be used it is necessary to consider some of the problems associated with accounting data, which must qualify the use of accounting ratios in assessing performance. Morgenstern (112, Ch.4), for example, provides a good discussion of the problems. In particular are the following points:

(i) the problem of measuring capital and profit which depends on the theories, opinions, conventions and traditions adopted by the particular firm in question.

(ii) the completeness of measurement in the balance sheet and profit and loss account. E.g. the firm may not possess a complete asset register thus assets and depreciation will contain a measure of estimation.

(iii) accounts contain information relating to different time periods and different money values and so non-comparabilities arise. In this context

a firm with a newer asset structure than another firm in the same industry may, even if the same profits are being earned, appear less efficient using rate of return criteria. Different revaluation conventions between sectors will also introduce elements of non-comparability.

(iv) similar firms may contain differing amounts of goodwill in their balance sheets. This makes comparisons difficult. Goodwill itself may introduce inaccuracies as it is likely to be a pure estimate of the excess of value of the assets of the firm over that shown in the accounts.

(v) the stated value of an asset in a balance sheet, if based on market price, depends on the non-disturbance of the market by the sale of that asset. Hence industry aggregates will be unreliable.

(vi) the writing-off of long-term expenditure, e.g. BGC's writing-off of North Sea debts and early scrapping of gas holders, may be achieved by creating temporary assets, to which book values of displaced plant are transferred then charged against revenue. It may also lead to excessive depreciation provisions for a number of years. Hence care is needed in interpretation of performance over time.

(vii) the revaluation of the assets of one firm in an industry, but not of another, will reduce the rate of return on capital and increase asset growth rates in the former. This may be overcome by a phased introduction of asset revaluation.

In addition to the accounting problems the interpretation of ratios is not without difficulties. Howe (62) has pointed to a number of difficulties. An excessive rate of return may be due to short run demand factors rather than to long run conditions of market power. Or it may arise through allowance made for risk, or because of supernormal efficiency. The possible existence of X-inefficiency in monopolistic conditions may mean that the rate of return appears not to be excessive. Care must also be taken in using accounting data

to test economic theories of resource allocation, because, as Stigler (173, pp.58-61) has noted, in the case of corporate income tax a different concept of income is being used. Distinction must also be made between what is salary and what is return on capital to owners of small firms.

A problem with ratios that is often ignored is pointed out by Whittington (201). This is that ratio analysis assumes the existence of a proportionate relationship between the two variables whose ratio is calculated. This assumption is invalid (i) if, say, a portion of a firm's profit is unrelated to the sales element or (ii) if the firm experiences decreasing returns or faces a saturated market, in which case the relationship is non-linear.

These caveats apply more in the case of establishing a relationship for the purposes of prediction. But they may also apply in the case of performance assessment against a standard. If, say, in the case of the return on sales ratio higher sales can be obtained only by a lower profit margin a non-linear relationship exists. In view of these caveats Whittington (op.cit) argues for the use of regression analysis. However, it can be argued that it matters little for measurement against a standard if a non-linear relationship exists - as one is comparing one ratio with another. Secondly, linear bivariate regression will not overcome the problem of linearity in ratios. It means simply an increase in the error term in the equation to be estimated, which provides evidence of non-linearity but not a means of solving it.

There are other criticisms of regression techniques. Just as movements in ratios over time may be affected by variables other than those included in the ratio, regression analysis may be affected by serial correlation in the error term. Regression analysis may also require the use of ratios as a deflator of the effects of size variations to overcome the problem of heteroscedasticity in cross-section regression analysis which produces unbiased but inefficient estimators[2]. Bias may be introduced in the use of

ratios if a spurious relation exists between ratios (Whittington op cit p.11). This may arise if two uncorrelated variables are divided by a common denominator. Whilst the solution is to ensure that the time relationship is in ratio form it must also be borne in mind that spurious correlations can affect regression analyses.

Despite these fairly severe general criticisms of ratios (more specific points will be discussed subsequently) ratio analysis is to be preferred. As Whittington (op.cit pp.12-13) makes clear, the empirical justifications of this argument are still fairly tentative and whilst conceptually regression analysis may be better for prediction, for performance measurement, the argument is less strong. Moreover, whilst we have seen the deficiencies of ex post accounting it may be best to use them because the conceptual problems of using discounted future income streams may be insuperable. Morgenstern (op.cit p.76) has suggested the use of probabilities of realisation as a way of correcting errors in asset valuation. But the difficulties of calculating such probabilities, since data is not available, would cast doubt on the usefulness of this. However, as one recent fairly rigorous study, using Australian data, has shown (14) there is some evidence that financial ratios have some value in the industry context. Although, the authors express reservations regarding the link between ratios and policies, they do point to the extremely important problem that policy makers or leading institutions may place too much emphasis on strict adherence to performance standards when data deficiencies would suggest that the standards should be seen only as providing a guidepost.

Before turning to consider individual ratio measures of performance it is worth reiterating that whilst it may be considered that one ratio in particular gives the best overall view of performance for specific decisions other ratios may be useful. In other words reference may need to be made to what is called the "pyramid of ratios".

The following sections will consider measures of performance under the following headings:

(i) Productivity measures

(ii) Value added measures.

(iii) Profitability measures.

(iv) Other - including internal financing, stock-market indicators and efficiency in the production function.

Productivity Measures

Probably the most well known use of labour productivity as a measure of performance in the nationalised industries is in the work of Pryke (142, 143). In justifying his use of output per man hour[3] Pryke claims that profit figures disguise the use of inefficient technology, which he defines as technology which results in lower productivity than is possible. But the Polanyi's (139, p.28), in criticising Pryke's claim that the nationalised industries were becoming more efficient, argue that changes in productivity are imperfect as indicators of efficiency. Labour productivity ignores technical efficiency in plant operation, in distribution of the firm's product and it ignores levels of costs. It must also be pointed out that rates of growth of productivity which Pryke was comparing, say nothing about the relative degrees of efficiency existing. If nationalised industries were very inefficient prior to nationalisation, then rapid increase in productivity may be merely a "catching-up" effect.

It has also been argued (Papps, 130) that Pryke's measurement ignores relative scarcities and thus relative prices. If capital is relatively scarce and expensive surely it is a more efficient use of resources to use labour. Pryke (142,p.67) has recognised that labour productivity,

by itself, is not a good indicator because there is no mention of what input of capital is combined with the input of labour to achieve a particular output per man hour figure. Pryke has attempted to combine inputs of capital and labour. By dividing the increase in output by the increase in combined input of capital and labour he attempts to arrive at a more meaningful measure of productivity. But this refinement still does not attempt to solve the capital measurement problem; the figures for capital in the accounts are taken as given, which simply entails accepting an accounting (historic cost) basis for capital valuation. In addition there are theoretical doubts about the validity of any method used for the apportionment of labour and capital inputs. For example, i) the use of earnings of labour as the proportionate weight for the labour input relies on the doubtful assertion that people in each industry are paid according to the value of their output contribution; (ii) there are practical difficulties in distinguishing the changes in factor inputs, which may be due to substitutions because of factor price changes or because of shifts in the production function; (iii) changes in factor prices e.g. higher wages may not be due to changes in quality. Further, as the Polanyis observe (op.cit. p.37) even if the above caveats are ignored, the meaning of any changes observed is unclear. An increase in output per unit of labour and capital input may reflect the realisation of inherent economies of scale with growth of output. Moreover it could be argued that there are more than two factors of production, so that a measure using only two factors ignores important components affecting performance of the firm.

The Polanyis carry out the same analysis of nationalised industry performance by using the measure of output increase achieved per unit of extra capital invested (op.cit p.40). This avoids the problem of assessing the value of the capital stock and changes in the value and in the capital stock.

But, again, like Pryke they accept the accountancy valuation of changes in it.

The Polanyis made allowance for changes in the labour force during the period under study, thus separating out the part of extra output that is associated with the capital input alone. The problem with this measure is that it tends to depress the apparent labour productivity growth in capital intensive industries because it relates extra output directly to the extra capital used. Hence the nationalised industries would be at a disadvantage vis-a-vis manufacturing. But this in itself is interesting from a resource allocation point of view. However, the use of this incremental capital output ratio may be no better than other productivity measures. Denison (33,pp.121 -122) alludes to some of the problems with this measure. Firstly an increase in physical capital is only one of many sources of growth so that its effects could be either increased or reduced by positive or negative correlation between it and other growth sources. Secondly, the direction of causality between investment and growth is by no means clear.

Later research by Pryke (145) has attempted to improve the use of the measure of combined labour and capital productivity, instead of using actual profits earned by the nationalised industries, which tend to be low, as a weight for capital,an opportunity cost approach was used. Pryke's method was to estimate the profits that would have had to have been earned to have provided for replacement cost depreciation and to have earned a ten per cent return on net assets at replacement cost. The wage salary bill was used as the labour weight. Comparisons of total factor productivity are then made for the nationalised industries and manufacturing for the two periods 1963-1968 and 1968-1973.

This approach appears still to fail to overcome the problems discussed above. The use of a ten per cent return on net assets at replacement cost

seems reasonable if the effects of stock appreciation are ignored. However, if stock appreciation is deducted in assessing replacement cost rate of return, the evidence (41, p.37 Table A) suggests that the real rates of return range from ten per cent in 1968 to about six and a half per cent in 1973.

From an empirical viewpoint evidence for the unreliability of productivity measures is provided by Harlow (57) and Lorenz (99,100). Investigating changes in productivity under nationalisation, Harlow found that there were no grounds for the belief that increasing capital inputs relative to labour inputs is the optimum way to improve performance. Nor does factor substitution in general cause productivity gains. The most important factors influencing productivity changes were found to be scale increases and technical progress. In the case of the gas industry, for example, fuel productivity increases resulting from technical change and the existence of capital expenditure constraints may be most important (57,p.236). Also there may be no consistent relationship between capital and labour productivity. For instance it was found in the air transport industry that labour productivity increased rapidly but capital costs hardly changed.

Lorenz has pointed to the difficulties in using productivity measures in the context of international comparisons of performance of post offices. Comparisons are distorted by different initial levels of efficiency, differing times at which labour saving techniques were implemented (i.e. different plant mix), initial levels of automation of telecommunications equipment, penetration levels of telephone usage, changes in the length of the working week in one country but not another, and installing new technology ahead of demand in one country but not another will depress labour productivity in the installing country. Total productivity comparisons will be distorted by conflicting financing and accounting practices. There is also the fundamental

problem of what is "output" in the labour productivity ratio. Differing results are produced depending on whether telephones per employee, calls per employee or connections per employee are used. The evidence, says Lorenz, (99) suggests that the latter provides a more reliable comparison.

The conclusions to be drawn from the above discussion of productivity measures appear to be firstly, that they are unreliable and secondly, and most important, that, on their own they do not impart sufficient information about efficiency. Productivity measures may be so misleading, as Farrell (38,p.263) observes, as to indicate high performance because of increased productivity in every industry and yet result in a lower standard of living in the country.

Added Value Ratios

Added Value is the difference between the value of goods produced and the cost of materials consumed in manufacturing these goods. It thus discounts the effect of variations in material costs and represents the sum available to cover all wages, salaries, expenses and profit. Protagonists of the added value concept, such as Wood (e.g. 213) and Gilchrist (e.g. 45) have pointed out that unlike profit added value is not affected by depreciation policy, interest charges, development costs, wages etc. because all along with profit are contained within the added value.

It is also argued that added value can provide a better measure of productivity because it is a better measure of output than sales turnover (e.g. Gilchrist op.cit, p.44). This is because sales turnover provides no information about the amount of labour input necessary to achieve it, and because it contains the value of items bought from outside. But by definition it appears that added value does not provide this information either. It is contained within the added value figure but must be separated out to be meaningful. The same applies to sales turnover where the cost of the labour input is one of the costsdeducted to arrive at profit. Gilchrist also argues

that sales may represent more or less than the value of goods produced in the period. The use of adjustments for changes in the stock levels of finished goods is only useful if the stock changes were planned. Otherwise, as Wood (213) has pointed out, stock changes result from mistakendecisions i.e. the firm has been producing inefficiently. Whilst this is conceded it must be true that to measure performance effectively it is relevant to know what materials the firm has purchased from outside because it is necessary to consider all the resources of the firm.

Moreover, if we are measuring productivity the denominator is the same as in the previous section with the attendant caveats alluded to there. Thus it seems that added value does not overcome the problem of measuring productivity especially since it only tackles the numerator in any productivity ratio.

Another aspect, as Beattie (13,p.26) has argued is that variations in added value per employee may be the result of differing proportions of skilled and unskilled workers employed in different firms. Perhaps, more usefully the use of the ratio of value added per £1 of labour cost provides an indication of the use made by a firm of its employees, if the firm insists on the use of productivity measures.

Howe (62,p13) has pointed out that if the ratio of added value to sales is obtained on a disaggregated basis, the degree of vertical integration by market may be measured. This may be useful for analysing the degree of concentration in an industry. In the firm context it may also be an indicator of profitability. Gilchrist (op.cit p.48) would argue that maximising this ratio maximises profit. However, movements in the ratio may be merely indicative of a sales mix comprising orders of changes in skills mix rather than being due to real changes in profitability.

Much is made of the use of added value ratios in the short-run control

of the firm (see Gilchrist op.cit for an example) by the use of such ratios as added value per employee, added value to sales, added value per £1 of capital and so on. But Beattie argues (op.cit p.25) that if we wish to analyse performance by functions or departments it is necessary to use ratios of profit to capital and cost to sales as well as added value. This is because a firm's value added results from the functioning of the firm as a whole. It is impossible to show the output of the production department separately from that of the sales department. In the example used by Gilchrist (op.cit) where six different products are produced for separate discrete identifiable markets it is, of course, better to use added value. But this seems to be a special case.

By definition added value circumvents the effects of inflation. But this may be misleading because although the amount of added value may not change over time when there is inflation it may conceal the fact that wages and overheads have increased in relation to profits. It thus seems necessary to analyse the components of it. If indeed it is found that wages and salaries are high it still does not indicate where the inefficiency lies. We are forced back to the analysis of the different functions of the firm discussed in the previous paragraph.

It thus seems that since added value is defined to ignore materials purchased from outside and that since it emphasises labour and capital productivity it provides only a partial analysis. If certain internal functions are to be analysed then added value ratios may be useful, such as in the cases outlines above. However, for overall efficiency it may be more useful to use a pyramid-of-ratios approach with return on capital the focal point. As the advocates of added value are quick to point out return on capital is not without its conceptual problems. These will be considered in the next section.

Before leaving this section it is necessary to mention two further points. It is argued by some that the ratio of added value to capital employed may be a better measure of performance than the rate of return on capital employed (e.g. Wood, 210). However, it has been argued above that added value is deficient for measuring overall performance. It should also be obvious that to criticise return on capital employed because of problems of valuation of capital, and then to suggest the use of the same denominator with added value as the numerator as a better performance measure, as Wood has done (op.cit), is inconsistent to say the least. Hence the use of added value to capital employed ratio does not appear to solve the problem. Secondly, Ball (6,p.7) and others have made the usual point that profits or high rates of return on capital may not be indicative of efficiency of resource use alone, because they may contain elements of monopoly. It would seem that added value which contains profit must involve the same problem.

Therefore, the conclusions to be drawn with respect to added value are that it has the same drawbacks with respect to the denominator as labour productivity and return on capital ratios; the exclusion of factors purchased outside the firm make it useful only for internal comparisons of particular areas of performance; and as it includes a number of interdependent factors it is not possible to determine what is happening in the firm without breaking this down . We are then back with the problems of defining profit. From the foregoing it also appears that added value would be more suited to short run comparisons of performance, such as the comparison of forecast added value with actual, than to comparisons over time when factor proportions are changing. Lastly, on a practical note, the use of added value is limited because of a lack of available data.

Rate of Return on Capital

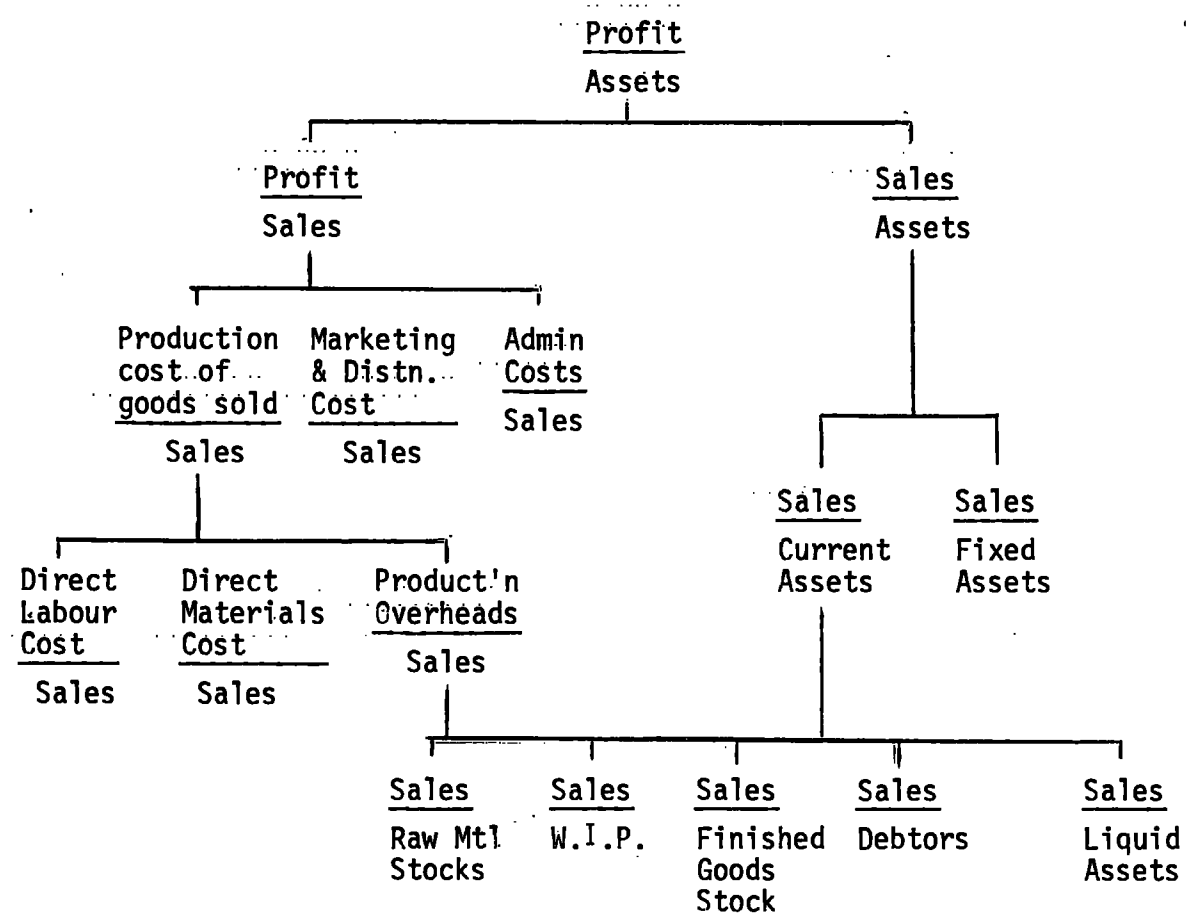
At the outset it must be clear that the rate of return on capital employed whilst being regarded by many as the primary ratio with respect to measuring performance by itself cannot reveal everything about the performance of the firm. For example an increase in the rate of return may result from an increase in the margin between costs and prices or it may result from using capital more efficiently relative to sales. The latter case is one of improved efficiency; the former may result from increased market power[4]. To analyse these it is necessary to consider the constituent parts of return on capital i.e.

$$\frac{\text{Profit}}{\text{Assets}} = \frac{\text{Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Asset}}$$

From here it is possible to calculate a number of ratios relating to particular areas of performance. Hence a pyramid-of-ratios such as Fig.1. may be built up. From this, for example, we may examine the ratios of turnover to stocks. If these are low it could be an indication that the firm is carrying more stocks than are necessary to keep at full production without running out of raw materials. If this is the case the company has money tied up which is not earning a return when there is probably a positive opportunity cost. Note that these are partial measures, which on their own do not provide an overall measure of performance. However, as a starting point for measuring overall efficiency we may take the rate of return on capital as this provides the closest approximation to the use made of all the resources of the firm.

Rate of Return on capital has long been used by the Monopolies Commission as the primary yardstick for the investigation of the effects of monopolies on resource allocation, since it is an approximation for the overall rate of return. That the definition of return on capital is not

Fig. 1: An Example of the Pyramid of Ratios



Source: L. Taylor Harrington Problems of Using Return on Capital as a Measure of Business Success. Manchester Statistical Society Mar. 1961 p.27.

inimitable and unambiguous is clear from Rowley's discussion of the "guideposts" used by the Monopolies Commission (154), and from Sutherland's critique of Rowley (175).

Discussion of the definition of the rate of return on capital for use in monopoly investigation was raised as long ago as 1952 by Silbertson and Solomons (164).

These authors point to two fundamental issues at the heart of defining rate of return on capital:

(i) what should be included in capital and profit

(ii) given (i) on what bases should capital be valued and income determined.

It is proposed to discuss each of these in turn. It should be borne in mind that in assessing performance in the nationalised industries essentially the same approach is being used as for the assessment of monopoly returns. That is, interest focuses on the economic use of the resources of the firm as an entity rather than on the proprietorship of the firm. We shall return to this point in chapter two where more practical problems are discussed.

(i) (a) Capital

1. If comparisons are to be made of return on capital in an industry then it seems reasonable to use only the capital employed in that industry. This usually means that investments in associated companies, marketable securities and so on are excluded. It is a moot point as to whether or not the firm is using investments in the business. On balance it seems that investments should be included as their existence will affect the average rate of return earned by the firm. Moreover they may be sold to augment the liquidity of the business. This might apply, for example, if the firm experiences seasonal fluctuations.

2. Excess or idle assets should be included e.g. vacant land because it is necessary to see if the firm is using all resources efficiently, and this included the degree of utilisation. The more idle or excess assets a firm has thenceteris paribus the lower will be the rate of return. It could also be argued that what may appear to be an idle asset, for example a building plot, may be being held as the firm expects to use it in future expansion.

3. Amey (2) argues for the exclusion of goodwill because it represents the addition to book values necessary to align the assets of the firm with the firm's own valuation of its efficiency. Howe(op.cit. p,11) agrees because

goodwill reflects the asset's ability to earn supernormal profits. Thus a rate of return calculated with the inclusion of goodwill would reduce the return on capital to a "normal" level. The problem of goodwill usually arises after a merger, where usually the acquirer pays a premium above the net book value of the assets of the acquired. Whilst this does not present a problem in the nationalised industries because the nationalisation statutes forbid merger activity it is important in the private sector. As Meeks demonstrates (106, Appendix A) to include goodwill biases the profitability measure downwards, and may thus disguise the gains from the merger, which may be negligible anyway (for example see Meeks op.cit and Utton, 189). Meeks thus excluded goodwill in his study[5]. However, as Aaronovitch and Sawyer (1) demonstrate, there has been a dramatic change in the ratio of book value of the victim to price paid by the acquirer over the last fifteen years, i.e. a dramatic increase in goodwill. Surely this is closely related to the increase in inflation in this period? Goodwill could thus be seen as an adjustment for the undervaluation of assets due to inflation. But it does not constitute a coherent system of inflation accounting. Such an adjustment, if included, would also lead to distortions in comparisons with other firms who had not been taken over.

On these grounds it appears logical to exclude all intangibles because the value placed on them will be subjective and bear no relation to future earning power. Moreover, if goodwill correctly measured, is included all firms will earn the same, normal, rate of return.

4. The inclusion of assets at depreciated cost may be objected to on the grounds of arbitrary accounting conventions with respect to depreciation provisions e.g. Straight line, fixed percentage etc. Hence two equal firms may appear to have differing asset bases simply because of differing depreciation policies. Moreover, the deduction of accumulated depreciation

provisions, it is argued, prejudges the declining efficiency of fixed assets which rate of return on capital seeks to measure. The use of undepreciated historic cost certainly overcomes the above problems of arbitrary allocation, and, it could be argued, it may compensate for the effects of inflation. But it is unsatisfactory because it provides no information on the decline in value to the business of the asset, nor is it in any way a reflection of the real effects of inflation on asset values. As will be seen in the section on valuation it seems that depreciated replacement cost is the best measure of assets.

5. Problems in inter-firm comparisons arise when firms have different proportions of hired assets. For the purposes of measuring economic efficiency, interest focuses on all the resources used to produce output, thus Amey (op.cit, p.62)suggests that some imputed value of hired assets may be used, if it is not possible to obtain the actual capital value of hired assets. But for leasehold land and buildings it is a matter of entering the gross value of the lease and depreciating this over time, as it is this which produces the income stream. Thus applying the same logic it would seem reasonable to use the gross lease value of the other hired assets.

It could be said that if the firm is effectively burdening someone else to hold some of its resources, for example suppliers with stocks, then if the imputed adjustments are not made, the rate of return will be higher than it really is when all resources are counted. But, surely it is a reflection of efficient management if it can achieve this. Thus the rate of return will be correct.

6. The question of investment charged to revenue may be pertinent to the nationalised industries. An example is the charging, by British Gas, of replacement of certain mains to revenue. The same points also apply to R & D expenditure. That is both have effects over more than one accounting period so that they should be included as capital, rather than as adjustments

to revenue. The same applies to other non-recurring expenses.

7. Given the above the question now arises whether gross or net assets should be used. In the case of British Gas the target rate of return set is the earning of a stated rate of return defined as net profit (pre interest but net of depreciation) on average net assets. Net assets are defined as fixed assets plus investments, displaced plant and deferred charges, plus current assets minus current liabilities. Average net assets are used to take account of the assets used throughout the period rather than just those in use at the end.

Now in essence the argument centres on the purposes for which the rate of return is being measured. As we are measuring performance then rate of return should be measured in respect of all sources of capital. This would imply a total asset base. On the liabilities side of the balance sheet this means the inclusion of long term loans, equity (in the case of the private sector), bank overdrafts, minority interests and current liabilities. An explanation of each of these is in order. If loans are excluded from liabilities, that is in the private sector we would be interested in a return on equity capital, then misleading information is conveyed because if it was not for the existence of the loan the entity could not have earned the rate of return on the rest of the assets that it did.

As Silbertson and Solomons (op.cit p.792) point out, this is especially crucial where the pre-interest rate of return differs from the rate of interest on loan capital and where loan capital accounts for a significant proportion of capital employed. Clearly, this is true in the case of the nationalised industries.

In the private sector it could be argued that the rate of return on equity provides the best measure of management performance. However as Amey (op.cit p.64) argues it is by no means obvious that differing gearing (the ratio of loans to equity) reflects managerial efficiency or whether

it is simply the result of market arbitrage. Financing differences should only affect the rate of return on assets to the extent that they affect the asset structure, not the financial structure of the firm. Moreover, interfirm comparisons should not be obscured by differing financial policies. Neither should the stock market valuation of equity be used because there is only a long run tendency for the market value of a company's shares to correspond to the value of assets they represent. This arises because of lags between increases in the assets earning power and increases in stock market valuation; stock market prices relate only to transfer of small parcels of shares i.e. they represent only incremental not total valuations; and stock market prices may be deflated below a true reflection of the earning power of assets because they depend on dividends which have tended to fall in recent years. This is due, to a large extent, to the increased cost to the firm of paying dividends arising from the tax changes introduced in the 1965 Finance Act. However, perhaps the strongest argument against equity is that if the stock market is operating efficiently rates of return on equity are equalised, since the price of shares include an element of goodwill. Thus return on equity says nothing about different levels of efficiency.

If a net assets view is taken then usually bank overdrafts are deducted from assets. But clearly bank overdrafts are essential to the overall performance of the firm. The exclusion of bank overdrafts has the same effect as excluding loans. Whilst minority interests are essentially no different from other classes of shareholders. British Gas makes a distinction between "Bank loans and overdrafts" and "Bank overdrafts". The former is treated as a capital liability, the latter as a current liability. It is unclear from the accounts what the precise difference is. It is assumed that it is a matter of the length of the loan/overdraft. This being

so for the purposes of this thesis all are treated as capital liabilities.

This leaves the question of current liabilities to be resolved. These include creditors, provisions, and temporary deposits. It has been argued by some that the creditors element of current liabilities is in effect a permanent loan which in a continuing business is never reduced to nil (Taylor Harrington, 179). Hence, it should be included as a source of capital. But if this is true, then by definition the debtors of the business must be a resourse for another firm. Therefore, it is the net position of debtors and creditors that represents the correct position.

On the foregoing arguments we would conclude that the asset base to be used for measuring performance should be Fixed Assets, plus investments, displaced plant and deferred charges plus current assets minus current liabilities plus bank overdrafts. In other words we use a net asset definition amended because of the inclusion of bank overdrafts.

(i) (b) Profit

Profit may be defined simply as sales revenue minus costs. If we are calculating a rate of return on capital then it seems reasonable that,for consistency in the arithmetic,net income should derive from the same activities in which capital is employed. Hence it should be subject to the same inclusions and exclusions discussed above.

Of particular interest are the cases of depreciation and interest. It is argued here that depreciation should be charged as a cost against profit as it represents provision for replacement of assets which is essential if the entity is to satisfy the going concern assumption. Depreciation is discussed more fully subsequently. In the case of interest payable to loan capital holders it was argued above that loan capital should be included in the capital base (if the asset base is viewed from the liabilities side of the Balance Sheet). Interest payments must be regarded

as payments to the suppliers of capital, not a cost. This payment should thus be seen as a distribution of the surpluses earned by a business on its operations. If we are comparing performance between two firms with differing proportions of loan capital, then if the two earn the same profit pre interest, post interest the firm with a greater proportion of equity will appear more profitable. This problem especially arises in comparisons between the nationalised industries and private firms.

When comparisons between small private firms and public companies are made, it is necessary to assess the profits of small firms before the deduction of those parts of the owner's salaries which represent entrepreneurial profit rather than a fixed overhead. However, it may prove difficult to make the distinction between that part which is salary and that which is profit.

The issue of taxation is ignored here since in the period under study the tax liability of BGC was zero.

Notwithstanding the above, care must still be taken when making comparisons between differences in the length of depreciation lives of similar assets in different firms, and differing stock valuation conventions which may produce different assessments of performance between two otherwise identical firms.

A case peculiar to the special circumstances enjoyed by British Gas, but which is worth mentioning as an example of some of the less obvious factors which may distort comparisons, has been alluded to by Targett (178). This is also of crucial importance in the setting of financial targets by the government. Targett demonstrates how, in the case of BGC, differing depletion policies of natural gas affect the rate of return. Higher depletion rates produce a high rate of return, ceteris paribus because it means capacity utilisation is increased. Differing depletion rates also alter the attainable rate of return, so that targets must be set in relation to it.

Now we turn to a discussion of the bases for capital valuation and income determination.

(ii) Capital Valuation and Income Determination

Traditionally capital has been valued at historic cost, ostensibly on the grounds of objectivity. However, under conditions of rising prices and changes in relative prices, it may result in a firm seeming less profitable than another simply because it has a younger age profile of assets. Further, whilst the gross value of the asset may be objective, subjectivity is introduced in the method of depreciation used.

There appears to be a wide consensus of opinion that the value of capital should be taken as the value of the asset to the business or "deprival" value (e.g. Baxter (12), Whittington (199) and Perrin (134). If relative prices change then historic cost is not a good proxy for deprival value. If historic cost is rejected then the choice is between three measures of current economic value, viz. net realisable value (NRV), present value (PV) and replacement cost (RC). It is proposed that each will be discussed in turn.

Net Realisable Value

The main arguments for NRV are as follows

(i) it provides proprietors with information on how much the firm would be worth if they were to dispose of it (e.g. Gray and Wells, 52);

(ii) it produces the minimum value of any alternative use i.e. the best estimate of opportunity cost (e.g. Gray and Wells op.cit)

(iii) it is the only relevant monetary equivalent which reflects a company's financial ability to adapt (e.g. MacDonald, 102)

Now, the three immediate points to note from this are firstly whether it is useful to assume that the firm will be sold within the current period and from this, secondly, should the firm be seen as a fund of purchasing power or as a fund of productive potential? Lastly, does the alternative

use value, or exit value, represent the best proxy for opportunity cost?

In most cases it is unlikely that the firm will be sold in the current period. The view that the -firm should be considered as a fund of purchasing power is, based on a proprietary view of the firm. It has been argued above that for purposes of measurement of performance all resources of the firm should be included in capital. In other words that the correct view of the firm for performance measurement, using an entity view, is that it is a fund of productive potential.

Now opportunity cost is usually assumed to be equal to the value of the highest-valued alternative use. But it only follows that this must lie outside the business if liquidation is imminent or if the firm or industry is declining. Except in these circumstances, argues Amey (op.cit,p.72 et.seq.) the true opportunity cost value of an asset not held for resale is its capital value not its NRV. Further opportunity cost may only be relevant with respect to the decision whether to acquire or retain, once the decision is embodied in capital. Therefore, NRV as a proxy for opportunity cost is only useful as the condition for closing down or the lower limit of the profitable retention of the asset in the business. But the fact that the management keeps an asset is evidence, under rational profit-maximising assumptions, that management consider it to be worth more than NRV.

Another argument must also be considered. If the assets of the industry are specialised, as in an entity like the gas industry they are likely to be, then NRV may approach zero as there is no alternative market, except scrap. In the short run opportunity cost will be zero and any return after full allowance for replacement will be quasi-rent. But as we have argued above, production will continue in the longer run, and, if the firm is not declining, opportunity cost will exceed zero. In other words as Stigler has pointed out in a critique of Jevons (171,Ch.2)it is wrong

to assume that capital once completed is consumed. It will remain invested producing a flow of income and services until it can be depreciated through use and salvage value, and it will continue in that use regardless of its return. If we assume, as implicitly we have, that production levels are maintained, then in the long run opportunity cost is not zero. Fixed costs must then be covered or capital will leave the industry.

Present Value

It has been argued by some (e.g. Kay 70) that if the objective is to provide information on the earning power of the assets then present value (PV) should be used. The use of present value takes into account the timing of receipts and estimates about the future.

However, whilst present value is useful in a world of perfect foresight and certainty so that all expectations are exactly fulfilled, in practice in an uncertain world its use is diminished.

Further, as Whittington (199) and Warrell (191) have observed, the true discounted value of the assets of the firm in toto is not equal to the sum of the separate asset values because the value of the assets computed on this basis is in part derived from the value of the business as a whole. The attempt to value individual assets at present value confuses the value to the enterprise of the mere possession of the asset with the value to the enterprise of the efficiency with which the asset is expected to be used. If the firm is considering whether or not to acquire the asset the present value is not the value of the physical asset but of the expected cash flows which will be influenced by and include the efficiency with which the firm uses the good. Thus it is not possible to assess the efficiency of the asset in isolation. Once the firm has the asset the maximum cost to the enterprise of losing the asset is not its present value. The removal of the asset, if it is a replaceable asset, will not affect the valuation of associated intangible

assets, organisational efficiency etc., since the increase in the value of these, which results from purchasing the asset or having the opportunity to purchase it and which is embodied in the present value, is transferable to a replacement asset. Hence present value appears to be an unsuitable estimate of the current economic value of the asset. Also, if we measure performance using the ratio Profits:Assets and the valuation of these is based on discounted future receipts then changes in the value of the denominator will also cause changes, automatically, in the value of the numerator. Thus we have a problem of lack of independence.

Moreover, it is clear that the use of PV,if calculated correctly, will reduce the rate of return to a "normal" level because PV includes the economic rent earned by the asset.

Replacement Cost

The valuation of assets at replacement cost may be difficult because:

(i) the cost of replacement is a function of the time available (Silbertson and Solomons, op.cit);

(ii) the firm may not replace like with like, i.e. net investment may be made in replacement. (Silbertson and Solomons, op.cit);

(iii) current replacement cost may reflect market imperfections i.e. it may include an element of consumer's surplus (Amey, op.cit);

(iv) allowance must be made for expired service (Amey, op.cit);

(v) the maximum price a prospective purchaser would be prepared to pay for the firm is not necessarily equal to the sum of the individual replacement costs of the assets.

However, these factors may merely mean that the replacement cost produced is only an approximation to the ideal value, the problems are not insurmountable. It may be assumed that the cost of replacement does not vary significantly with the amount of time available, if in most cases the firm has time to consider all alternatives. The second problem may be

overcome largely by using price indices and the fourth may be solved by adjusting the depreciation provision.

Returning to our three concepts of deprival value it can be seen that there are six possible rankings:

Table 1: Ranking of Valuation Concepts

	maximum loss on deprival and correct basis of valuation:
1. NRV > PV > RC	RC
2. NRV > RC > PV	RC
3. PV > RC > NRV	RC
4. PV > NRV > RC	RC
5. RC > PV > NRV	PV
6. RC > NRV > PV	NRV

Source: Sandilands, G4 para.218 Table 4 p.59

As Kay (70,p.301) points out instances where NRV is greater than either PV or RC are unlikely to persist. Thus for practical purposes the six options reduce to two, numbers three and five. In case five, the maximum loss on deprival is less than RC, so that the firm cannot gain as much by either using the asset or disposing of it. Examples of this case are highly specialised assets specific to one industry, and/or assets with extremely low productivity or utilisation. Thus whereas it does not pay the company to dispose of the asset since PV > NRV, it does mean that the company will not replace the asset when it wears out as RC> PV. Apart from the specific reasons given above for not using present value as the value of the asset to the firm we have also argued that as the firm is to continue in business it will replace the asset.

Thus we are left with three where the firm is better off using the asset and will replace it. Here also it can be seen that the maximum loss on deprival will be replacement cost. Therefore, the basis for valuation should be replacement cost. It represents the closest approximation to capital value.

There is one further point that needs to be tackled. Myddelton (119) has argued that exchanges occur precisely because the buyer prefers what he buys to what he pays for it. Thus the cost price is not equivalent to the value to the buyer, and hence a hypothetical RC is not even an approximate measure of value to the business. But equivalence is not necessary. All that is required is a satisfaction of the inequality condition, that replacement cost is less than (or equal to) the value to the business.

In considering income valuation we must be clear about our definition of income. There seems to be widespread agreement on the use of a Hicksian definition of income. Following Hicks (59) we may measure income as that amount which may be consumed or distributed during an accounting period and leave the business as well off at the end of the period as it was at the beginning. In other words it is the amount necessary to maintain the substance of the firm. However, from this at least five concepts of income (or profit) may be isolated (see Table 2).

It has been argued above that for purposes of performance measurement it is essential to measure income before the deduction of interest payable on loans. In other words an entity view should be taken. On an entity view, interest payments which are a transfer from shareholders to creditors should not be brought into the account at all. To deduct them as well as the adjustment to depreciation and cost of sales amounts to double counting. If a proprietary view is taken then interest payments must be deducted from profit. But in times of changes in prices, as will

Table 2: Concepts of Income

Concept of Income	Capital Regarded as:	Note	Concept of Firm
1. Gains arising during year which may be distributed whilst maintaining monetary amount of shareholders interest at beginning of year.	Monetary amount of shareholders interest at beginning of year	Basis of Historic Cost Accounting	Proprietorship
2. Gains arising during year which may be distributed whilst maintaining 'purchasing power' of shareholders interest at beginning of year.	Amount at end of year equivalent in purchasing power to monetary amount of shareholders interest at beginning of year.	CPP Method	Proprietorship
3. Gains arising during year which may be distributed whilst maintaining productive capacity of assets.	Productive capacity of company at beginning of year.	Replacement cost accounting. Used by Philips in Holland.	Entity
4. Gains arising during year which may be distributed whilst maintaining 'purchasing power' of amounts on balance sheet representing assets at beginning of year.	Equivalent in terms of 'purchasing power' at end of year of balance sheet assets at beginning.	Similar to concept 3, except 3 based upon maintenance of physical assets	Entity
5. Gains arising during year which may be distributed after charging for 'value' of assets consumed during the year.	'Value to the Business of the Company's Assets.	Sandilands/ ED/18 basis	Entity

Source: F. Sandilands Inflation Accounting Cmnd 6225 (1975) pp.32-38

be discussed in more detail below, adjustments should be made to proprietary profit for the real gain on monetary liabilities because this is a gain to shareholders at the expense of creditors. It seems to the present author that failure to distinguish these two concepts of the firm leads to confusion in assessing the performance of the firm and how this is affected under inflationary conditions.

It has been argued that for performance measurement using the rate of return on capital an entity viewpoint should be used. This immediately rules out the first two concepts outlines in Table 2.

Now under the assumption that the firm will continue in business the aim must be to maintain the capital of the business intact. The question arises as to what is meant by this. Concept 3 (in Table 2) would contend that it involves the maintenance of the physical assets of the entity. Hence gains would not be regarded as profit until sufficient funds have been provided to replace the assets consumed during the year. The problem is that the company may not wish to replace its assets by exactly the same kind of assets even though it wishes to maintain its productive capacity. As Kay (op.cit p.302) has pointed out the Sandilands definition (Concept 5) uses a definition of capital as being value to the business but as Sandilands itself defines this, in most cases, to the current replacement cost (Sandilands G4,p.56) it seems that logically there is no difference between the two concepts.

Now if Concept No. 4 is examined it is seen that we are still concerned with the maintenance of the firm as a fund of productive potential. But in maintaining this we are concenred with maintaining the real value of the income streams from the capital of the firm, rather than the physical assets of the firm. From an economic point of view, this concept would appear to be the correct one to use.

On this basis we may still use a measurement of capital based on replacement cost, as outlined above. That is if relative prices are not constant, and with a given constant general price level, historic cost is unsuitable.

The adjustments necessary to income will be as follows. To maintain the purchasing power of fixed assets and stocks of goods and materials a deduction should be made from income. Changes in purchasing power should be measured by the movements in prices of the fixed assets and stocks. This assumes that the company will continue to invest money in the same types of fixed assets and stocks in the future as at present. In most cases this will be a reasonable assumption. In the case of British Gas, of course, it could be argued that with the change from town gas to North Sea gas, the Corporation is investing in different assets.

It will also be necessary to make adjustments for the gain/loss of purchasing power due to the effect of relative price changes on net monetary liabilities/assets. Whereas for fixed assets and stocks a specific index would be used, for adjusting monetary assets in the absence of any information on what the monetary assets would be used to purchase a general index such as the Retail Price Index should be used.

At the same time as the extra depreciation allowances should be deducted from income,it is also necessary to record the gain to the firm from holding its existing assets compared with the position it would have been in if it did not own the assets.

Traditional accounting income distinguishes two types of gain - the realised operating gain and the realised holding gain. As the traditional model is based on historic costs it only recognises gains when they are realised. If we use a concept of income which bases its measurements on replacement costs, current period income will be recognised in both its

realised and unrealised forms. The latter is represented by the change in a resources replacement cost prior to realisation. The question of whether holding gains represent income centres on what capital is required to maintain. All holding gains will represent income if we are simply interested in maintaining the money value aggregate of replacement cost capital. If we are interested in maintaining the physical resources and productive capacity of the entity then unrealised holding gains do not represent any change in this, and realised holding gains may not do so either if the realised cash has to be used to replace the realised resource at a cost different from the original. But as we define capital maintenance as maintaining the earnings stream then it should be classed as income.

McElroy (103) writing in the context of national income accounting, argued that in the real, changing, world, if capital gains or losses are excluded the income stream is distorted as we arbitrarily mix current and part relative prices. Capital gains indicate that expected future consumption flows have increased, i.e. capital had earlier been misvalued. If we exclude holding gains and depreciate at replacement cost we understate total income since the increase in net worth is not recorded in the period when it is perceived, but it is depreciated out when the increase in consumption which the increase in net worth anticipated actually occurs. We would thus be adopting an arbitrary periodisation rule of income.

The problems of adjusting income and capital will be returned to in the next chapter where the effects of inflation are discussed in detail. The discussion here has sought to outline valuation concepts.

A few minor, but surmountable, problems remain. Firstly, adequate historic cost records are required to be able to adjust assets to current cost. Secondly, intangibles may be excluded because historically they are not recorded. Thirdly, should assets be revalued at "used" value or

"new minus depreciation"? Fourthly, should replacement value be that of an identical asset or that of one producing the equivalent output? Lastly, on what basis should stocks and debtors and bank balances be valued?

In practice most firms appear to keep adequate historic records. However, in the case of the gas industry, where there were historic problems due to nationalisation, a comprehensive asset register did not exist as recently as 1977. We have argued above that intangibles should be excluded for purposes of assessing performance. In principle it does not make any difference whether assets are valued at "used" or at "new minus depreciation", although there is some evidence (nee Arnold and Huefner (3) that the use of indices, which are based on prices of new goods, are more reliable than suppliers list or secondhand price lists. As interest focuses on retaining operating capacity it is necessary to use the replacement value of an equivalent asset. As debtors and bank balances are in monetary terms NRV = RC. Since stocks are likely to be sold within the period then ideally NRV should be used. However, for practical purposes NRV of stocks is not likely to differ significantly from RC

Other Measures of Performance

(i) Some ratios widely used in analysing performance of the private sector, such as Dividend Yield, P/E ratio, Earnings per Share etc. are quite obviously irrelevant to the public sector and can be rapidly dispensed with.

(ii) Until recently the nationalised industries were encouraged to finance as much new investment from internal funds as possible. The view held was that the more a firm/industry can finance investment internally the less it has to rely on borrowings, and thus the lower will be any interest payments that the firm has to make. Thus one suggested measure of performance was the self-financing ratio. However, as pointed out in Cmnd 7131, and elsewhere (68) self-financing ratios reflect changes in the level of investment as

much as changes in the level of profitability. They also completely overlook the opportunity costs of these funds.

(iii) Asset Growth If a firm opts for growth maximisation then it is assumed, at least by the models in the literature, that it will not simultaneously maximise profits.A trade-off takes place between growth and profitability as the marginal investments become less and less profitable beyond the optimal point. Growth maximisation may lead to a greater than proportionate increase in the managerial system of control with the accompanying growth of X-inefficiency and other managerial diseconomies of scale. These diseconomies may be overcome, argues Williamson (204), by the move from a U-structure (unitary) of management to an M-structure (divisional) of management.

However, growth maximisation will be constrained to the extent that the growth of assets must be financed. The supply of finance at one point in time will be limited. If the firm grows by the use of internal or external finance the amount by which it can grow will be closely related to its profitability. In the former case last year's profit and this year's retention ratio control next year's investment. In the latter case, unless the firm is reasonably profitable it may be difficult to raise finance via new issues and borrowing. The empirical evidence, however, suggests no clear relationship between growth and profitability (see for instance the survey by Eatwell (35)).

Asset growth may be obtained in two ways:

(i) internal growth

(ii) external growth

The evidence available would suggest that for firms in general these two factors are complementary (see for example, Aaronovitch and Sawyer, 1).

Further, in attempting to determine which of these contributes more

to growth it may be impossible to isolate their separate effects. But there is some evidence to suggest that firms partaking in mergers did not find them successful. The work of Meeks is one for example. A study of Utton (op.cit) of merger intensive firms in the UK suggested that companies heavily dependent on mergers had lower efficiency and lower profitability than companies whose long run growth is slower but whose internal efficiency can be sustained.

The calculation of asset growth by mergers is complicated by the problem of what value is to be put on the assets of the firm acquired. UK standard accounting practice offers no clear-cut guide with the result that it is fairly arbitrary whether book value or purchase price is used. If the acquirer pays a price exceeding book value of the firm's assets then the problem of accounting for goodwill arises. A full discussion of this problem is beyond the scope of this thesis[6], but it seems that the main alternatives are to (i) enter goodwill in full with no revaluation of the acquired firm's assets or (ii) revalue the acquired firm's assets and enter as goodwill only the excess of purchase price over this revaluation. It could be argued that because of inflation the historic book value of a company's assets is understated, thus goodwill should be included as an estimate for this. But as Howe (op.cit. p.11) argues in the context of monopoly and restrictive practices investigation, goodwill should be excluded because it reflects the assets' ability to earn super normal profits and a rate of return calculated with the inclusion of goodwill would reduce the ratio to a "normal" level.

If either goodwill is included or assets are revalued on merging, then assets will be seen to increase, whereas if goodwill is excluded or assets are not revalued the asset growth will not be so great.

However, in the case of the nationalised industries the nationalisation statutes forbid merger activity so that this aspect of asset growth does not apply.

The use of internal growth as a measure of performance may be unreliable where apparent growth results from the firm revaluing its assets. In any case the use of asset growth tells us nothing about how those assets are being used and hence says little about resource allocation.

(iv) Sales Growth

As with asset growth sales growth competes with the object of profit maximisation. Hence, as was seen with asset growth it tell us nothing about the level of efficiency of resource allocation.

(v) Other forms of technical efficience are based on the specification of the production function of the industry in the most efficient way from an engineering viewpoint (for example see the path-breaking article by Farrell, 38 and the review of the literature in this area by Todd, 181). These methods by their nature tend to be partial and restricted to firms with a fairly homogeneous structure. Otherwise problems arise of different capital vintages, and of the availability of sufficiently detailed information relating to different plants and products.

Problems may arise because of the difficulty in measuring particular inputs. In measuring technical efficiency interest focuses upon the optimum combinations of physical inputs. But data may not be available in a suitable form, for example if the numbers of labour employed are taken as the labour input then bias may arise as differential skill levels are ignored. The existence of inflationary elements in accounting data may obscure the real resources being used.

Measures of technical efficiency also face problems of accounting for changes in relative prices. After the decision to invest has been taken changes in relative prices cannot be taken into account as the possibility of substitutuion of input factors is practically impossible.

Lastly, to take technical efficiency in isolation from the environment in which the firm exists is to ignore important factors which may affect the overall efficiency of the firm.

Part 1 Ch.1: Summary and Conclusions

A number of criteria for performance measurement and efficiency assessment have been examined in this chapter. That there is much inter-dependence between these various criteria should be abundantly clear.

The two main ex ante measures outlined in Part 1 Appendix II have been shown to have developed to a high degree of sophistication and it has been indicated in which cirsumstances it is possible to use them. But, in an imperfect world with uncertainty, their use must be limited - actual events often turn out in a way different from that predicted. Accordingly ex post criteria are required.

The discussion of these criteria alluded to the problems of using accounting data, but concluded that it was better to use this data because of the insuperable problems of using discounted future income streams. Otherwise, if we get bogged down in such semantics little progress would be made in measuring performance.

It was clear that the ratios themselves suffer to a great extent from problems of definition and that many of them only related to particular parts of the entity, i.e. they were partial measures. The point was made that, to measure performance completely, a number of ratios would have to be used, and an example of a pyramid of ratios was given. But it was argued that, as a starting point for analysis, one ratio should be used as a guidepost. It was concluded that this should be the rate of return on capital employed. From the ratio discussed the rate of return on capital employed provides the broadest overall view. However, its definition and use are not without problems.

The conceptual problems of capital and income valuation have been examined in some detail. The argument concerning what to include centred on the objective at hand. As the objective here is the measurement of the overall performance of the firm all resources available to the firm should be taken into account. Thus for example, loans should be included

Table 3: Comparison of B.G.C. Consolidated Income and Capital on Different Definitions of Income and Capital

	INCOME AND CAPITAL	
	As in BGC Accounts (1975/76) £m %	On Basis of Definitions Used Here (1975/76) £m %
INCOME		
1. Profit Pre-interest post depreciation inc. other income	201.9	
2. After adding back capital items charged to revenue (48.1m).		250.0
CAPITAL		
1. F.A. + C.A. - C.L.	2280.6	
2. F.A. + C.A.- C.L. + Bank overdrafts		2298.6
3. Add capital items previously charged to revenue		48.1 2346.7
Pre-interest rate of return	8.9	10.7

Note: that in BGC accounts Bank overdrafts are subtracted from capital but included in pre-interest profit.

Source: BGC. Annual Report and Accounts 1975/76 pp.36,37,44,45.

in capital, and income should be calculated before deduction of loan interest because it is the existence of the loan which enabled the firm to perform in the way that it did. Interest payments must be regarded as payments to the suppliers of capital, not as a cost. In other words, an entity view of the firm was taken.

Comparisons, over time, of performance would be distorted, it was argued, if firms charged what may be better seen as capital items (for examples, R + D expenditure, and replacement of fixed assets) against profit.

It is interesting to compare the rate of return on capital of BGC on the basis as defined in their accounts and on the basis adduced here (see Table 3). Assets are increased by adding back bank overdrafts and items previously charged to revenue and income is similarly increased by adding back this capital item previously charged as a cost. The rate of return on capital increases significantly[7].

The bases for capital valuation and income determination were discussed. Three possible methods of capital valuation were considered - NRV, PV and RC. It was argued that, as the firm is assumed to continue in production in the long run and is not declining, the opportunity cost of the assets was best measured by capital value not NRV. It was further argued that replacement cost provides the best approximation to capital value. In the case of income measurement it was contended, using a Hicksian definition of income, that the maintenance of capital should be interpreted as meaning the maintenance of the real level of income streams to the firm.

The discussion placed emphasis on the fact that it was an examination of the valuation process of income and capital. Before it is possible to state the model to be used to appraise the performance of the British Gas Corporation it is necessary to consider the effects of changes in the general price level on capital and income calculation. Therefore, we turn in the next chapter to consider the inflation accounting debate.

Part 1:Ch.2: The Measurement of Income and Capital with a Changing Price Level: The Inflation Accounting Debate

Introduction

The concepts of capital valuation and capital maintenance to be used were discussed in the previous chapter.

In this chapter the effects of inflation on the arguments in chapter one will be tackled. It will be necessary to refer to some of the other concepts outlined in Table 2 of chapter one. Principally the relevant concepts are two and five. These formed the basis for the inflation accounting proposals put forward in provisional SSAP 7 and in the Sandilands Report and subsequently ED18 respectively. These proposals are outlined and discussed in Part 1: Appendix III.

From Ch.1 Table 2 it is seen that the SSAP7 income is concerned with the gain in the purchasing power of shareholders interest and that capital maintenance here seeks to maintain the monetary purchasing power of the shareholders interest. It thus uses a proprietary view. Sandilands/ED18 recognises income as gains after charging for the value of assets consumed during the year and capital as the value to the business of the company's assets. It is interesting to note that SSAP7 recognised the validity of using a replacement cost accounting approach for management, (i.e. entity purposes (61,AppendixI)) but rejected it on the grounds of subjectivity. But SSAP7 did recognise the effect of relative price changes on replacement cost. However, this raises wider issues. If accounting is to measure economic performance and income and capital are to be defined in Hicksian terms then relative prices must be accounted for, in addition to general price changes. As argued in the previous chapter, if the price of the assets of the firm increases relative to things in general then there has been a real increase in its income stream. This condition holds both in

times of stable and rising general prices. Thus it seems essential that an inflation accounting system must contain two parts, an adjustment for the change in general prices (pure inflation accounting) and an adjustment for the change in relative prices (a valuation adjustment). The system proposed in SSAP7 merely adjusted for the change in general prices. The Sandilands system adjusted only for the gross change in relative prices. But both of these approaches stemmed directly, of course, from the concepts of capital and income used.

We now examine, in the light of the above, the various sides of the inflation accounting debate.

Capital Valuation and Income Measurement

Consider for a moment the conflicting arguments of SSAP7 and Sandilands /ED18.

The protagonists for SSAP7 contend that a general price index should be used to adjust asset values and that the purpose of replacement depreciation is to maintain the real purchasing power of shareholder's interest intact, rather than maintaining the physical capital of the business as in Sandilands/ED18. Further, it is argued by proponents of this view that the assets of the firm are unlikely to be replaced by new assets which are exactly the same, because of changing technology. In addition the maintenance intact of physical assets provides little information about the income streams deriving from those assets.

These views have been criticised on a number of counts. Firstly, it is argued by Howe (61) that a general approach contravenes the going concern concept of financial accounting. By not taking account of the changes in the purchasing power of money which directly affects it the firm is failing to maintain itself as a going concern in the long run.

Secondly, the use of a broad based index produces a smoothing effect which suppresses information showing the randomness of actual price changes relating to the portfolio of net assets held by the firm. Thus this view is adduced by Standish (168) who says that it is only by the use of specific indices that a firm specific definition of the current value of net assets can be achieved.

Thirdly, there is no guarantee that the assets of the particular firm in question will have moved in the same direction and by the same amount as general prices, as a result of inflation.

Lastly, if shareholders or other interested parties wish to know the general effects of inflation then they would be better off consulting other, publicly available, statistical information because the information in a company's accounts is a lagged indicator of the effects of inflation because the shareholder has to wait until well after the end of the financial year before the information is available.

These considerations would suggest that a more specific range of indices should be used in asset valuations. But there are certain reservations to be considered. It has been argued (118,119) that the use of specific indices departs from the objectivity concept of historic cost accounting. The force of this argument is reduced, however, when it considered that subjectivity enters historic cost accounts, for example with respect to apportioning of overheads, obsolescence, the calculation of depreciation and the capitalisation of some assets but not others.

Inaccuracies may arise because the available specific indices do not fit the asset categories of firms precisely. This is a well known problem but whilst in some cases an arbitrary decision is made as to the industry class to which a firm belongs, approximations of this nature will, it is said, produce better estimates than an index based on a theoretical and

abstract "basket of goods" such as the retail price index. Evidence that the retail price index does not provide a reasonable approximation to specific industry indices is adduced by Bourn, Stoney and Wynn (16,17) and Peasnall and Skerratt (133). The remaining argument here now centres on the use of asset specific rather than industry specific indices. Whilst Bourn et al (17) and Peasnell and Skerratt (op.cit) produce evidence that asset specific indices produce "better" results they do recognise the usefulness of the industry specific indices that are published (in G6 for example). But they say it is possible to produce asset specific indices from the existing data base, so the advent of these should simply be a matter of time.

One final point concerning industry indices. Price controls in times of high inflation may distort the indices. This may occur if a price is kept artificially low so that it would be expected that excess demand existed. It is difficult to see how an index can take account of this. The problem, though, only arises if all industries are not affected equally by price controls. This inequality may arise where a firm has a high proportion of imported raw materials. It is assumed, however, that in such cases the specific index will be no worse than the general index.

Some authors would wish to depart from the use of indices on either the general or specific bases.

Amey (2,p.91) puts forward the case for using fire insurance valuations on the grounds that these are comprehensive, a definite value is required, the firm usually insures at reinstatement value, replacement values are determined by applying some rate of depreciation to replacement cost as new, and revaluations are made regularly. However, in times of rapid inflation these revaluations may lag behind the inflation rate. In any case the use of insurance valuations may be possible for internal use,

but the information is not available to the external researcher.

A method used by Shashua and Goldschmidt (158) attempts to value assets in aggregate by the assumption of a uniform age distribution and an average rate of growth of assets, so that an average rate of inflation may be used in the revaluation. The supposed advantage of this method is that it overcomes the problem that use of indices means a restatement of historic cost in current prices and not a revaluation. But the assumption of a uniform age distribution assumes the problem away. Differing age distributions make a significant difference to the overall assets value so that disaggregation must be used. Consider the effects of assuming that gas mains have the same age distribution as gas board vans. How the length of the age profile is to be decided upon is not made clear. If a relatively short age profile is used then assets such as land and buildings will be underestimated. If a relatively long age profile is used then assets such as motor vehicles will be overestimated. It seems that if sufficient information is available then a more accurate approach is to calculate the age distribution for each asset by adding back each annual investment until the balance sheet gross book value less disposals at the end of the current year is obtained.

The method of continuously contemporary accounting, developed by Chambers (22) and used by Gray (51) has three main features: (i) it retains the conventional historical recording system (ii) it periodically makes adjustments to assets ad and when reports are required so as to record changes in their current cash equivalents, and (iii) it periodically records the adjustments necessary to profits and losses which will maintain shareholders equity in terms of purchasing power. Thus it is hoped to account for both changes in the relative prices of assets and for the effects of general purchasing power gains or losses to equity capital.

However this method bases its valuation of assets on current selling price or net realisable value. But we have laid down the argument against the use of NRV in the previous chapter. If the firm is to continue in business then it is required to renew the assets of the firm as they wear out. Thus for most purposes replacement cost is the relevant valuation concept.

Sandilands considered but rejected the notion of valuing assets on a CCA (Current Cost Accounting) i.e. specific, basis and then adjusting them in subsequent years for changes in the purchasing powerof money, the CPP (Current Purchasing Power) approach. This approach was considered to be too complex (G4, para. 546). Sandilands was also sceptical about the validity of any measure of general inflation and thus left it to the interested party to make his own adjustments for the decline in value of the monetary unit (paras. 45-47). But this seems a curious argument to adduce. Whilst the deficiences of the retail price index are recognised it has hitherto been satisfactorily used as a basis for measuring general inflation. For Sandilands to argue otherwise seems a weak case for the use of specific indices. It seems perfectly reasonable to use specific (CCA) indices to take account of relative price changes since the date of purchase of the asset, but as under conditions of inflation the monetary unit declines in value then a general (CPP) adjustment would present the figures in the accounts in real terms.

Again the distinction is related to the view taken of the firm. The pure CPP method does not maintain the purchasing power of the income stream from the assets in the balance sheet of the firm, but taking a proprietary approach it seeks to maintain the purchasing power of the shareholders interests. The CCA method seeks to maintain the physical assets of the firm rather than the real value of the income stream to the firm as an entity.

Operating Profit and Holding Gain

The historic cost system of accounting introduces an element of holding gain into the profit calculation because depreciation and consumption of stocks are charged at the prices historically paid not the cost of replacing them. The holding gain in historic cost accounting is recognised at the point of realisation as a form of cost reduction. When accounts are adjusted for inflation the income in the value of assets representing the holding gain is recognised as it occurs, that is it is an unrealised holding gain.

Now Sandilands recommended that distinction be made between operating gains, defined as turnover minus "value to the business" of inputs, and holding gains, defined as "value to the business" of inputs minus their original cost. Defined as such it was argued that operating gain would approximate closest to the Hicksian definition of income. Further, by separating out holding gains from operating gains, and placing them in an appropriation account outside the profit and loss account it was intended that the interested party would see what gain was due to skill of the management and what was due to the forces of chance.

But Kay (op.cit) has pointed out that operating gains are equivalent to repeatable profit only if everything which is classified as a holding gain is an unexpected gain (a "windfall" in the Hicksian sense). Thus the analysis made by the Sandilands Committee is only valid if all past price changes were unanticipated and prices are expected to remain stable in the future. It is doubtful whether either of these two conditions have much empirical support. Moreover, as Amey (op.cit.p.114) observes it is a function of management to anticipate relative price changes. Thus holding gains should be an element to be included in measuring performance. Moreover it is not necessarily true that holding gains and operating gains

are the result of different decisions as Sandilands implies. In practice the two are inextricably linked.

It has also been argued by Kay (op.cit)and Baxter (12) that operating profit gives an unclear picture to interested parties because operating profit is on the one hand reduced by the increased cost of sales and depreciation, but it is not compensated for by the increase in asset values. Thus it is contended that operating gain is not equal to Hicksian income or distributable profit.

Before proceeding further with the distinction between operating gain and holding gain it is necessary to consider in detail cost of sales and depreciation adjustment.

Cost of Sales and Depreciation Adjustments

One suggested method of adjusting for changes in the cost of sales has been that stocks should be valued on a LIFO (last in first out) basis, so that the most expensive stock is charged in the profit and loss account, and the cheapest appears in the balance sheet, rather than the opposite happening as with FIFO (first in - first out).

But it has been pointed out (e.g. Howe, op cit) that this is not a replacement valuation policy. It is suggested that a more realistic method may be to retain the FIFO basis, carrying forward in the balance sheet the most recently acquired stock at cost or market value, but charging stock deemed to have been used in production in the profit and loss account at replacement valuation, with the amount of stock revaluation being taken to a reserve.

Baxter (op.cit) suggests that the cost of stocks should be raised with the general index. This is because of the time lag between purchasing of stocks and rate of goods which means the cost in pounds of one date are

subtracted from the cost in pounds of another. To be consistent it is necessary that the outlay on stocks means as much this year as it did last year. The use of a general index gives recognition to the maintenance of real rather than physical wealth. But it also assumes that there has been no change in relative prices during the time lag. As Morley (113) has pointed out stock appreciation can derive from a change in relative prices, which produces an increase in profitability, and from a change in the general level of prices. In the former case if a firm purchases raw materials before prices rise, it holds stocks which are appreciating without incurring additional costs. Operating profit remains constant, but because of stock appreciation a real gain to the firm results. If stocks are purchased after the price rise then operating profit falls because of the increased cost, but the stock appreciation remains. Thus the overall result, in this instance, is no fall in profitability. In the case of a general rise in prices, then there will be nominal stock appreciation. If inflation is 10 percent, the stock appreciation will be 10 percent of the value of the volume of stocks at the beginning of the year. Morley concludes that it is only in the case of the change in relative prices that the accrual is real.

A similar point is made by Gibbs (43) who argues that Sandilands errs because it does not take account of the timing of price increases. Under the present price control system a company is usually prevented from putting up prices to reflect the higher cost of stocks until all the old stocks have been sold. But if it is to maintain the same quantity of stock without having to borrow, it must be allowed to put up prices as soon as the cost of its purchasing starts to rise. This will produce a stock profit, but it is not to be confused with stock appreciation, which Gibbs defines as the increase in the cost of holding a given volume of stock. Gibbs contends that the Sandilands Committee make an error when they describe the two as

synonymous. This also implies that taxation on stock appreciation should be restricted to that amount of appreciation over and above the general rise in prices.

Another deficiency in the Sandilands method of stock adjustment has been alluded to by Kay (op.cit). Kay contends that because the stock adjustment is arrived at by an averaging method, which is approximated by multiplying the average of opening and closing stocks by the average price increases in the year, then stock appreciation can be exceptionally high or low. As the starting point is the original cost of stocks,then if the original cost is exceptionally high or low, the adjusted cost will be. Therefore, gains which are due to luck or skill in the timing of purchases will be embodied in Sandilands operating profit not in holding gain. Thus we should include real holding gains as part of income.

In the case of depreciation, it was seen earlier that Sandilands and subsequent proposals (see Appendix III) suggested that depreciation should be calculated on the replacement cost of assets.

Using a specific index it is suggested that the appropriate method is to inflate the historical depreciation charge in respect of a fixed asset each year using the specific index relating to the fixed asset concerned. But as Howe (op.cit) points out this method will not guarantee sufficient funds to replace the original fixed asset if the final replacement cost is calculated as the original cost times the final replacement cost index.

It has been suggested that back-log depreciation should be charged. That is depreciation provisions should be adjusted for subsequent changes in the price level to ensure that depreciation provisions made at the life of the asset equal the replacement cost of the asset at the end of the period. However, as Howe (op.cit), Baxter (op.cit) and Kennedy (76) have observed, this may not be necessary. As long as the accumulated provisions

are of such a kind that their value is likely to move more or less in line with the asset in question they provide a perfectly good"hedge" against unforeseen movements in the price level. Also if the matching principle is adhered to then any change in the price level of the fixed asset concerned which takes place after current depreciation has been provided for is not relevant. Thus as current revenue is being matched with current cost the appropriate value of the pound in which to express depreciation expense is the value of the pound in which the current period's revenue is expressed. This hinges on the assumption that in providing for depreciation we are trying to adjust for the use of the asset rather than trying to spread the replacement cost. The provision of backlog depreciation would thus change the whole concept of depreciation. Moreover, if depreciation is thus considered to provide for the replacement cost of the asset then the depreciation charged annually in the proft and loss account for the year will exceed the value to the business of the asset consumed during the year. Sandilands (paras. 474 - 483) has recognised this problem. Sandilands (para. 606) also points out that whilst it is not necessary to charge backlog depreciation an adjustment must be made in the balance sheet so that the cumulative depreciation provision matches the difference between the gross and net book value to the business of the depreciated assets.

So returning to the discussion of operating profit and holding gain it has been seen that Sandilands operating profit is reduced because it attempts to maintain capital in terms of physical assets rather than striving to maintain the real income stream from the assets. This is the reasoning behind Sandilands showing holding gain separately from operating gain.

Leading on from this Sandilands contends that holding gains cannot be shown as profit, and therefore cannot be distributed to shareholders,

because they have not led to an increase in the cash flow of the business. This has led Kay (op.cit) to accuse Sandilands of producing a measure of profit which is not a measure of profit but of liquidity.

That liquidity is important to firms was emphasised by the liquidity crisis in much of British industry in 1973/4. Evidence provided by Lawson (e.g. 87) suggests that because of inadequate information on cash flows companies have been distributing to equity holders an excessive amount of earnings.

Exponents of cash flow accounting criticise conventional accounting because of the difficulties of measuring profits and capital. Traditional historic cost profits do not represent the cash flow of the company. But if the primary objective of the company is to survive then in the last resort this means the company must have the ability to meet costs, repay loans etc. The accounts should show how well this has been achieved. Cash flow is objective, it automatically deals with changing costs and prices as all entries are at current value, and by entering receipts and expenditures when they fall due cash flow accounting avoids the problems of gains/losses on net monetary liabilities. Some would argue that instead of devising an elaborate structure of inflation accounting it is preferable to use a cash flow accounting system. (Lawson, e.g.(86) and Sumner, 174). However, the main problems with cash flow accounting are in defining profits for the year when the accounting system it requires does not match revenues and costs; to be of most use it requires the incorporation of cash forecasts; and whilst a positive cash flow tells us the firm has no liquidity problems it provides no information as to whether or not the firm is allocating resources efficiently. But despite these shortcomings it is useful to have information on cash flow positions as supplementary information as a guide to whether the company is in danger of imminent collapse, as Sandilands

recognised (para.518).

The problem of profitability versus liquidity has led to disagreement over whether holding gains may be distributed to shareholders. A number of writers have argued that profitability has not increased as a result of holding gains and that to distribute such gains would lead to disaster (84,108) as Pilkington (136) argues if a firm followed the above advice its asset values would fall and its borrowing base would probably have been eroded because it would have passed part of the gain, that eventually becomes evaporated due to plant obsolescence, through into distributable earnings.

Merrett and Sykes (108) argue that it is incorrect to say that profitability has increased on the basis of a gain from an option that the company has no intention of pursuing, that is selling the fixed asset to realise a holding gain. Further, in times of inflation, this gain if used for capital expenditure is not "voluntary" in the sense that it will enhance the future position of the company. Rather, it is necessary in order for the firm to keep going at the same level of activity. They further argue (110) that a company said to be more profitable because of holding gains may have no resources with which to pay dividends, taxes, wages etc.

Merrett and Sykes have been criticised by Kennedy (74) who claims that they confuse liquidity as being synonymous with profitability which is a characteristic of inflation, especially when the real rate of interest is negative. A number of methods have been suggested which reveals this possibility.

One commentator (Gibbs 43) has favoured a combination of CPP and CCA methods in providing a better indication of profitability. The method suggested has four main features:

(i) operating gains are calculated after allowing for maintenance of assets employed, as in CCA; (ii) all items of income and expenditure are adjusted to £s at the beginning of the year and are thus based on a standard measurement unit, as in CPP (iii) holding gains/losses on fixed assets and stocks are shown as real gain/losses because the general inflation element of the rise in prices is removed, and (iv) the gains on holding net monetary liabilities are included as in the CPP system. It is contended that this produces a better view of the profitability of the company than a CCA system which understates operating profit but overstates total gains because holding gains shown reflect general inflation rather than real holding gains/loans.

A development of Gibb's method has sought to produce a more appropriate definition of money profit, that of a distributable surplus having maintained fixed and working capital intact, while also retaining the inital ratio of debt to shareholders funds (i.e. the same gearing ratio) which is conventionally used as a measure of financial strength. This method, developed by Godley and Cripps (47) assumes that the firm invests the required amount to maintain its capital intact, in terms of the Sandilands' definition of capital maintenance. Further, as a result of operating gains resulting from real gains in fixed assets, stocks and monetary liabilities the basis is provided for raising further debt which produces cash available for distribution to shareholders. This arises because in times of inflation interest should reflect an amount of compensation to the lender for loss on the real value of his money, in addition to the nominal rate of interest. This amount over and above the nominal rate of interest is thus really a capital transfer and should not be included in the profit and loss account which is conceived by Sandilands to be a strictly current account balance.

If it is treated as a charge against profit then this makes a

provision for reconstituting the real value of the assets due to a company's creditors and thus less than the whole of the appreciation in the company's assets is needed to reconstitute the assets due to the company's shareholders to their original real value. The proportion of such asset appreciation which, if full interest is allowed against profit, should be allowed to be outside the profit.balance is given by the ratio of Shareholders Equity to Total Assets.

Alternatively, still excluding from profit that part of interest payment which represents the difference between the nominal and the real rate of interest on the grounds that it is a capital transfer, it has been suggested (Jay, 66) that the disallowed interest could be shown as a debit in the holding gains section of the accounts below the line at which profit is shown. Thus this would, it is argued, avoid the problem of double-counting which the inclusion of working capital and interest payments in the profit and loss account produces. Some (e.g. Lawson, 84) would disagree with this, arguing that Sandilands does not fully account for working capital. Two ways in which the situation may be rectified are suggested by Lawson:-

(i) charge annual interest in the profit and loss account at a company's weighted average cost of capital, on total working and fixed capital invested so that total interest and depreciation equal depreciation calculated at the cost of equity capital on an annuity basis plus interest on total invested working capital calculated at the cost of equity capital plus loan and overdraft interest paid minus debt interest recalculated at the equity interest rate.

or (ii) the Total Corrective equals total capital expenditure plus/minus the periodic increase/decrease in total working capital plus loan and overdraft interest paid minus/plus long, medium and short term debt raised/ redeemed.

As Sandilands uses parts of (i) and (ii) the total corrective falls short thus depreciation is likely to be inadequate. In part (ii) the last two parts represent the benefit derived by substituting debt capital for equity. But, Lawson argues that if this is done the substitution will be offset by the higher cost of equity capital in the first parts of the calculation. Thus it seems to Lawson that adjustments à la Gibbs, Godley-Cripps, and Jay compound the overstatement of shareholders' earnings.

Lawson goes on to argue that whilst a company's debt raising capacity may increase in times of inflation because of a monetary increase in the asset and interest cover, this will not affect shareholders' profit. If the company, as a result of gains due to inflation, adjusts its capital gearing ratio upwards by raising debt and simultaneously distributing the cash to shareholders then this debt-for-equity substitution alters the allocation of a given income between debt and equity providers, but it also increases the risk class of each remaining equity share although equity holders are compensated by receiving a higher (geared) income per share. The net effect is that the market value of new debt is equal to the market value of displaced equity - equity prices do not rise because the higher equity income is capitalised at a higher discount rate reflecting higher risk, and although debt gets lower income per unit it has a higher preference on income. There has been simply a transfer of an equal amount from equity to debt. In other words Lawson appears to be saying that to distribute income by debt financing is to trade-off future dividends for higher current dividends if the real expected earnings stream is unchanged.

But as Gibbs and Godley-Cripps have shown it is legitimate to include as income that amount of holding gain over and above the holding gain due to increases in the general price level. This produces the basis, in terms of a real increase in profitability, to borrow to increase distributable

profit. In other words the real expected earnings stream has increased even though the company cannot realise the asset to increase its actual cash flow as Lawson would like, as this would contravene the going concern assumption, the owner of the asset has increased his potential command over all other goods and services and is thus better-off vis-a-vis non-owners. Further, as Kennedy (72) points out,by wishing to keep in business the owner of the asset is implicitly saying that the economic value of the asset is greater than its market value, and subjectively the owner's assessment of the gain he will make is greater than the profit he would realise. Thus, in order to take his profit he can borrow more on the strength of the rise in its market value, and since the owner estimates economic value to be greater than market value he must expect that future cash flows will be sufficient to service the interest on the loan. In other words the owner of the asset is able to preempt part of the latent cash flow from the disposal of the asset.

It does seem that Lawson is preoccupied with cash flows and liquidity rather than profitability. Kennedy, whilst agreeing that the raising of the new debt is part of the cash flow of the company (76), disagrees with Lawson (85) that it is related to operating cash flow. The gearing adjustment which is generally agreed to be a capital adjustment enters the profit and loss account after the deduction of interest payable/on loans and so does not affect the provisions needed to maintain productive capital. The general adjustment is necessary because, contrary to the view adopted by Lawson (82) the actual amount of interest represents a discount on costs below the current market rate sufficient to account for the gain due to inflation, the actual figure shown does not represent the real cost only the money cost. Watson (192) puts the point clearly by considering the problem from the viewpoint of a monetary asset. If the firm had a monetary asset yielding x of money

income and the whole of x were spent each year then in successive years the company could produce fewer and fewer quantities of physical goods. But if the interest received is corrected for its reduction in purchasing power by deducting from the interest received an amount equal to the rate of inflation times the value of the asset this would produce a figure for real income, and if all this were spent each year the firm would still be able to purchase the same amount of physical goods each year.

Thus, the real gain on monetary liabilities, the other side of the coin, must be considered as income. This depends on the assumption that the firm, in maintaining capital,aims to maintain the purchasing power of that capital.

Now it is essential, as has been argued, that for assessing performance an entity view of the firm should be taken. In other words income should be measured before the deduction of interest payable on debt, because interest charges represent a transfer from equity to debt. For purposes of assessing shareholders' income it is necessary to deduct interest payments. Now if geared holding gains are not added back then an ungeared company will appear more profitable than an otherwise exactly similar geared company, simply because of a negative real rate of interest.

The special position of the nationalised industries, which in general have no equity worth considering/ has attracted comment It has been assumed so far by the industries that loans could be regarded as being akin to equity and thus no adjustment along the lines suggested by the Hyde Committee (63)/ is required Now, the Hyde guidelines (op.cit. para.5) state:

> "If the total liabilities of the business... exceed total monetary assets, so that part of its operating capacity is effectively financed by net monetary liabilities, an adjustment should be made to reflect the extent to which depreciation and cost of sales do not need to be provided in full from the current revenues of the business in showing the profit attributable to the shareholders."

Strict adherence to the Hyde guidelines would mean that the gearing adjustment would add back practically all of the increased cost of depreciation

and sales previously deducted. This would seem reasonable given the gain due to the reduced burden of servicing debt. But note that this applies to the position after interest has been deducted. We have argued above that it is the pre-interest position which provides the relevant information for assessing performance.

Thus if we regard interest on debt as an appropriation of profit rather than a charge, that is we take an entity view, then the correct profit is arrived at before all financing costs, including interest.

Inflation Accounting and Taxation

In the context of the nationalised industries the issue of taxation is of little more than academic interest. Thus it is not proposed to pay more than cursory attention to the issues involved in inflation accounting and taxation.

Essentially the argument centres on the fact that unless adjustments are made to the taxation system, then corporations will bear an excessive tax burden under inflationary conditions. This is because some sales proceeds will be used to purchase replacement stock at current cost, which will usually be higher than in the previous period. Under the historic cost system tax is chargeable upon the difference between sales proceeds and historic cost.

The government went some way towards recognising the problem of the increased cost of stocks by the introduction of tax relief and 100 per cent first year tax depreciation allowances on new investment in 1974. This was merely a deferral of tax liability. It may have resulted in some companies building up large tax liabilities which affects their financial position and borrowing capacities. One observer (Stanley,169) has pointed out that because the relief takes no account of changed stock values those companies with inefficiently high stock levels get tax relief on them. Sandilands and Gibbs (op.cit) endorsed this system as a useful "rough and ready" form of inflation accounting for tax purposes. Other, for example,Lawson (84), argues that it

is at least a necessary condition for operationalising the principle of tax neutrality, that is where the imposition of a tax produces a neutral effect on the allocation of resources in the economy (see Musgrave R.A. and Musgrave P.B (117) p.417 for a discussion of the conditions for neutral corporation tax). In other words it is argued that the tax system should be reformed to achieve neutrality, but that the proposals put forward by Sandilands and subsequent proposals give inadequate treatment to the problem, and hence the business decision remains distorted. This is because the present system taxes distributed profits at a different rate from retained earnings, hence the cost of equity finance is raised relative to that of debt finance. Interest payments are allowable as a charge against profit, whereas dividends to equity holders must be paid out of post-tax profits.

However, the point is that for purposes of performance measurement interest focuses on pre-interest pre tax profits.

Summary and Conclusions on Inflation Accounting and Performance Measurement

A number of often contradictory views have been put forward as suggestions for the way in which the firm may account for inflation. In summarising these suggestions we concentrate on those pertinent to the task of performance measurement

As a starting point we take the conclusions from chapter one, that in measuring performance an entity view of the firm must be used. Included in capital are fixed assets, plus investments, plus current assets minus current liabilities. Income is valued before the payment of interest, and after provisions have been made for the maintenance of capital, which is defined as maintaining the purchasing power of the assets in the balance sheet.

Given this background the methods of adjusting asset and income valuation in times of inflation could be obtained.

Basically, assets, as defined above, are to be adjusted by applying

specific indices to the historic cost of fixed assets. This provides an estimate of replacement cost.

Income valuation proves to be more complicated. Three of the adjustments that are necessary are fairly straightforward and uncontroversial. Turnover and operating costs are adjusted to take account of the fact that they accrue throughout the year. Following the methodology of SSAP7 this adjustment is carried out by multiplying the relevant data by the ratio of the end of year general price index to the average general index for the year. (Note that the current thinking of the accounting profession omits this adjustment).

If the replacement cost of the assets and stocks of the business increase then the extra cost of replacement must be charged against revenue. The extra cost, it was argued, should be calculated using specific indices rather than general indices, since whilst interest does not focus on replacing the same physical assets it does focus on replacing the same type of assets. Thus from an entity viewpoint general indices are not the correct indices. (The mechanics of calculating stock and depreciation adjustment are outlined in Part I Appendix IV sections I and II). In times of inflation the real value of the monetary assets of the business will be eroded, thus an adjustment must also be made for their maintenance. Following Kennedy (77,p.63) it is argued that trade monetary liabilities should be included here to give a figure for net monetary assets (trade liabilities are seen as negative monetary assets). Using a general index the figure for net monetary assets is adjusted to provide an estimate of the amount by which net monetary assets would have to rise to be maintained in real terms. The amount so calculated is deducted from profit as the adjustment necessary to maintain the real value of net monetary assets (see Appendix IV, section IV).

By far the greatest controversy surrounds the treatment of holding gains resulting from a rise in the general price level, from that resulting from

a change in the specific price level. The difference between the specific and the general holding gain is the real holding gain on the asset.

As Kennedy (77, p.60) point out, following Godley-Cripps, the general index holding gain on an asset financed by borrowing is equivalent to the monetary holding gain on the assets, since equal but opposite adjustments will be made to the sum borrowed and to the historic cost of the asset. The net result is the holding gain on the asset itself. Thus the gain on financing assets by borrowing, the gearing gain, should be added back to entity profit to produce proprietary profit.

On the grounds of prudence (Kennedy, op.cit p.61), viz. that no unrealised revaluation surpluses should enter the profit and loss account the Hyde Guidelines apply the gearing adjustment only to those holding gains represented by the adjustments to depreciation and cost of sales. Strictly, the gearing adjustment should be applied to all holding gains, as Gibbs and Godley-Cripps have argued.

As we have already pointed out, in the nationalised industries, which are financed totally by borrowing, the calculation of proprietary profit by adding back the gearing gain a la Hyde, would virtually offset the deductions made for increased depreciation and cost of sales provisions. But, as interest, in this instance, focuses on the firm as an entity, this problem need not concern us.

However, the ungeared real holding gains is of importance. Thus, the difference between the holding gain calculated using a specific index and that calculated using a general index, should be regarded as income, as the consensus of the arguments in this chapter suggests. As such it is available for loans to be raised so that the cash can be distributed to shareholders. But, recall the definition of income employed in this thesis, that is the gains arising during the year which may be distributed whilst maintaining

the purchasing power (i.e. the real income stream) of the amounts on the balance sheet representing assetsat the beginning of the year, and the arguments concerning capital gains outlined in chapter one. These two points suggest strongly that entity income will be understated if capital gains are excluded. With capital gains excluded replacement cost depreciation and the cost of sales adjustment overprovide for the maintenance of the real income stream. Note that if there is general inflation with no changes in relative prices then the real income stream from the assets of the entity has not changed. But the purchasing power of shareholders will increase to the extent that assets are financed by debt; the real cost of debt falls. Thus from a performance measurement view the real holding gain must be used to offset replacement cost depreciation. (See Appendix IV section III for the mechanics of calculating the real holding gain on non-monetary assets).

Thus we may summarise the necessary adjustment to the accounting data to arrive at an entity replacement cost rate of return as:

(i) assets revalued at replacement cost using specific indices;

(ii) turnover and operating costs adjusted in recognition of their accrual throughout the year;

(iii) adjusted depreciation allowances using specific indices;

(iv) an adjustment to the cost of sales;

(v) an estimate of the real gain on holding assets;

(vi) an adjustment to maintain the real value of net monetary (trading) assets.

Partl. Footnotes

1. G.J. Stigler (173), p.62), however, found no evidence that risk premiums were demanded. on Stigler also found little difference in the level of the rate of return/capital between concentrated and unconcentrated industries. However in the former the rate of return tended to be more stable.

2. For a discussion of this problem and a possible solution see G. Maddala, Econometrics McGraw-Hill 1977.

3. Turnover per employee or profits per employee are alternative measures of productivity. The problem is that a labour intensive industry will have lower sales or profits per employee than an industry that is more capital intensive.

4. The use of $\frac{\text{profit}}{\text{sales}}$ as a measure of market or monopoly power is an approximation to the Lerner Index (see Lerner, 90) which in strict theoretical terms says the ratio $\frac{\text{Price} - \text{Marginal Cost}}{\text{Price}}$ measures the diversification from optimal resource allocation.

5. It should be noted that, whereas Meeks did exclude goodwill for purposes of comparing post-merger profitability, it did not alter the principal conclusion that post-merger profitability declined.

6. See G.A. Lee Modern Financial Accounting 2nd Edn Nelson 1975 pp. 131-135 and pp. 420-425 for a discussion of the valuation and treatment of goodwill in the balance sheet.

7. Note that for purposes of illustration depreciation has not been deducted on capital items charged to revenue. It is this adjustment rather than the bank overdraft adjustment which makes the greatest difference.

PART 2

INFLATION ACCOUNTING IN PRACTICE - THE NATIONALISED INDUSTRIES AND SOME COMPARABLE PRIVATE INDUSTRIES

INTRODUCTION

As long ago as 1961 the problem of accounting for inflation, particularly with respect to depreciation provisions, was recognised in the nationalised industries:

> "Most of the Boards recognise in their reports that, ... it would be prudent to make some additional provision out of revenue to meet the difference, which emerges when prices rise, between depreciation at historic cost and at replacement cost".
>
> (G2, p.5 para. 8)

In an often ignored recommendation the White Paper went on to suggest that adjustments should be made to take account of this:

> "Provisions should be made from revenue for:.. (i) such an amount as may be necessary to cover the excess of depreciation calculated on replacement cost basis over depreciation calculated on historic cost ..."
>
> (G2, p.7 para 19(b))

This part examines the extent to which the nationalised industries have made progress towards the implementation of the above, to examine this in the light of the theoretical discussions of Part 1 and to compare the practice of the nationalised industries with some selected comparable private firms and industries.

The nationalised industries differ greatly in character and structure so it seems reasonable to suppose that they have been affected in different ways by inflation. The piecemeal methods of inflation accounting adopted as discussed below, by the nationalised industries will only necessarily distort comparisons more than if no attempt is made if all the nationalised industries have been affected more or less equally by inflation. But, it is not necessarily true that each nationalised industry in making some move towards inflation accounting has moved consistently in the right direction or by the correct amount. Indeed, the very ad.hoc nature of their attempts suggests that they have achieved neither.

Part 2. Ch.1: Inflation Accounting in the Nationalised Industries

The evidence as presented in the annual reports and accounts of the industries studied indicates that a wide range of methods have been employed, thus each industry is considered in detail. For purposes of the study the nationalised industries are taken as British Airways, British Gas, British Rail, British Steel, Electricity, National Bus Co., National Coal Board, National Freight Corporation, and the Post Office.

1. British Airways

Until the formation of British Airways[1], any inflation accounting provisions related to BOAC only. The introduction of inflation accounting in BOAC can be traced to the 1969/70 financial year, (D1) when provisions to a fleet reserve were introduced. The purpose of this reserve was to provide funds to cover the excess of replacement cost over the historic cost of aircraft in service. By the end of the 1977/78 financial year this reserve, which by then included former BEA aircraft, stood at £64.4m (D6, p.55, note 14).

The Corporation, realising that aircraft are seldom replaced by others of similar type and size, calculated the additional cost over historic cost for purposes of allocating provisions to the fleet reserve, on the basis of replacement of equivalent productive capacity (D2, p.9).

In 1974/5 British Airways was awaiting the publication of the Sandilands Report (G4). Internal exercises had been carried out and the conclusion reached was that net worth would be seen to increase with some form of inflation accounting (D3, p.6). As it could fail to be increased by inflation accounting only in the case of losses from holding net money assets, the conclusion seems trite. In the same Report, whilst declining at that stage to publish the full

results of the exercise, it was estimated that the aggregate value of land and buildings exceeded net book value of £88.6m by £20m. However, the qualification was added that in view of the specialised nature of their long leasehold land and property, it was impractical to arrive at an open market valuation.

By the end of the 1975/6 financial year, the Corporation had taken account of the Sandilands recommendations and had published estimated comparable Current Cost Accounting (CCA) accounts, but was still insisting that changes would not be made from the historic cost presentation until a statement of standard accounting practice was published. The main differences to emerge in the figures presented were an increase in the value of net assets from £480m at historic cost to £620m on a CCA basis; and a deficit before interest and tax of £30m on CCA basis, compared with an historic cost profit of £10m.

A more detailed comparison of balance sheet information on historic and current cost bases was first presented in the 1976/7 accounts. The exercise was repeated for the 1977/8 financial year. The data for both years are reproduced over (Table 1).

The 1976/7 accounts emphasised that under CCA shareholders funds increased by 27.2 per cent (D5)[2], compared with an increase in the Retail Price Index of 17 per cent between the end of 1975/6 and the end of 1976/7. From this some indication is obtained on how the "shareholders" investment has fared in real as opposed to physical terms. Although Sandilands did not attach much weight to this recent discussion of the CCA proposals has recently drawn attention to the need for this information (See Ch.2). But care must be taken in this area as "adjustments" in the 1977/8 accounts (see above) mean that between 1975/6 and 1976/7 shareholders funds fell by 14 per cent. This raises a general problem in that

TABLE 1: BRITISH AIRWAYS BALANCE SHEET

1976/7 and 1977/8

	HISTORIC COST		CCA	
	1976/7	1977/8	1976/7	1977/8
ASSETS	£m	£m	£m	£m
Fixed Assets	695	819	960	995
Investments	13	14	20	23
Net Current Assets	(5)	(4)	(5)	(4)
	703	829	975	1014
FINANCED BY				
Public Dividend Capital	290	300	290	300
Reserves (Inc. Revaluation)	85	136	219	229
Shareholder's Funds	375	436	509	529
Capital Borrowing	237	297	237	297
Minority Interest	1	1	1	1
Deferred Tax	90	95	228	187
	703	829	975	1014

Source: B.A. Annual Report and Accounts 1977/78 p.13

year on year it may not be clear which changes are due to inflationary adjustments and which are the result of changes of definitions made by the Corporation accountants. Of course, this problem existed before the question of adjusting for inflation arose as a random perusal of nationalised industry accounts readily shows (e.g. compare the closing and opening figures for Land Buildings in D8 and D9, Schedule 3, respectively).

Part 1

The guidelines of the Hyde Committee (see/Ch.2 Appendix I) with respect to adjustments to the profit and loss account have also been incorporated as

a supplementary statement. The comparisons of this with historic cost data are shown below:

TABLE 2: COMPARISON OF PROFIT AND LOSS ACCOUNT OF B.A., 1977/8

	HISTORIC COST £m	CURRENT COST (HYDE) £m
Profit before interest	65	65
Less additional depreciation	-	47
	65	18
Deduct interest	23	23
	42	(5)
Currency losses	2	-
	40	(5)
Gearing adjustment	-	14
Pre-tax profit	40	9

Source: B.A. Annual Report and Accounts 1977/8 pp.12,13

It is worth noting that additional depreciation of £47m is almost sixty per cent of historic cost depreciation. The gearing adjustment of £14m reflects the particular capital structure of B.A. which unlike most of the nationalised industries has a significant element of equity (public dividend capital). In other nationalised industries where this is absent the gearing adjustment would almost completely offset the additional depreciation charge, which

partly explains why it has not been included in the data that B.A. provide; although no reason is given presumably this is because in relative terms the amount would be insignificant.

Following on from the building up of a Fleet Reserve, B.A. has said (D4, p.6,11) that it is setting itself a minimum financial objective of generating sufficient cash flow to meet the replacement cost of aircraft and equipment and other obligations[3]. This would have been achieved had it not been for losses incurred because of Concorde.

One crude way of accounting for inflation is to shorten the depreciation life of an asset, thus increasing the charge against current profit. However, B.A. has increased the depreciation lives of some of their aircraft. For example in 1975/6, the depreciation life of the S1-11 was increased to 12-14 years compared with the 10-14 years of other aircraft[4] (D3, p.30); and in 1976/7 the Boeing 707-336 fleet amortisation life was increased to 14 years (D4, p.34,40). This latter change reduced the amortisation charge for the year by £2.2m. The normal justification for this might be that technical progress was expected to reduce the cost of replacement, or that after an initial introductory period the assets were thought likely to be useful for a longer period than was originally thought. In the context of British Airways it seems that this is not the case, both aircraft having been in service for some time, but that the reduced amortisation charge is a device to make stated profits appear greater.

2. British Gas

Until the 1975/6 financial year BGC followed conventional historic cost accounting principles. Indeed it showed little concern for the effects of inflation, except to note that the 7 per cent pre interest rate of return

on assets target laid down by the government was inadequate to meet the cost of replacing assets owing to the rise in interest rates (and therefore, implicitly, because of inflation)(D10, p.13).

However in 1975/6 the Corporation began to charge the cost of replacing certain categories of existing fixed assets to revenue and only that expenditure which represented an extension, increase in capacity or improvement to fixed assets was to be charged to capital account (D10, p.42). This resulted in £48.1m being charged to revenue in 1975/6 which would previously have been capitalised. The reasons advanced for this action were, firstly, inflationary costs, secondly, changing technology, and thirdly, the need to build up reserves to £500m by the end of the decade[6], to maintain the industry's relative position.

The charging of capital items to revenue may seem a highly objectionable practice because the assets in question last more than one year. According to one commentator: "British Gas has developed rare and unrealistic accounting techniques" (39). However, B.G.C.'s action may be seen as a crude way of accounting for inflation, in the absence of a consensus of opinion on a more formal method of inflation accounting. However, because the cost of the particular asset is written off in the year of acquisition, care is needed in interpreting the resultant rate of return on net assets. Since the deflation in the rate of return on net assets resulting from an increase in capital stock with profits held constant is biased by the action taken.

The numerator in the formula $r = {}^{\pi}/_{k}$ [7] is reduced as explained above, but in the denominator the capital charge does not appear as an addition to the value of the capital stock. Technically this is not incorrect, since all expenditure is accounted for. The problem is the lack of

uniformity it creates with the other nationalised industries, thus making direct comparisons difficult. Moreover, adjusting the numerator only takes account of maintaining, at current prices, an old value of the asset stock, rather than the current value.

However, B.G.C. have subsequently gone further than this. In the 1976/7 accounts they adopted the recommendations of the Accounting Standards Committee (ED18) (D11, p.15) relating to proper financial provision in the annual accounts for the replacement of physical assets at current cost in order to maintain the corporation's business in its existing state. To this end a supplementary charge to revenue, in addition to normal historic cost depreciation and replacement costs charged to revenue has been made. For 1976/7 this resulted in a supplementary depreciation charge against revenue of £102.6m, compared with a historic cost depreciation charge for the same period of £176.4m (D11, p.36). The comparable historic cost and CCA positions for both 1976/7 and 1977/8 are shown below:

TABLE 3: COMPARISON OF HISTORIC COST AND CURRENT COST PROFIT AND LOSS ACCOUNTS OF B.G.C. 1976/7 and 1977/8

	HISTORIC COST		CURRENT COST	
	1976/7	1977/8	1976/7	1977/8
	£m	£m	£m	£m
Turnover	1976.2	2568.1	1976.2	2568.1
Less Operating Costs	1194.5	1585.1	1194.5	1585.1
	763.0	983.0	763.0	983.0
Less Replacement Expenditure			55.6	89.0
Historic depreciation	176.4	196.0	176.4	196.0
Supplementary depreciation			102.6	145.4
Displaced and deferred charges	228.9	238.9	228.9	238.9
Pre-interest profit	376.4	548.1	218.2	313.7

Source: B.G.C. Annual Report and Accounts 1976/7 1977/8, profit and loss account, Schedule 1 and Note 3.

It is to be noted that the historic cost profits shown are before deduction of replacement expenditure. It would be interesting to compare the rate of return on capital using the two methods, but B.G.C. do not provide data on the replacement cost valuation of assets.

Backlog depreciation has not been included in the supplementary charge (D12, p.43 note 16 (iii)). However, as discussed at length in Pt.1.Ch.2, this is only necessary if the intention of providing depreciation is to provide funds for replacing the asset. As emphasised there, this is a fundamental departure from the notion that depreciation provisions reflect the value to the business of the asset that has been used up.

According to the information in the annual reports, the supplementary charge has been based upon an internal revaluation of assets or upon the application of "appropriate indices", although the basis for the latter is not revealed in the accounts. Despite this, it is not too difficult to show the problems faced by industries in implementing fully and accurately methods of accounting for inflation.

Consider the case of B.G.C. Pre-vesting day[8], a very high percentage of authorised gas undertakings was municipally owned, according to one study, (23) 43 per cent of the 718 statutory undertakings in 1935. On many of these sites, there would be electricity and water undertakings. It was considered too complex a task to delineate precisely which part of a site belonged to which concern, and the problem was solved by estimating a lump sum to represent each concern's assets for each region. With the formation of BGC in 1973, those pre-vesting assets not already depreciated were written off completely. As some of these assets still have a substantial value, any calculations of supplementary depreciation will be imprecise to the extent of the problems arising from separation.

The supplementary charge is credited to an "Asset Maintenance Account" with no change shown in the balance sheet asset values. This has been criticised as a "cover-up operation" (34), necessary to prevent pressure to remove excess profits[9]. However, in order to engage the triggering mechanism, (that is for reserves to be in excess of 10 per cent of net assets) the corporation's reserves would have to rise from £116m in 1976/7 to about £195m. In fact in 1977/8 accumulated reserves amount to £313.0m compared with average net assets of £2,210m, that is reserves are now 14.2 per cent of net assets. But the condition for ministerial intervention is not unambiguous. It would appear that the provisions of Section 16 of the 1972 Gas Act relate only to that excess revenue deriving from the searching for and boring for gas. The normal trading activities of B.G.C. are excluded from Section 16.

The action of B.G.C. is not however incorrect. As has been pointed out (61) (pp. 29-30) it is perfectly reasonable to either inflate the historic value of the fixed assets by the chosen price index, or, as B.G.C. have done, subtract from the historic value of the fixed assets in the Balance Sheet only part of the replacement depreciation provision, and carry the remainder to a special reserve. Only if the first course is adopted is it necessary to credit the increase in the value of the assets to a capital reserve. In either case, the problem is avoided of subtracting replacement cost depreciation from historic cost asset values which would otherwise inflate the return on capital employed ratio. However, the first course may be preferred since it places a more realistic value on the asset in the Balance Sheet. The actions of B.G.C., as will be seen, are in contrast to those of British Airways, British Steel, National Bus and the Post Office, all of whom have attempted to calculated replacement cost depreciation and have published the revalued asset figures. However, it should be noted that in all cases except the Post Office, the revalued

asset figures are published for comparison only.

A further distorting effect is created by the reduced period over which displaced plant and deferred charges are being written off (D11 p.43). These charges relate mainly to the unamortised residue of costs of coal-based plant made obsolete as a result of the development of Natural Gas from the North Sea, to the unamortised balance of oil-based plant taken out of commission because of natural gas, and to the cost of converting appliances to North Sea gas. Initially, amounts were being written off in five equal annual instalments which would have been completed by the end of the 1978/9 financial year. However, the writing off has been brought forward one year and the displaced plant and deferred charges have been increased from £135.7m (in 1975/6) to £228.9m (in 1976/7) (D11, p.36), with a final amount of £238.9m in 1977/8 (D12, p.38). This is explained in the accounts as being in line with the Corporation's practice of continually reviewing accounting policies, (D11, p.15) but it must also be seen as another crude method of accounting for inflation, as shortening the period of writing off displaced plant means a greater cost in real terms in the period to the end of the financial year 1977/8 than if the period was extended to 1979/80.

As regards one of the other main adjustment for inflation deemed necessary in the Hyde Guidelines, that of adjustments to the cost of sales and stocks, B.G.C. have decided that these would be immaterially affected by adjustments for inflation (D11, p.15). At first this seems a reasonable attitude, as the quantity of gas in store is a fraction of that in store when all gas supplied was town gas. But despite the fact that in relation to the supplementary charge for depreciation, a charge for stock appreciation would be very small, in relative terms, it would still be significant in

absolute terms as becomes clear when it is realised that stocks and work-in-progress amounted to £113.6m at the end of 1977/8 (D12, p.48). Furthermore, it could be argued that had B.G.C. included this in their accounts it would make the seriousness of their intentions with respect to inflation accounting more convincing.

The gearing adjustment recommended by Hyde is considered to be inappropriate because "the supplementary depreciation charge is required in full to maintain the assets at current cost and this need is not affected by the form of financing or capital structure". (D12, p.14). This is a reasonable attitude given the capital structure of the industry (unlike that of British Airways). But it does mean, as pointed out in Part 1/Ch.2, that income for performance measurement must be measured before the disbursement of interest. If the Corporation, wishes to take a proprietary rather than an entity view, which taking pre-interest income implies, then the gearing adjustment would need to be included. In declaring income as post-interest but pre-tax (D12,p.14) but at the same time saying a gearing adjustment is not needed the Corporation is not taking a consistent entity or proprietory view.

The misgivings alluded to above give rise to concern about any enhanced ability to appraise the performance of B.G.C. since it is impossible to verify their actions and impossible to interpret correctly their results.

3. British Rail

The initial response by British Rail to the introduction of inflation adjusted accounts was to show concern with the trade-off between the benefits to be derived from such a system and the increased administration costs involved (D13). Even so at the time, 1976, it did estimate that by using inflation accounting, the charge for depreciation would increase by about £115m[12].

Despite the above misgivings the 1975 Accounts indicate a rough-and-ready attempt at inflation accounting. Additions to, and replacements of, fixed assets are normally charged to capital account. However, from 1975 onwards expenditure on replacements and alterations to certain kinds of way and structural assets, certain track works (that is other than that concerned with major additions), and signal and telecommunications equipment have been charged to revenue account as incurred. As seen above a similar approach has been used by British Gas, and as shown there such action leads to a distortion in the reported rate of return on capital. That is, by adjusting only the numerator and not the denominator in the rate of return expression the rate of return on capital will be understated.

As another crude method of accounting for inflation in 1975, the depreciation lives of certain assets were shortened.

By 1977 the British Railways Board had welcomed "the flexible approach to accounting" (D14, p.13) of the Hyde Guidelines and was considering the implications of implementing them. In fact the approximate effects were published in a supplementary note (D14, p.13). Whereas the published information takes the post-interest, post-tax and extraordinary items as its starting point, the following presents the effects of the adjustments using pre-interest results. (Table 4).

Clearly the adjustments for inflation produce a worse financial outturn than the straightforward use of historic cost figures.

However, what is interesting here is that a gearing adjustment has been introduced. Whilst it seems reasonable for British Airways and British Steel to introduce a gearing adjustment, because of the element of public dividend capital in their liabilities, for British Rail this is a little curious as public dividend capital is absent. If it was used then a priori it would

be expected to approximately offset the supplementary depreciation and stock adjustment (if it is introduced along the lines suggested by the Hyde Committee). However, because of relatively large reserves the gearing gain on capital liabilities is reduced.

It does seem surprising that British Rail should only have provided data on current costs in the 1977 accounts. Perhaps it was discouraged from doing so earlier, and is still reluctant to enter current costs in the profit and loss account proper, by the realisation that any sort of replacement cost accounting would make it show an even worse profitability record than the one it already has. For, despite the disposal of many old assets as a result of the Beeching closures, the industry must still possess a very high proportion of track and structural assets which have been written off long ago, but which would require a great deal of resources to replace.

4. British Steel Corporation

Since being renationalised in 1968, British Steel has undergone extensive reorganisation. However, it has not been slow to pursue the effects of inflation on its accounts.

The Corporation's initial efforts in this direction were the publication of comparable profit and loss accounts and balance sheets on Historic Cost and Current Purchasing Power (CPP) bases, along the lines of the proposals in provisional SSAP7 (D15, pp. 44-45). These data (first published in 1976) were to be regarded solely as supplementary information.

The main points to emerge were:

1. The estimated gain in purchasing power owing to the effects of inflation on net long term monetary liabilities was £166.6m.

TABLE 4: CURRENT COST STATEMENT FOR BRITISH RAIL, 1977

	£m	£m
Total operating surplus after historic cost depreciation		62.8
Plus other income		9.7
		72.5
Less Corporate expenses		4.1
Profit before interest		68.4
Less supplementary depreciation	125	
amortisation	50	
stock usage	20	205.0
Adjusted loss before interest		(136.6)
Less interest		43.0
		(179.6)
Plus gearing adjustment		50.0
Loss (pre-tax) after adjustments		(129.6)

Source: B.R. Annual Report and Accounts 1977 pp.13, 39

Note: Total operating surplus includes passenger support grant of £363.7m and compensation for maintaining level crossings of £10.5m (D14, p.39 note 1).

2. Additional CPP depreciation of fixed assets was £104.5m.

3. An additional CPP stock charge amounted to £171.4m.

4. CPP valuation of Fixed Assets[13] amounted to £2642.6m compared with £1707.9m on a historic cost basis.

For the 1976/7 financial year B.S.C. discontinued the provision of CPP data following the publication of ED18. Instead, preliminary estimates of the CCA depreciation charge and the increased book value of assets were shown (D17, p.9). In general these estimates were seen to be slightly above the CPP charges.

Despite the reluctance of B.S.C. to go further than this in 1976/7, by the end of 1977/8 a current cost statement was produced: (table 5).

As expected, the inflationary adjustments result in B.S.C. reporting considerably worse profits than under the historic cost system. Like British Airways a gearing adjustment is included in the current cost statement. This is reasonable as about half of the capital employed by B.S.C. is Public Dividend Capital.

B.S.C. have also increased the depreciation lives of certain of their fixed assets (D18, p.42 note X) because assets fully depreciated were still in use. Accordingly this has led to an increase in the net book value of assets brought forward with a corresponding increase in depreciation charges. Thus both income and the rate of return on capital are depressed.

TABLE 5: PROFIT AND LOSS ACCOUNT OF B.S.C. FOR 1977/8 - INCORPORATING CURRENT COST STATEMENT

	£m	£m
Trading loss before interest, but after deducting historic cost depreciation and adding interest receivable, etc.		(244.3)
Less depreciation adjustment	171.7	
cost of sales	52.8	224.5
Loss pre-interest		(468.8)
Less interest		197.4
Loss after interest		(666.2)
Add gearing adjustment		77.7
Loss before taxation		(588.5)
Less taxation and minority interests		1.7
Post tax loss		(590.2)

Source: B.S.C. Annual Report and Accounts 1977/78 pp.38, 57

5. Electricity Council

The Electricity Council was one of the earliest of the nationalised industries explicitly to recognise the problem of inflation accounting. In 1972/3 the Council stated that it was "closely considering various aspects of this problem" (D18, p.20) and that these included the implications of presenting accounts on a CPP basis. However, it was felt that a more detailed study was necessary before the Council would be prepared to change its policy.

In 1973/4 the E.C, stated that it was not prepared to do anything until a consensus of opinion was arrived at, but, by the time of the publication of the 1974/5 results, internal exercises had been undertaken

and the not too surprising conclusion reached that replacement cost depreciation would be greater than historic cost depreciation. It was thought premature to present a set of accounts relating to current price levels, "as some other organisations have done", (D.19, p.32) since the problem of inflation arose not merely in relation to depreciation but also because the nationalised industries were specifically affected in view of their particular capital structure and overall financial framework. In its 1975/6 report, the Council was still awaiting a consensus of opinion (D21, p.22). It was also concerned at the effect that replacement cost accounting would have on performance figures. But this is a curious attitude. It is quite well recognised in the inflation accounting debate that performance figures will appear to be deflated. However, and in fact, in a period of inflation, historic cost profits are overstated and historic cost asset values are understated. Replacement cost accounting attempts to present the real picture.

Whilst the Electricity Council welcomed the proposals of the Hyde Committee (D23, p.3) it has not as yet produced a supplementary statement of current costs.

However, the Council has made use of a rought and ready method of accounting for inflation as allowed in the 1976 Price Code (G5). This allows all firms to add 40 per cent to depreciation charges. The Council, clearly does not see this innovation as a system of accounting for inflation as it believes that a review of its overall financial framework is an essential prerequisite to the introduction of accounting for inflation (D23, p.3)

Although this supplementary depreciation is permitted under the 1976 Price Code, evidence has been presented that the higher depreciation provisions have been passed on in the form of higher consumer prices in at least one regional Electricity Board (G7). In investigating this problem the Price

Commission has suggested that, since the Board bases pricing policy on total costs, the extra depreciation should be offset by a gearing adjustment to prevent consumers paying excessive charges (G7, paras 11-15). Without a gearing adjustment the total costs include both the interest on the capital borrowed to finance the purchase of existing assets and replacement cost depreciation in full.

But we have argued for an entity view of the firm. If this is accepted, then prices are not expected to cover total costs. Principally, as Kennedy (77, p.63 fn.10) point out, on an entity view prices are not expected to cover interest costs. On the same grounds no gearing adjustment is required. Thus from the entity viewpoint prices should not take account of interest costs but they should take account of replacement depreciation.

However, it appears that, as pricing in the Board concerned (the South of Scotland Electricity Board) is based on total costs, a proprietary view is being taken. If this be true then the Price Commission are correct in their view - recognition must be made of the fall in the real value of monetary liabilities. If the adjustment is not made then, when nominal interest rates rise with accelerating inflation, nationalised industry prices have to rise disproportionately to other prices. The link between depreciation and gearing gains, as Godley-Cripps point out (47) and which Kennedy (op.cit p.60) endorses, arises from the fact that the real gain on an asset financed by borrowing will always equal the monetary holding gain on the asset, since equal but opposite adjustments are made to the sum borrowed and to the historic cost of the asset financed by the loan. Note that this assumes the uses of the general index. If specific indices are used, there may be some extra real holding gain on the asset.

Strictly, the gearing adjustment should be applied to all holding gains.

(Pt.3. Ch.2 uses this assumption). However, on the grounds of prudence, that no unrealised revaluation surpluses should enter the profit and loss account, the Hyde Guidelines apply the gearing adjustment only to those holding gains represented by the adjustments to depreciation and sales (Kennedy, op.cit p.61).

It is surprising that the Electricity Council had not adopted at least some form of inflation accounting prior to this year, as some other comparable industries had done; the charging of replacement cost of some capital to revenue account is an obvious example. This appraoch has been used by B.G.C. and British Rail, both of which like the Electricity Council have large distribution networks. The significant size of these networks would suggest that, if the methods used to account for the increase in replacement cost differ between industries, comparisons could be distorted.

6. National Bus Company

Although set up in 1969, to amalgamate the multiplicity of road passenger transport services, it was not until 1974 that National Bus made any attempts at inflation accounting. In this year all properties of NBC operating subsidiaries were revalued at current use value "in accordance with joint recommendations of the Institute of Chartered Surveyors" (D24, p.21, para.37).

As a result of this revaluation NBV of these assets rose from £32.2m at 31.12.73 to £87.3m at 31.12.74 (D24, p.33, note 12). Further, the accumulated depreciation of properties which were revalued was written back and taken to a surplus arising on revaluation reserve, so that a total of £56.8m was credited to such reserves in 1974.

Following this, and as a result of the Sandilands recommendations, the 1976 Accounts included a note that an additional £24m would be required for replacement depreciation on a current cost basis (D25, p.22). Supplementary

statements showing the effects of inflation are not due to be included until the 1978 accounts (D26, p.26 para.61).

Although NBC has made some progress in the right direction it would be expected from an economist's viewpoint that comprehensive replacement cost data should be provided. For if, by using inflation accounting, we are seeking a better measure of efficiency, and hence, by implication, opportunity cost, then as NBC is one of the few nationalised industries having an alternative in the private sector an approximation to an opportunity cost rate of return, which a replacement cost rate of return would give, is required. In the case of NBC it should also be clear that net realisable value (NRV) of assets approximates more closely to replacement cost than in some other nationalised industries. The discussion in part I, however makes it clear that for a going concern replacement cost is the most useful measure of capital.

7. National Coal Board

The NCB has been very reluctant to pursue any attempts at inflation accounting. It has stated that a revaluation would probably show the market value of land and buildings to be in excess of book value (D27, p.34). But it considers that this valuation would have no significance in the context of normal trading operations. Furthermore it is also concerned (D.27, p.18) about the complexity of revaluing assets on a CCA basis, especially with respect to shafts and underground railways of a Victorian vintage.

However, whilst it is true that Victorian assets will not be replaced by exactly the same assets it is surely clear that provision over and above that provided by historic cost depreciation provisions is required especially as assets of this age will have been written out long ago. The precise method of providing for replacement is, however, not obvious. It was

mentioned above[14] that British Airways calculated the additional cost above historic cost required by referring to the replacement cost of equivalent productive capacity. This may not be helpful here because the capacity of a Victorian pit is likely to be well below the capacity which would be regarded as suitable for the efficient use of modern coal extracting machinery. However, if the capacity equivalent of all very old pits together could be calculated and provision made on this basis then it would seem that this would yield a useful approximation.

More recently the NCB have recognised the importance of making adjustments for inflation, in the light of the publication of Cmnd 7131 (G5). But as the Hyde Committee proposals are only an interim guide the Board have further postponed the publication of current cost statements (D28, p.35).

8. National Freight Corporation

As seen in section 6 the most comparable nationalised industry to NFC (NBC) has gone some way towards accounting for inflation. However, NFC has not specifically mentioned the problem of replacement cost accounting in its reports.

Nevertheless, two very minor innovations have been made. Firstly, depreciation on freehold buildings was discontinued in 1972 in order to reflect the increase in value (D29, p.54). Secondly, in that year the depreciation lives of certain vehicles were shortened. The net effect of this was an improvement in the financial results for 1971 of £0.3m. At the same time however the Corporation refused to revalue fixed assets because of their specialised nature.

The evidence from the accounts suggests that NFC is too preoccupied with reconstruction and reorganisation to concern itself with inflation accounting.

But it does explicitly show concern for the need to provide for the replacement of assets, estimating that replacement cost depreciation would be £29.4m compared with historic cost depreciation of £11.9m (D31, p.9). Present pre-interest profit of £2.8m is clearly insufficient to cover a supplementary depreciation provision of this magnitude.

The argument applied above to the NBC is relevant here. For in opportunity cost terms there is an alternative market for the assets of NFC. Thus there is a strong case for the introduction of comprehensive inflation-adjusted accounts which would include data showing a better estimate of the opportunity cost of the assets of NFC than the present historic cost accounts.

9. Post Office

Although the 1975/6 Accounts state that the Post Office were examining the implications of Sandilands recommendations, inflation accounting had already been introduced, even before it ceased to be a government department in 1969.

The introduction of accounting for inflation took the form of a special provision for depreciation and was introduced in the 1946/7 year[15].

The reason for the introduction of this special provision for depreciation was explained thus:

> " In consequence of the general rise in prices since 1939, the cost of renewing plant has considerably exceeded the accumulated provision for depreciation of the plant renewed. From 1 April 1939 to 31 March 1947 telephone plant renewals cost some £28m compared with depreciation provision of about £21.5m. The Post Office estimate the excess on renewals in 1947/48 at £3m and expect larger excesses in future years. They consider that it would cost about £500m if all the telephone plant *in situ* at 31 March 1947 had to be renewed at current prices: the original cost of this plant (adjusted to 1935 prices for older items bought at higher prices) was about £300m".
>
> (D32, pp.40-41, para.10).

This method of providing additional depreciation with a consequent reduction by the same amount of the revenue surplus had the backing of the Treasury (D32, pp. 40-41 para 10), and is carried out up to the present day.

The supplementary depreciation charge is calculated on plant, furniture, vehicles, garage plant and office machinery so as to bring the total provision for the year into line with the current value of the assets. Buildings remain to be depreciated on an historic cost basis.

The supplementary charge is arrived at by applying current price indices to the historic cost of the above mentioned asset groups and by then computing depreciation at "appropriate" rates on the added values. It must be noted that no supplementary charge is made on those assets where it is considered that technical advances mean that replacement cost is less than or equal to historic cost (this applies to main circuits) or to assets on which substantial sale proceeds can be expected on their disposal, as for example, buildings.

According to the accounts these provisions have not been adjusted for subsequent changes in price levels but, as has been shown (61), this may not be necessary. There may be no need, in subsequent years to add to the provisions made now, despite increases in the future cost of replacement. The reasoning behind this is that as long as the accumulated depreciation provisions are embodied in assets such that their value is likely to move more or less in line with the asset whose replacement is being provided for, they provide a perfectly good "hedge" against unforeseen movements in the price level. In addition, balance sheet matching requires that current revenue should be matched with the appropriate current cost in order to yield the correct measure of current income. In this case the theoretically appropriate value of the pound in which to express depreciation expense is the value of the pound in which the current period's revenue is expressed.

Thus any price change in the fixed asset concerned which takes place after current depreciation has been calculated is not a relevant consideration.

The following table demonstrates the magnitude of the supplementary charge for depreciation in relation to historic cost depreciation.

TABLE 6: POST OFFICE DEPRECIATION PROVISIONS AND PROFITABILITY (1977/78)

	£m	%
Historic Cost depreciation	390.5	
Supplementary depreciation	350.6	
Pre-interest, post all depreciation profit	697.1	
Less interest (net)	329.4	
Profit post-interest	367.7	
Average Net Assets	653.1	
Pre-interest return on capital		10.7
Pre-interest return on capital net of Historic depreciation		16.0

Source: Post Office Annual Report and Accounts 1977/78 p.43.

The supplementary depreciation charge against profit significantly reduces the pre-interest rate of return on capital from 16 per cent to 10.7 per cent. But if replacement cost accounting was introduced, the rate of return is unlikely to be depressed further to any significant degree.

Not surprisingly, then, the Post Office appears to consider the

supplementary depreciation provision to be an adequate adjustment for inflation. It states explicitly (D34, p.7) that a cost of sales adjustment would be immaterial. Relatively speaking, stocks at £23.2m in 1977/8 are insignificant (0.4 per cent of average net assets). But in absolute terms this is quite a significant amount. The other proposal made by the Hyde Committee, a gearing adjustment, is considered inappropriate because all external finance is from the government. This is a reasonable attitude, as has been argued in the similar case of British Gas. On the above grounds the Post Office declines to publish a supplementary statement showing the effects of inflation.

Part 2, Ch. 2: INFLATION ACCOUNTING IN THE PRIVATE SECTOR

In deciding upon which private industries to examine, the prime objective was to obtain information for those industries operating under market conditions similar to those of the nationalised industries.

The main characteristics of the nationalised industries, for this purpose, were taken to be:

(1) all, apart from BSC, are non-manufacturing;

(2) although some of the products/services of the nationalised industries may be regarded as substitutes e.g. gas for electricity and coal, and road freight and road passenger transport[17] for British Rail, the industries operate under a limited degree of competition, and in most cases have an almost complete monopoly for their product.

(3) some are involved in primary extracting industries e.g. coal, and gas.

The main industries/firms seeming to fit some, if not all, of these categories, and which although not an exhaustive sample, are likely to be representative, were taken to be:

(1) Cement industry

(2) I.C.I.

(3) Shell

(4) B.P.

These will be considered in turn.

Finally, the results of two cross-section studies are discussed.

(1) Cement Industry

Practically the whole of the cement produced in the UK is concentrated in five firms, viz. Aberthaw and Bristol Channel Portland Cement Co. Ltd., Associated Portland Cement Manufacturers Ltd., Rugby Portland Cement Co. Ltd., Tunnel Holdings Ltd., and Ketton Portland Cement Co. Ltd.

The pricing agreement of the cement cartel was one of those upheld by the Restrictive Trade Practices Court, which was set up under the provisions of the 1956 Restrictive Trade Practices Act. It is beyond the scope of this chapter to consider in detail the cement manufacturers' agreement and, in any case this has been documented elsewhere, (176, p.182) suffice to say here that the upholding of the agreement perpetuated a situation of market power such that no significant rivalry has emerged and a pricing system where prices diverged so greatly from costs has to lead to significant resource misallocation. (see 177 for a detailed discussion).

It is interesting, then, to consider whether in view of the prevailing market conditions of lack of competition, the cement industry has used inflation accounting to any significant extent more than might be expected and which might be construed as trying to conceal monopoly profits.

The information for this section was obtained from the annual report and accounts of the companies and from the relevant data provided by "Moodies Services".[19]

We may consider the behaviour of each firm in turn:

(i) Aberthaw and Bristol Channel Portland Cement Co. Ltd

The 1976 Annual Report and Accounts of "Aberthaw and Bristol" present a fully detailed set of CCA accounts, based on the recommendations made in Exposure Draft (ED) 18.

The main proposals outlined in ED18 provided for adjustments to the accounts to be made in the following areas.

(1) additional depreciation to reflect the increased replacement cost of assets, as a consequence of inflation.

(2) an adjustment to the cost of sales to take into account the increased cost of stocks because of inflation.

(3) an adjustment to reflect the gain on holding monetary liabilities, and

a loss from holding monetary assets. This latter proposal has been the most controversial issue concerning the ED18 proposals, nevertheless Aberthaw and Britsol include a calculation of the gain on net monetary liabilities, which amounts to £0.7m. The gain is attributed to the fact that much of the expansion of the firm up until 1976 had been financed largely by borrowings.

The fixed assets of the company were recalculated on a replacement cost basis by using the following indices:

(i) plant, machinery, spares and deferred grants - "capital expenditure in other manufacturing industries index". This index includes building materials, timber furniture and pottery and glass.

(ii) builders merchant stocks - used the wholesale distribution,builders merchant index.

(iii) offices, land being quarried and the calculation of the effect on shareholders interest - used the Retail Price Index.

Whilst agreeing with the indices used in (i) and (ii), it is argued here that the Retail Price Index is not an accurate enough estimate of the inflation in office and land prices, being too general. This is especially true if we wish to assess replacement cost in earlier years notably in the 1972-1974 property boom years when the relative price of land increased dramatically. It is suggested here that a more appropriate index to use would be the "Building Society Loans on new dwellings - mortgages approved"[20] index. The adjustment to the valuation of fixed assets resulted in a CCA net book valuation of fixed assets in 1976 at £20.8m (D35, p.21) compared with a Historic Cost valuation in the same year of £10.0m (D39, p.11) and an additional depreciation charge of £0.6m (D35, p.20). This calculation may be regarded as something of an underestimate, because as a note to the accounts states; no values have been attributed to those assets which have

been fully depreciated in the historical cost accounts". (D35, p.22).

The cost of sales adjustments, amounting to £0.4m, has been calculated by reference to internal information. The monetary items adjustment was calculated on the average inflationary rates applicable to the cost of sales and fixed assets adjustments.

The CCA operating profit was then arrived at after charging depreciation and the cost of sales on the basis of the current values to the business of the physical assets consumed during the year. The CCA figures show a pre-tax profit of £1.4m in 1976, compared with a historic cost profit of £1.7m. Total gains for the year (including available profit) amounted to £4.3m, and total equity capital and reserves were £19.7m compared to £5.2m in historic costterms (D35, p.5). As a result of the revaluation of fixed assets, stocks and investments £3.7m was carried to a Revaluation Reserve. From the data available pre-tax historic and replacement cost rates of return on net capital employed may be obtained. Excluding goodwill, Aberthaw earned a 13.8 per cent pre-tax return on capital. If gains on monetary liabilities are included the replacement cost rate of return is 5.9 per cent. (2.9 per cent excluded gains on monetary liabilities). A striking change and one which highlights both the effects of undervaluing fixed assets and the reduction in the real value of monetary liabilities.

(ii) Associated Portland Cement Manufacturers Ltd. (Blue Circle Cement)

A.P.C.M. must have been one of the earliest companies to make adjustments for inflation in its accounts, having introduced the following measures over 20 years ago. The charge for depreciation of fixed assets is charged from the dates of original use, or subsequent revaluation, plus an additional charge representing the increase in depreciation for the year required to take account of the increase in the replacement costs of fixed assets from the date of the last valuation, or acquisition, to the mid-point of the year.

Surpluses or deficits arising at the time of revaluation are transferred to a fixed asset replacement reserve. According to the 1976 accounts (D37, p.20) assets were last revalued at 1st January, 1974.

The additional depreciation is charged to the profit and loss account, this, like the surplus on revaluation, being transferred to the Fixed Asset replacement reserve. In 1977, this additional depreciation charge amounted to some £10m. The basic principle is similar to that used by British Gas Corporation in its supplementary depreciation charge. However, the main difference is that APCM records the increase in fixed assets, BGC does not.

A supplementary current cost statement, produced in accordance with the Hyde Guidelines, is also presented (D38, p.6). Since depreciation is charged on a current cost basis in the historic cost accounts, the extra information in the supplementary statement is limited to a cost of sales adjustment (£5.9m) and a gearing adjustment (£2.1m). The current cost element of depreciation is shown as £18.3m, made up of £11.3m additional depreciation and £7m. extra depreciation resulting from asset valuations. The cost of sales adjustment is calculated on stocks of goods, raw materials and fuel, but not engineering stores.

(iii) Ketton Portland Cement Co. Ltd.

In 1973 this company became a wholly owned subsidiary of T.W. Ward Group. The annual reports of Ketton Portland up to this date do not refer to any attempts at inflation accounting.

(iv) Rugby Portland Cement Co. Ltd.

Any methods of accounting for inflation within Rugby Portland Cement will have to wait until a general consensus is arrived at. As the Chairman has noted (D40, p.18):-

> "It is apparent that inflation accounting will be the subject of considerable debate before a new system is completely finalised. While, therefore, I have no doubt

> that adjusting accounts for inflation is desirable, I can see no point in producing accounts in an entirely new form until the final pattern which we shall have to follow is established."

But following the publication of the Hyde Guidelines, it was estimated that for 1977 pre-tax profit (£13.8m) would be reduced by about 40 per cent if allowance was made for the effects of inflation.

The revaluation of certain assets of the company in 1973, which produced a revaluation surplus of £2.6m (D40, p.14), has led to the introduction of a form of inflation accounting in the shape of increased depreciation charges in subsequent years.

(v) Tunnel Holdings Ltd.

The Directors of Tunnel Holdings are of a similar opinion to that of their counterparts in Rugby Portland. It was stated in the 1976 Accounts (D42, p.7) and reiterated in the 1977 Accounts (D43, p.7) that the company recognised that the real rate of return on capital in manufacturing industry has been "dangerously low" and as a consequence, companies have not provided sufficient funds to maintain their businesses. But because of the lack of unanimity in the accounting profession on a generally acceptable standard practice, inflation adjusted accounts have not been presented.

However, by revaluing land and buildings in 1971/2 on a going-concern basis at £4.95m (D42,p.16) a rough and ready form of inflation accounting has been introduced. This resulted in £1.59m being transferred to reserves amd a consequent increase in the depreciation charge.

(2) I.C.I.

Imperial Chemical Industries (I.C.I.) was formed in 1926 by the amalgation of four chemical companies, namely Brunner, Mond and Co. Ltd., Nobel Industries Ltd., The United Alkali Co. Ltd., and British Dyestuffs Corporation Ltd. By 1973 it had over 400 subsidiaries and was Europe's largest chemical

manufacturer.

Up to the end of the 1975 financial year, I.C.I. had published accounting data on a CPP basis, for comparison purposes. However, in the 1976 accounts this practice was discontinued, following the publication of ED18, and the acknowledgement in the Accounts that CCA is of"greater relevance" than the CPP method (D44, p.9).

I.C.I. make the point that CCA asset valuations involve more subjective judgements than are required by historical accounting (D44, p.9) but do not seem to consider this a major problem.

The data published in the 1976 accounts were not based on detailed revaluations of assets, because there was insufficient time to carry out such exercises. But the 1977 accounts publish a comprehensive current cost statement covering the two years 1976 and 1977. The comparative historic cost and current cost data for 1977 are produced in Table 1.

A number of interesting points emerge from Table 1 and from the accompanying notes (D45, p.36). In practice each asset class has a range of depreciation lives. Historic cost depreciation is based on a conservative view of asset lives, in order to make an ad hoc adjustment for inflation. But for current cost depreciation average asset lives are assumed to be at the larger end of the range. As the Accounts note (D45, p.21) current cost depreciation lives are up to fifty per cent larger than historic cost depreciation lives. This serves to minimise the gap between the size of historic cost depreciation and the size of current cost depreciation. This reduces the effect of inflation accounting.

The cost of sales adjustment follows the recommendations of the Hyde Guidelines.

However, I.C.I. departs from the Hyde Guidelines in its gearing adjustment. In an approach similar to that suggested by Kennedy (77, p.63)

TABLE 1: CURRENT COST STATEMENT FOR I.C.I. 1977

	HISTORIC COST		C.C.A.	
	£m	£m	£m	£m
Trading Profit		552		552
Less inflation adjustments:				
depreciation			182	
cost of sales			57	
Erosion of net monetary assets			12	251
Pre-Interest Trading Profit		552		301
Plus Investment Income	65		65	
Net profits of associated companies	31	96	31	96
		648		397
Less Employees profit sharing bonus	29		29	
Interest payable	107		107	
Exchange loss on net current assets overseas	29	69		40
Profit before Taxation and grants		483		261
Less Taxation less grants		202		142
Profit after taxation and grants		281		119
Gearing Adjustment			59	
Exchange gain on Financial items			27	86
Profit before minority interest		281		205
Average assets employed		3600		6185
Pre-Interest Return on Capital		15.3%		4.9%

Source: I.C.I. Annual Report and Accounts 1977 pp.22, 36

the gearing adjustment is, effectively, divided into two parts.

This is achieved by considering trade creditors as negative monetary assets, rather than as monetary liabilities. This helps to reinforce the distinction between an entity view of the firm and a proprietary view. Accordingly I.C.I. make an adjustment for the erosion in the real value of net debtors. This is shown as an addition to trading profit before interest. The gearing adjustment per se, that is the net holding gain on assets financed by net non-trading liabilities (borrowings less cash), is shown as an addition to post interest profit.

A further departure is represented by an adjustment for exchange gains or losses on the non-sterling part of non-trading liabilities. This either increases the gearing adjustment, in the case of an exchange gain, or reduces it, if exchange losses are incurred.

Other minor adjustments are made in respect of taxation and grants.

(3) "Shell"

The Royal Dutch/Shell Group is owned by two non-operating parent holding companies, The Royal Dutch Petroleum Company having a 60 per cent interest and the "Shell" Transport and Trading Co. Ltd. a 40 per cent interest.

The principal investment held directly by Shell Transport and Trading Co. Ltd. are its 40 per cent shareholdings in the Shell Petroleum Co. Ltd. and in Shell Petroleum N.V. These two companies are the main holding companies owning the total group interest in the other, servicing and operating, companies forming the Royal Dutch/Shell Group.

Companies like Shell U.K. Ltd. are merely operating companies within this structure. The 1976 accounts of Shell U.K. Ltd. make no mention of accounting for inflation. However, there is a note to say (D46, p.27) that from 1st. January 1976 the company has changed from a depreciation to a depletion basis for the writing down of the value of production assets in

the North Sea gasfields. That is such assets as platforms and infield pipelines were to be written down on a unit of production basis. The change of policy resulted in an increase in retained earnings at 31st December 1975 of £3.5m to reflect the partial release of depreciation provided up to this time under the previous policy.

Subsequently, in 1977, Shell U.K. stated that inflation accounting would not be introduced until there was a consensus of opinion in the accounting profession and until it was clear which method of inflation accounting would be most suitable for the company. (D47, p.4).

The parent company, Shell Transport and Trading, however, have produced a fairly comprehensive set of inflation accounts prepared on a CPP basis and which relate to the operating activities of the Royal Dutch/Shell Group as a whole. The supplementary information has been provided for a period of five years from 1973 onwards.

When compared with the accounts calculated on a historic cost basis the CPP accounts for 1977 show a 5.9 per cent return on net assets, compared with a 19.2 per cent return on historic cost.(D49, p.50). The table below presents the other salient changes in the balance sheet data for 1977, after adjusting by the Retail Price Index.

In the 1976 Accounts (D48, p.31) the company noted the publication of ED18 but pointed to the controversial aspects of it. Especially relevant to "Shell" are the major practical problems relating to overseas subsidiaries and associated companies. Also important from Shell's point of view are developments in U.S.A. because the bulk of crude oil is traded in dollars, and in Holland because that is the home of one of the parent companies. Both these countries have produced draft inflation accounting proposals, but as in Britain, nothing universally acceptable has been agreed. Until such time as there is unanimity the company states that it will continue to produce comparable accounts on a CPP basis.

TABLE 2: COMPARISON OF HISTORIC COST AND CPP RESULTS FOR ROYAL DUTCH/ SHELL GROUP FOR 1977

	HISTORIC COST	CPP
	£m	£m
1. Profit and loss Account		
total revenue	23,963	24,894
depreciation	617	1,231
cost of sales adjustment	-	396
gain on net monetary liabilities	-	397
net income	1,340	774
2. Balance Sheet		
net property and plant	8,141	13,408
investments in Associated companies	591	1,654
net current assets	3,209	3,433
minority interests	898	1,679

Source: Shell Transport and Trading Co. Annual Report and Accounts 1977 pp.50-1.

As hinted at above inflation has a great effect on Shell Trasnport from an international point of view. The existence of differential inflation rates (most relevant in the case of U.S. dollar and Netherlands guilder) between currencies means that if the transfers of non-sterling property, plant and equipment are recorded based on historical exchange rates, a substantial understatement in current sterling terms results. The Accounts claim that the difference between these two figures, in 1976, was £1,830m. The additional effect of associated companies using closing rather than historical rates would have increased the Group's investment by about £520m. It is

believed that the complications of historic exchange rates are approximately allowed for by the use of the Retail Price Index, because this reflects implicitly the higher rate of inflation in the UK than in other countries.

4. British Petroleum Co. Ltd., (B.P.)

It is interesting to study B.P. not just because it is the largest industrial concern in the U.K. in terms of turnover, but because at the end of 1977 about 31 per cent of the shares of B.P. were owned by the government and 20 per cent by the Bank of England. The remainder is held by about 177,000 stockholders. Under an amendment to the Company's articles of association, introduced when the government acquired its interest in 1914, the government has the right to nominate two members of the Board with power to veto any resolution. This right of veto has never been used, and the government has undertaken not to interfere in the company's commercial affairs.

The 20 per cent share held by the Bank of England was purchased in 1975 following liquidity problems of Burmah Oil Co. Ltd. The Bank of England has undertaken not to exercise the voting rights attached to its holding, and the government has said it will not exercise a greater proportionate voting power. Indeed the government decided in December 1976 to dispose of some of its share.

It is clear from the above outline of its capital structure given by the company (D51, p.21) that the company is mid-way between being a nationalised firm at the one extreme and a private company at the other, and so it is interesting to assess whether the introduction of accounting for inflation is different from private or nationalised industries.

In fact B.P. produced comparable CPP accounts for the financial years 1974 and 1975. However, following the publication of Sandilands and ED18 the company no longer regarded the publication of CPP accounts as helpful and

have therefore discontinued the exercise.

Like a number of the other concerns analysed in this chapter, B.P. support the basic principles behind the CCA proposals but have certain reservations. These are, as specifically referring to B.P. :-

(i) the need for agreement on the treatment of oil reserves and overseas assets;

(ii) the need for more harmonisation between the differing world-wide requirements for inflation accounting.

(iii) the existence of excess capacity in the oil industry means that the replacement cost for shipping and distillation assets bears no relationship to either realisable asset values or earning capacity.

The first two reservations arise since B.P. must comply with the inflation accounting rules in other countries where the company has operating assets. This problem also affects Shell Ltd.

If the company is to continue as a going concern then the problem of replacement cost equalling realisable value is irrelevant. Further, the reduction of earning ability, due to excess capacity, should be reflected in the specific indices used to value assets.

Nevertheless, whilst stating these reservations, a supplementary current cost statement is provided , in accordance with the Hyde Guidelines. The comparative historic and current cost data are reproduced below.

TABLE 3: CURRENT COST ADJUSTMENTS FOR B.P. 1977

	£m	£m
Income after customs duties and sales taxes		12,258.0
Less operating costs	9561.0	
historic cost depreciation	303.7	9,864.7
Pre-interest historic cost profit		2,393.3

Cont'd.

	£m	£m
Inflation adjustments:		
depreciation	203.0	
cost of sales	123.0	326.0
Pre-interest current cost operating profit		2,067.0
Less interest and financing cost	207.5	
Add gearing gain	101.0	106.5
Post interest current cost profit		1,960.5

Source: B.P. Annual Report and Accounts 1977 pp. 14,28.

5. Inflation Accounting in Industry in General

A random sample of 242 companies was sent a mailed questionnaire as part of the investigations of the Sandilands Committee (G4)[22]. From the fifty per cent of companies who responded, the extent of inflation accounting was found to be as shown in Table 4. Clearly, the evidence from the published accounts of the companies studied above suggests that they are little different from industry in general, as evidenced by the data in the Table.

The nationalised industries have been discussed in detail in the previous chapter, but it is noteworthy that adjustments for inflation in the management accounts are no more in evidence than is the case with the published accounts.

With respect to quoted and smaller companies it was interesting to test for significant differences in the degree of implementation of inflation accounting, especially in the light of recommendations that larger firms should show a lead[23]. The results of these tests indicate very little

TABLE 4: INFLATION ACCOUNTING IN INDUSTRY IN GENERAL

Annual Adjustments made for the impact of inflation	Management Accounts			Published Accounts		
	Quoted Cos.	Smaller Cos.	Nationalised Ind.	Quoted Cos.	Sml Cos.	Nationalised Ind.
	(%)	(%)	(out of 7)	(%)	(%)	(out of 7)
(a) Fixed assets in the balance sheet	13	14	1	11	4	-
(b) depreciation	11	14	2	7	4	1
(c) cost of stocks consumed	10	18	1	5	7	-
(d) cost of holding cash and other monetary assets	9	14	1	3	7	-
(e) The gain to the equity on borrowing	9	7	1	5	-	-
Number of companies	87	28	7	87	28	7

Source: Sandilands Committee Report Cmnd 6225 p.261, 287

TABLE 5: ADJUSTMENTS TO ACCOUNTS FOR INFLATION-DIFFERENCES BETWEEN QUOTED AND SMALLER COMPANIES

Annual Adjustments made for the impact of inflation on	Published Accounts		Management Accounts	
	t-test	Yates corrt'd Chi-Square	t-test	Yates corrt'd Chi-square
(a) Fixed assets in the balance sheet	1.0739	0.7577	-0.1369	0.0100
(b) Depreciation	0.5814	0.0345	-0.4274	0.0037
(c) Cost of stocks consumed	-0.4219	0.0015	-1.1396	0.5259
(d) Cost of holding cash and other monetary assets	-0.9390	0.0907	0.7671	0.1689
(e) the gain to the equity on borrowing	1.3477	0.3158	0.3216	0.0025

Note: 1. Sig. at 10% level

2. degrees of freedom for (i) t-test = $n_1 + n_2 - 2 = 113$

(ii) Yates corrected Chi-squared = 1

3. Yates corrected Chi-squared results are as computed by SPSS. (see 125).

evidence of any differences. Nonetheless, the results are reported in Table 5. Indeed the only significant difference at the ten per cent level refers to the adjustment to be made for the gain to the equity on borrowing. The very low incidence of inflation accounting is strikingly in contrast to the percentage of companies claiming to be in favour of introducing inflationary adjustments.

The evidence from Sandilands[24] indicates a range of favourability from eighty two per cent of smaller companies favouring adjustment to fixed assets in the published balance sheet to forty two per cent of quoted companies in favour of adjustments to the cost of holding cash and other monetary assets in the management accounts. The dichotomy between what is favoured and what is practiced must surely be attributable to the lack of consensus in the accounting profession concerning the exact nature of adjustments for inflation.[25]

Further evidence, if such were needed, that relatively few firms are making any attempt at accounting for inflation is provided in a study by Nguyen and Whittaker(126) which investigated the importance of a high rate of price inflation[26] in causing the amortisation funds accruing to individual industries to fall short of their replacement needs. They found that all industries in the study, except gas and electricity, had amortisation funds considerably less than their replacement requirements. For nine of the industries analysed amortisation funds were less than half of their replacement requirements. For example vehicles, shipbuilding, mineral oil refining, and Iron and Steel had amortisation funds as a proportion of replacement

requirements of 8 per cent, 30 per cent, 34 per cent and 36 per cent respectively. Thus many firms were likely, they concluded, to face difficulties in financing these "deficits" and the rate of growth of their investments was likely to be seriously affected.

Part 2: Summary and Conclusions

A great diversity in approaches to accounting for inflation have been reported. The simplest way to summarise the findings of this survey is provided below: (Table 6).

The following conclusions may be drawn.

(1) At the time of writing neither the nine major nationalised industries nor the private firms considered, have pursued methods of accounting for inflation very far. However, there is both explicit and implicit evidence that this arises from the lack of unanimity in the accounting profession about which method(s) to choose.

(2) As a result of the lack of consensus a majority of the firms and industries studied have been prepared to make ad hoc adjustments for inflation. It is argued here that, because these have varied between industries, inter-industry comparisons are distorted.

(3) Consequently there has been little progress towards implementing the proposals of the 1961 White Paper, and hence small improvement in the information available to assess the efficiency of the nationalised industries.

(4) The limited use of other efficiency criteria in the nationalised industries (such as those proposed in G3) is well documented and the practical problems of implementing the theoretical tools are understood (for example see 121). It is surprising, perhaps, that there has been so little pressure to introduce inflation accounting, which is conceptually more straightforward and which possesses greater practical applications than the other efficiency criteria.

Table 6: Check list of approaches to inflation accounting by the nationalised industries and selected private firms.

INDUSTRY/FIRM	INFLATION ACCOUNTING				Other ad hoc methods
	Used in Historical Accounts	Supple-mentary data	Internal Exercises	No. Attempt	
1. Nationalised Industries.					
Brit. Airways		✓			✓
BGC	✓				✓
BSC		✓			
Brit. Rail		✓			✓
Elec. Cncl.			✓		✓
NBC		✓			✓
NCB				✓	
NEC				✓	✓
Post Office	✓				
2. Private Firms					
Aberthaw and Bristol Channel		✓			
A.P.C.M.	✓	✓			✓
Ketton Portland				✓	
Rugby Portland			✓		✓
Tunnel Holdings				✓	✓
I.C.I.		✓			
Shell		✓			
3. Part Nationalised /Part Private					
B.P.		✓			

(5) The reduction of declared profit levels occasioned by a measure of compensation for inflation in accounting, be it by supplementary depreciation or charging capital to revenue, may help to protect industries against crude use of profits figures by the Price Commission and the Press; but it may have the effect of helping to obscure the true rate of return being earned.

(6) There is very little difference between the attempts made by the nationalised industries and the attempts made by the private firms considered. Nor can these be said to differ from the position in industry in general.

(7) The problems of comparability of the results of the nationalised industries being complicated by ad hoc inflationary adjustments has been alluded to above. But from the evidence presented here there appears to be a problem arising from following the recommended Hyde Guidelines. This is that some nationalised industries are charging supplementary depreciation and then adding back a gearing adjustment. Those nationalised industries without Public Dividend Capital have made no gearing adjustment. Thus in order for comparisons to be made on a like-with-like basis it appears that profits before interest and gearing adjustments should be used.

PART II: FOOTNOTES

1. With the passing of the Civil Aviation Act 1971, which brought together BEA and BOAC.

2. The corresponding total of shareholders' funds for 1975/6 on a CCA basis was £596m, according to the 1976/7 accounts.

3. The Secretary of State continues to set a target rate of return before interest, as required by the British Airways Board Act 1977.

4. The change, of course, means an increase in the average depreciation life of S1-11 aircraft.

5. A note on p.14 of the 1972/3 accounts considered that no useful purpose would be served by revaluing land and buildings.

6. At the end of 1975/6 financial year, reserves totalled £84m (1975/6 Accounts p.13).

7. Where r = rate of return, π = profits, K = capital stock.

8. 1st May, 1949.

9. See Gas Act 1972 Section 16, p.13 for the conditions for this to occur.

10. See Gas Act 1972 Section 2(2) parts (c) and (h) for precise definitions.

11. Some storage is necessary because it is impossible to extract gas at a fast enough rate to meet daily peak winter demands. The main method, although there are also LNG holders and linear storage systems, is "line-packing" whereby, overnight, gas is drawn from the North Sea and stored under higher pressure than usual in the main transmission system.

12. For 1976 financial year. This also included £45m relating to assets which under the present conventions are life expired.

13. This was arrived at by using the Retail Price Index to convert historic cost figures by reference to the dates on which the expenditure occurred. This had to be estimated in a number of cases.

14. p.2.

15. Because of Defence Regulation 60N which suspended publication of the accounts. This was not revealed until publication of the 1947/8 accounts.

16. Note that net fixed assets are calculated net of historic cost depreciation only.

17. Also, of course, there is private passenger and haulage, but these tend to be in different market sectors.

18. Since 1973 Ketton has been a subsidiary of the T.W. Ward Group.

19. The author would like to thank Dundee College of Technology Library for making this information available to him.

20. This index is published in HMSO Housing Construction Statistics

21. This excludes Carrington Viyella Ltd., a company in which I.C.I. has a large shareholding (35 p.c. in 1973) but whose accounts are not consolidated with I.C.I.

22. For the method of selection and source of this sample see (16) Annex B pp. 284-285. See also Annex F op.cit. p. 287 for a detailed analysis of the number of firms in each industry selected; and Annex A op.cit p. 279 for the questionnaire used.

23. For example see F.E.P. Sandilands Inflation Accounting Cmnd 6225 1975 para. 552 pp. 166-167.

24. Sandilands op.cit. p. 260.

25. It must be borne in mind that the Sandiland's survey was carried out in 1974. The evidence in the rest of part three relates to the position at the end of 1977. However, as the accounting profession was little nearer agreement in 1977 than it was three years earlier it was not thought that the time-lag results in any significant discrepancies.

26. At the time of their study (1975) price inflation was running at an annual rate of 16 per cent.

PART 3: REPLACEMENT COST RATE OF RETURN FOR THE GAS INDUSTRY

INTRODUCTION

In previous chapters the theoretical economic and accounting aspects of performance measurement in general have been discussed. It was concluded that for overall performance measurement a replacement cost rate of return should be made. Different definitions of replacement cost and the use of different price indices to measure assets will produce different cost rates of return.

To recapitulate, briefly, the replacement cost rate of return to be used in this context is to be determined by:

(i) A revaluation of all assets of the firm (including stocks) using specific indices for each asset.

(ii) Consequent upon (i), an adjusted depreciation allowance using specific indices.

(iii) An adjustment to the cost of sales.

(iv) An estimate of the real gain on holding assets.

(v) An estimate of the real loss on holding net monetary assets.

(vi) An adjustment to turnover and operating costs to take account of the fact that they accrue throughout the year.

In part two it was shown that the nationalised industries as a whole have made little progress towards the introduction of inflation accounting, and hence they have made little progress towards the use of a replacement cost rate of return. It was seen that the gas industry has made the greatest advance in this direction.

This part, then, sets out to provide an independently

determined replacement cost rate of return for the gas industry, using the above adjustments as a basis.

It is recognised that it would be a little dubious to compare the replacement cost rate of return of the gas industry with its historic cost rate of return and with, say, a replacement cost rate of return for all manufacturing industry, at one point in time, because of the possible distortion created by short term economic factors. For example, price control in the nationalised industries. Thus the replacement cost rate of return has been calculated for the period 1960/61 to 1977/78. Taking a period of this length also provides sufficient date on the performance of the gas industry prior to the Gas Act 1965 which instigated the movement towards a centralised structure, culminating in the formation of the British Gas Corporation (B.G.C.) in 1973.

The first chapter discusses the methodological problems encountered in revaluing the assets of the British Gas Corporation and presents estimates of the gross replacement cost valuation of the assets of B.G.C. In the second chapter the estimated replacement cost rates of return for the period under study are presented and discussed. This includes comparisons with the historic cost rates of return earned by the industry and comparisons on a replacement cost basis with other broad sectors of industry.

Part 3. Ch. 1

Estimations of the Gross Replacement Cost of the Assets of B.G.C. - 1960/61 to 1977/78

Introduction

A preliminary task was the identification of broad categories of the fixed assets owned by the gas industry. This

helped the determination of the price indices necessary to make the revaluation adjustments. Fortunately, this information is provided in the annual reports and accounts of the industry

The following table presents a detailed breakdown of the historic cost valuation of the fixed assets of BGC:

Table 1: Type of Fixed Asset and Percentage of Total Fixed Assets Represented by Each Asset 1977/78

Type of Asset	Asset Value (£m)	% of total
(1) Freehold Land and Buildings	114.8	4.8
(2) Long Leasehold Land and Buildings	12.3	0.5
(3) Short Leasehold Land and Buildings	6.6	0.3
Total Land and Buildings	133.7	5.6
(4) Mains	1365.8	57.2
(5) Services	261.3	11.0
(6) Gasholders and other storage	89.6	3.8
(7) Plant and Machinery	324.8	13.6
(8) Meters	123.0	5.2
(9) Motor Vehicles and Mobile Plant	24.7	1.0
(10) Furniture,Fittings & Office Machinery	18.7	0.8
(11) Miscellaneous	42.2	1.8
Total Fixed Assets*	2383.8	100.0

Source: BGC Annual Report and Accounts 1977/78 p.40.

*excluding assets of subsidiary companies.

It is most important to note that the data shown in Table 1 represent the sum of investments less displacements (i.e. gross book value) since vesting date, and do not include prevesting assets. Prevesting assets are quite significant but any amounts relating to these were written out in 1973. Even before this date any data relating to prevesting assets referred only to net book values. For purposes of revaluing assets net book values provide insufficient information. They represent the original investments less accumulated depreciation provisions but for asset valuation gross book values are required.

As the data in the accounts is deficient to the extent that prevesting data is excluded, and complicated by displacements since vesting day the original approach was to make estimates of the numbers of buildings, mileage of mains, number of vehicles etc. These raw data could then be multiplied by an "average" valuation for each type of asset to produce a replacement cost valuation. Although this approach could not be used in the end, the methodology is reported for reference purposes along with the actual method used.

Methodology

1. Land and Buildings

Land and Buildings present the main problem because it is not possible simply to adjust the net book value shown in the accounts by the appropriate index. Ideally, without the benefit of internal valuations by the Corporations surveyors, it would be best to obtain an estimate of the numbers of the buildings

owned by the industry. This is because (i) the cost or valuation of land and buildings for former undertakings taken over in 1949 were written out of the records on 31.3.73, the date of formation of B.G.C., as they could not then be separately identified. As the Corporations accounts state some of these assets have a substantial value. Although, in relative terms much of this will have been overshadowed by the construction post vesting-day of a number of administration centres. Much of the prevesting land and buildings will have been written off with the advent of North Sea Gas.

(ii) freehold land is not depreciated but buildings standing thereon are depreciated and, to complicate matters further, over varying periods.

(iii) it is also important to know where the land and buildings are because of significant regional variations in land and buildings valuations.

Once the numbers of buildings had been obtained it was then envisaged that estimates of value would be obtained by asking a qualified surveyor to estimate the values of some "typical" gas corporation buildings (showrooms, offices, etc) using a measure of size as a guide to value. Then indices could be applied to produce a time-series of valuations for the period under study.

However, this initial approach was unsuccessful, for reasons which will become clear below:

(i) Estimation of numbers of buildings

The initial direct approach of a mailed request (see pt.3 Appendix I for a specimen copy of the letter) to all twelve

BGC regions for information failed partly because of the BGC policy of not providing general information on a regional basis,[1] and partly because of the high cost of producing the data required.

It was surprising to be told during an interview with BGC accounting management that there was no complete and comprehensive asset register. This, it was pointed out to the author, was mainly due to historical reasons at the time of nationalisation.[2]

A second approach, based on the assumption that most commercial premises will have a telephone number, was to use the Post Office telephone directories for Britain as a source of BGC premises. This is not wholly accurate because of deficiencies in the telephone directories (e.g. because of delay in publication premises disposed of may still appear) and the policy of some regions that callers should telephone a central unit and not their local showroom (see, pt.3 Appendix II for the methodology of estimating showroom figures for these regions).

Using telephone directories it is possible to stratify BGC premises into the categories upon which valuations could be estimated. (E.g. Headquarters, (national, regional, area) showrooms, service centres, gasworks, gas terminals, distribution offices, etc). The data assembled from the search of the telephone directories is presented in Pt.3 Appendix III. Land and Buildings are categorised into

twelve sub-headings broken down by Region[3].

(ii) Estimating size and valuation

Whilst the numbers problem could be solved, as outlined above, there remained the problem of producing a size-distribution of the different types of buildings to which estimated valuations of "typical" showrooms, offices etc could be applied. Information on physical size, e.g. floor area, is not available publicly. It was suggested that the rateable values of a representative sample of premises should be obtained[4] and that this would provide a good proxy for size for valuation purposes. However, for a number of reasons this approach to valuation of land and buildings did not provide an answer. These are:

(i) rateable value bears no direct guide to market capital value, which we take as the nearest estimate to replacement cost. Rateable values are derived from annual rental values as they occurred in the open market at the time of the compilation of the rating lists. The gross rateable value of a showroom, say, would be based on the estimate of the annual rent which could have been obtained for it if offered to let, vacant, on the assumption that the tenant would pay rates and the landlord would bear the cost of repairs and insurance. Problems arise because of the dearth of open market transactions for certain types of property.

(ii) hereditaments occupied by the gas and electricity authorities are excluded from rating by sections 33 and 34 of the General Rate Act 1967, but there are certain exceptions in sections 33(2) and 34(2), e.g. showrooms and offices not

situated on operational land. These latter are assessed in the normal way[5], which as seen in (i) above is unsatisfactory for capital valuation purposes. As regards gas hereditaments on operational land it is impossible, from the rating lists, to assign a rateable value to each type of premise, because gas hereditaments are entered as a total sum for each local authority rating area.

As was pointed out to the author:

> "... The "gas hereditaments" are merely an apportionment, for the rating area, of a global rateable value calculated and amended from time to time, according to statutory formulae based upon numbers of therms supplied per mile of trunk main.
>
> "Although the historical roots of the global total originated in rateable values which were themselves derived from valuations, even those were based upon the accounts of gas undertakings and are not related to the market value of the buildings and other assets. In short, the gas hereditaments are not now (if they ever were) an indication of property values" [6]

Thus the use of rateable values for capital valuation had to be discarded.

The approach used.

Recourse was then made to the information contained in the annual reports and accounts. Since vesting date the accounts contain data on annual investment in land and building, and all other assets, and also data on "investment less displacements". Now this is important because from 1967/68 onwards displacements of land and buildings involved in gas manufacture increased with the advent of North Sea Gas. As the accounts note (D10, p42 Note 1 (d).

> "The unamortised residue of costs of coal-based plant made obsolete as a result of new sources of gas supply and technical developments has been

> taken to displaced plant account. This account also includes the unamortised balance of oil-based plant taken out of commission sooner than expected due to the introduction of natural gas. ... proceeds from the sale of assets are applied to reduce the unamortised balance".

Initially the intention was to write this off by 1980-81 but this was brought forward to the end of the 1977/78 financial year as the accounts note (D11, p.43 Note 1 ccs).

Quite clearly this action will have a marked effect on the age profile of BGC's land and buildings[7]. In calculating the replacement cost of the land and buildings it seems reasonable to assume, given the above note, firstly that the older land and buildings will be displaced first, and secondly that the land and buildings displaced will be disposed of. A note of caution is entered here because it is likely that some of the land content will be retained. However, given the data limitations it is not possible to assess what this is. Hence in the following estimates this problem is ignored. The effect,if the land content is present,will be to deflate the estimated replacement cost. It is thought that the effect will not be significant.

Now using the data in the accounts there are two ways of calculating the length of the age profile, both of which produce the same result. The first is based on data gross of depreciation, the second is based on data net of depreciation. Using data gross of depreciation and defining I_t = gross investment in an asset in year t, J_t = displacements in year t (i.e. assets taken out of use before being fully depreciated), K_t = disposals in year t (i.e. assets taken out of use after being fully depreciated), the age profile (n) of the assets in use is approximated by the number of years of investment in an asset that it takes to solve the following:

$$\sum_{t=T-n}^{T} I_t = \sum_{t=V}^{T} I_t - \sum_{t=V}^{T} J_t - \sum_{t=V}^{T} K_t \qquad \begin{array}{l} T = \text{current year} \\ V = \text{vesting day} \end{array}$$

In words, the age profile of the asset is estimated by summing backwards the gross investments in the asset until the total is approximately equal to the total of gross investments from vesting day less the gross value of displacements and disposals since vesting day. The same age profile may be obtained by using net data. This "gross method" has been used to revalue each asset category of B.G.C. Thus it is necessary to bear the above expression in mind when each asset category is discussed subsequently.

If we return to the case of land and buildings it is seen that if the above procedure is followed then because of displacements of gas making land and building since 1967/68 the age profile becomes progressively shorter from 1967/68 onwards. Thus for purposes of estimation the replacement cost of land and buildings an age profile ranging from thirteen years (1977/78) to eighteen years (pre-1966/67) has been used.

It is conceded that this age profile seems somewhat shorter than may be expected. Indeed, BGC depreciate buildings over a longer period than this. But given the limitations of the data available to the author it seems impossible to make any further refinements. For example, an inspection of the accounts readily reveals a practice of redefining asset categories from year to year, so that assets may be switched from one category to another.

Further, the lack of any data on investments prior to vesting day has meant that annual investments in land and buildings prior to 1949 have had to be estimated. For purposes of this exercise annual investment in land and buildings prior

to 1949 was assumed to be equal in real terms to the average of the three years 1949/50 to 1951/52. This applies here to the period 1949/50 to 1943/44. The reasonableness of this assertion is based on the assumptions that immediate post-war demand did not fluctuate and that the individual gas companies did not increase investment because of the knowledge that nationalisation was imminent.

The choice of an index for land and buildings

Two alternative indices present themselves:

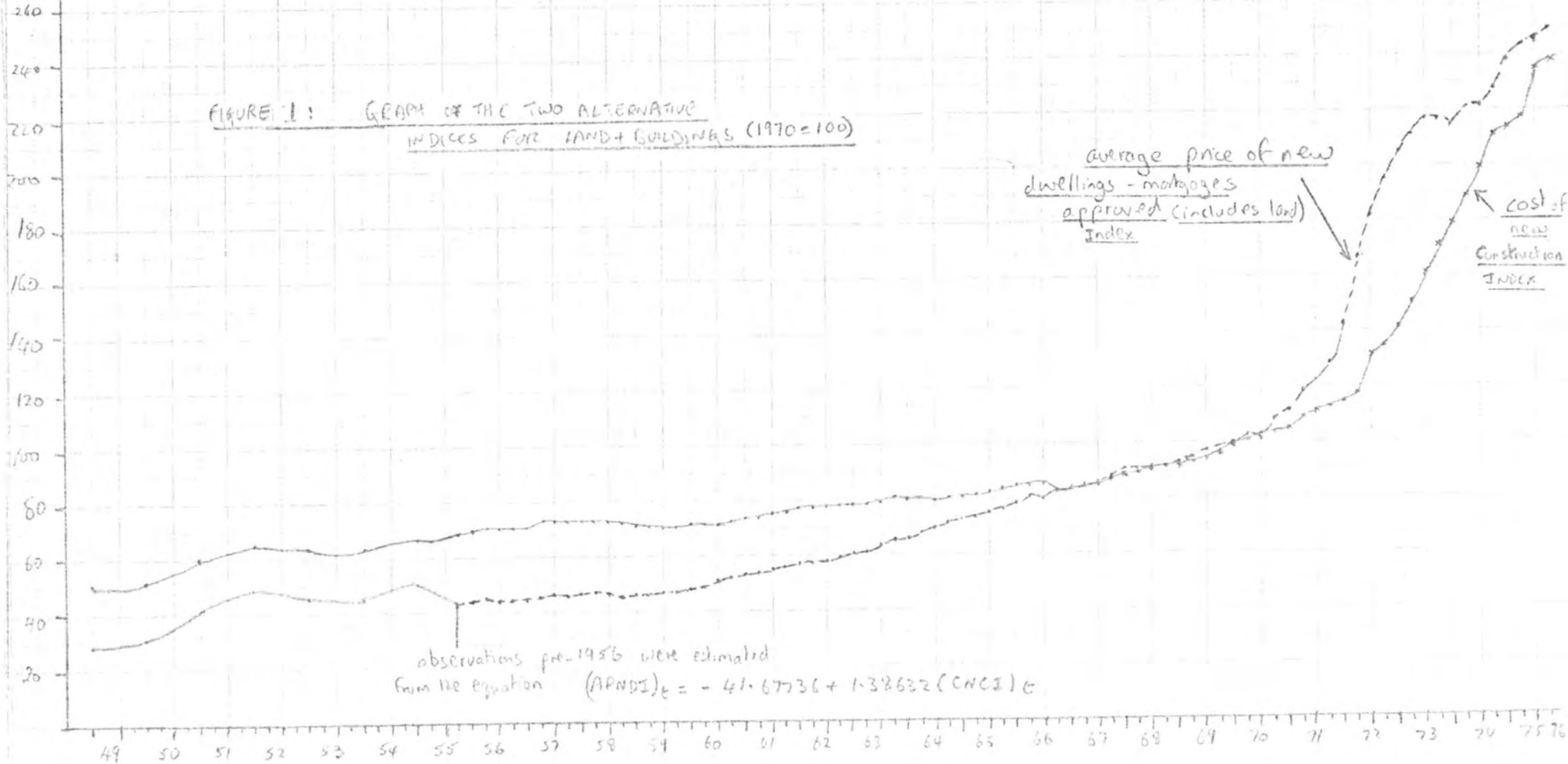
(i) The index of the average price of new dwellings - mortages approved with Building Societies.[8]

(ii) The index of the cost of new construction, which measures the average change in the cost to clients of new building and civil engineering work in general, rather than changes in the cost of particular types of work.[9]

The former index is concerned solely with private domestic properties and thus has a narrower base. But it has the advantage over the latter in that it includes the cost of land in new dwellings which the latter index does not.

The choice of which index to use hinges on the effect of the land element over the period under study. Inspection of Fig.1, which plots the two indices for the period under study reveals the following. The pattern of the two indices are very similar, although at different levels, up until the early 1960's when they converge. After 1970 the average price for new dwellings index is growing at a faster rate. This is attributable to the shift in the relative price of land in the early 1970's during the property

FIGURE 1: GRAPH OF THE TWO ALTERNATIVE INDICES FOR LAND + BUILDINGS (1970=100)



boom. As the land element is important in an assessment of capital value it was decided to use the average price of new dwellings index.

It was seen above that the estimated age profile of land and buildings was from 13-18 years. Assuming that this remains constant throughout the period a series of price indices is required from 1943/44 onwards to enable the replacement cost valuation of land and buildings in 1960/61 to be estimated. As the new dwellings index is not published prior to 1956 the following solutions were employed:

(i) The missing data for 1949 to 1955 were estimated by splicing the new dwellings index with the new construction index.[10]

(ii) Prior to 1949 the Building Materials index was spliced onto the above data.[11]

Thus, in general, the replacement cost valuation of land and buildings in any year is estimated by:

$$T = \sum_{t=T-n}^{T} 1\,t \left(\frac{LI_T}{LI_t}\right)$$

n = length of age profile
t = annual investment in land and buildings
LI_T = index for land and buildings at end of age profile
LI_t = average[12] annual price for land and buildings for each year in the age profile.

2. Mains

According to the Gas Corporation accounts, mains represent the greatest proportion of total assets, measured at historic cost. (£1365.8m or 57% of assets). Although the accounts give a figure of mileage of gas mains in use 136,000 miles in 1977/78 it is difficult to arrive at an accurate replacement

cost valuation by multiplying this by, say, an index for steel tubing or average cost data because of the great diversity in type of pipe (diameter and material) between the National and Regional transmission systems. Diameters range from 48" to 3", and materials can be steel or plastic. This can result in large differences in the cost of mains pipe per mile. Plastic piping in use tends to be smaller in diameter, although this alone does not account for the difference in cost. Metal pipes have to be welded together, then each weld has to be X-rayed for defects. As a further safety measure the metal pipe is then filled with water and pumped up to a pressure twice that of normal use and kept there for twenty four hours to test the strength of the weld. Further, as the welding of the pipes is a specialist task, labour costs are extremely high. Hence the wide differences in average costs per mile.

However, in the absence of any internal information on costs per mile being released by BGC it was necessary to use the information published in the annual report and accounts on investments in mains.[13]

Unlike land and buildings mains have not been so affected by displacements arising from the advent of natural gas. Thus a constant age profile may be used. The depreciation life used by BGC is forty years. It seems reasonable to use this as an approximate length of the age profile of mains, as it is necessary to sum the annual investments in mains for the whole period 1949/50 to 1977/78 until it equals the total of gross Investments less displacements and disposals at the end of 1977/78 which

suggests an age profile larger than 29 years. However, the absence of data pre 1949/50 means that annual investment prior to this date must be estimated.

For purposes of this exercise it is assumed that investment in mains (and by implication services) remained equal in real terms to the average of the three years 1949/50 to 1951/52 for the period prior to 1949/50 under study. Whilst there would have been net investment in this period for safety reasons and to serve extra consumers it is recognised that the constancy assumption is a fairly strong one. However, constraints of the data available mean that this is unavoidable.

The most suitable indices to use for adjusting the annual investments in mains would appear to be:

(i) Steel Tubes index which covers MLH 312 - for the period 1949/50 to 1977/78, spliced to produce a continuous series with base year 1970 = 100.

(ii) Iron and Steel index, for the period 1920 to 1949, spliced onto the steel tubes index. This is a more general index than the Steel Tubes index, but it is the most suitable index prior to 1949.

Given the above the replacement cost valuation of mains (Mt) for any year could be estimated by the following:

$$M_T = \sum_{t=T-40}^{T} m_t \left(\frac{MI_T}{MI_t}\right)$$

m_t = annual investment in mains
MI_T = index for mains at end of the age profile
MI_t = average annual price index for mains for each year in the age profile.

It is worth mentioning, <u>en passant</u>, that for mains, and

services, the assumption of continuity is crucial for the estimated replacement cost to be greater than historic cost.

In the, admittedly unlikely, event of the gas industry ceasing to exist then the opportunity cost calculation of mains is likely to be very close to zero. Only the Water Authority could find any alternative use for them and it is very unlikely that the pipes would be the same network that they would require. In all probability the cost of removing the mains from the ground would outweigh any scrap value. So mains are quite literally a sunk cost. The land under which they run does not enter the problem as BGC merely has easements thereon, i.e. the right to use the land in order to inspect the pipes.

3. Services

Basically, these are the pipes running from the main in the street to the customers home. But neither the pipe diameter nor the length of pipe is standard.

There are no complete records of the number of services in use. Of course, there is one for every customer (almost 14 million at 1975/76 year end) but there are also a great many services in homes that do not use gas, where perhaps a previous tenant had gas taken out but the current tenant has not replaced it. The question arises as to how many of these, if any, can be regarded as assets. Some will be used again in future others will not, but without the benefit of the internal research that has been carried out on customer gains and losses it is impossible to estimate what this figure

may be.[14]

Furthermore, no internal information is available on costs of services, nor can the information on average costs, contained in the published accounts, be considered sufficiently reliable.[15]

Therefore a similar procedure was adopted to that outlined above for mains. The age profile of services was estimated to be fifteen years. This is less than the depreciation life used by BGC which is twenty years. However, it may be regarded as a reasonable depiction of the truth because the average age of services has been lowered by the significant increase in new customers (a ten per cent increase since 1968/69) and the advent of natural gas which may have led to the replacement of older services for safety reasons.

For obvious reasons the indices used for services were the same as those used for mains. One minor problem here is that some of the later service pipes are plastic not steel. However, this problem was considered to be immaterial.

If we denote the replacement cost valuation of services by (S_t) then, given the above, for any year:

$$S_T = \sum_{t = T-15}^{T} s_t \left(\frac{SI_T}{SI_t}\right)$$

s_t = annual investment in services
SI_T = index for services at end of the age profile
SI_t = average annual price index for services for each year in the age profile.

4. Gasholders and other storage

With the advent of firstly L.N.G. from Algeria and secondly North Sea Gas the methods of storage in the gas

industry changed quite dramatically. Gas from Algeria had to be stored in specially constructed holders mainly at Canvey Island but also in the Regions (e.g. Partington in N.W. Region). Much of the gas from the North Sea is stored by "line-packing" overnight, because it is not possible to meet daily peak demands by drawing directly from the North Sea. "Line-packing" consists of storing gas in the main distribution network. Some gas is still stored in gasholders, although many have now been razed, and some is stored in a system of densely looped pipes. Clearly then it would be expected that the accounts should show an increase in investment per year in storage capacity. But it is also expected that Investment minus displacements and disposals should be quite small as much storage equipment suitable only for town gas is being made obsolete before the original planned date. As already noted in the case of land and buildings these obsolete assets are being transferred to a displaced plant account. The data in the accounts clearly reflect this, but it also presents something of a problem. In order to revalue the assets an age profile is required to which our indices can be applied. It is unclear from the accounts just what is the age of the storage capacity being displaced. We must assume it is the oldest storage capacity. However, another problem arises because changes of asset category definitions mean that the data for Investments minus displacements do not reflect the true picture of what has been displaced. Thus it is not possible to arrive at the time age profile of storage

capacity. Nor is it clear that the length of the age profile is declining over time because the above produce contradictory effects. Thus for simplicity a constant age profile was assumed throughout the period under study. The length of the age profile was estimated to be nineteen years by summation of the gross annual investments backwards from the end of the period until the total figure for gross Investments less Displacements and disposals at the end of the period was reached, as with previously discussed assets pre 1949 investments were assumed constant in real terms and equal to the average of the three years 1949/50 to 1951/52.

The choice of an index presented a problem as (i) there is no wholesale price index for gasholders, and (ii) an index was required to cover the period 1942/43 to 1977/78 because of the length of the age profile. No single suitable index covers the whole of this period in the U.K.

It was decided that the following would be the most suitable indices:

(i) Vats, tanks, cisterns and other industrial hollow-ware (MLH 399/7) and its forerunner, industrial hollow-ware for the period 1949/50 to 1977/78.

(ii) The wholesale industrial materials (non-food) spliced with (i) for the period prior to 1949/50.

The latter was chosen in preference to the Iron and Steel index, and the U.S. metal container[16] index because when plotted on a graph it proved to be the closest fit to the vats, tanks etc. index.

From the above the replacement cost valuation of gasholders and other storage (G_T) may be estimated by solving, in general:-

$$G_T = \sum_{t=T-19}^{T} g_t \left(\frac{GI_T}{GI_t}\right)$$

g_t = annual investment in gasholders and storage
GI_T = index for gasholders at end of age profile
GI_t = average annual price index for gasholders for each year in the age profile.

5. Plant and Machinery

This category of asset has perhaps experienced the greatest change since the early 1960s. The advent of natural gas has led to the scrapping of most of the plant and machinery used for town gas manufacture. It has also led to an increase in equipment such as pumps and compressors for use in distributing gas from the beach-head to the regions and within regions, and into storage. Consequently the age profile has been shortened. Plant and machinery of the former type was depreciated over a period of up to twenty years, whereas the newer equipment is mainly depreciated over five years

The age profile of plant and machinery was estimated in the same manner as for the assets discussed above. As a result of the vast changes taking place in the usage of plant and machinery in the gas industry, as noted above, the age profile was found to range between eight years (1974/5) and twelve years (pre 1967/8). As the effects of investment in North Sea Gas begin to work themselves out, so that new investment in plant and machinery outweighs displacements, the age profile of this asset has begun to lengthen (to

eleven years in 1977/78).

Index choice was somewhat problematical for this asset as the potentially most interesting series did not begin until the early 1960's and late 1950's. After comparing, on a graph, the likely candidates - viz. the wholesale price index, Iron and Steel index, U.S. annual general purpose machinery (unadusted and adjusted), and the UK pumps valves and compressor index, it was found that the following produced the most reliable continuous series for the whole period:

(i) UK pumps index (SIC,MLH 333/1) for 1977/78 to 1956 Q.1.

(ii) the wholesale price index spliced onto (i) for the period prior to 1956 Q1.

Hence the replacement cost of plant (P_T) and machinery in any year may be obtained by satisfying the following:

$$P_T = \sum_{t=T-n}^{T} p_t \left(\frac{PI_T}{PI_t}\right)$$

where p_t = annual investment in plant and machinery
PI_T = index for plant and machinery at end of the age profile
PI_t = average annual price index for plant and machinery for each year in the age profile.
n = length of age profile

6. Meters

The initial approach towards estimating the replacement cost of meters was to attempt to estimate the number of meters and their types. Once this information was obtained it was intended that average prices of meters would be applied to each category to obtain the replacement cost. In the end this

was not the approach used but it is reported for information purposes. The method used is discussed subsequently.

Unfortunately the accounts of BGC do not record any information about the numbers of meters owned; thus it was necessary to make estimates. As was seen above (Table B fn.14) the customers of BGC fall into three broad categories, domestic industrial and commercial. In the nature of things these three categories of customers will require very different types of gas meter. For example the amount of gas used by an industrial concern is likely to be very much larger than that used by the ordinary domestic household. Thus there will be differences in the cost of a meter depending upon the use to which it is put.

A complicating factor is that the number of meters will not correspond to the number of customers. The reasons for this are:

(i) Domestic customers

The existence of multiple-households in one dwelling, e,g. privately rented flats and bedsits. According to the 1971 census[17] about 1.5 per cent of the estimated 16.45 million dwellings in England and Wales were occupied by more than one household.[18] Now in the case of BGC the percentage of multiple occupancy households will be lower than this because many dwellings that are counted as having more than one household from the point of view of the Census will be flats where the occupiers are separate customers of the Gas Corporation. There remains the problem of a landlord letting

his house into bedsitting-rooms and flats and having a separate meter for each room. However, on the evidence available[19] it appears that less than half of one per cent of meters are located in multiple occupancy dwellings. Thus it is assumed that the problem will not be significant. Hence the number of domestic customers will be taken as a proxy for the number of domestic meters.

(ii) Commercial and public administration customers

This category includes things like offices, schools, colleges and universities in addition to shops, hotels, public houses, garages and so on. There will be multiple meters per customer mainly in the public administration category. For example a university will be regarded by the Gas Corporation as being one customer, but it is likely to have a number of meters e.g. one in each hall of residence; one in each separate teaching building; and one in the administrative block.

From the information available to the author it appears that a ratio of two to one commercial customer is a reasonable estimate to use.

(iii) Industrial customers

To the extent that a firm has separate premises it will have more than one meter. A firm may also have a secondary or sub-meter where an interruptible load contract is in existence. An interruptible contract is made where the gas corporation agrees to sell gas to the firm at a reduced price, in return for which the firm is prepared to be switched off temporarily, at short notice, when BGC requires the gas to

supply peak demand elsewhere. This will be the case for example in the middle of a cold winter. The firm will then switch to the use of an alterative fuel, in many cases oil.

Again, on the basis of the confidential information supplied to the author an average ratio of two meters to one industrial customer is a reasonable estimate.

On this basis, then there are 13,365,000 domestic meters and 1,120,000 industrial and commercial meters (twice 560,000). The next problem is to estimate prices for each type of meter.[20] Prices vary greatly especially industrial gas meter prices. Prices for industrial meters range from £47 for a small 1¼ inch diameter connection[21] to around £900 for special meters. However, it must be borne in mind that BGC receives a discount of approximately one third off the above prices to private customers. Thus the following prices were used in the calculations of the replacement cost of meters:

		£
Domestic -	prepayment	18.67
	credit	12
Industrial/ Commercial	- average	120

It will be observed that there are two types of domestic meter, prepayment and credit. In recent years there has been an accelerating trend towards the use of credit meters because from the gas corporation point of view it is cheaper to read a meter for credit than to send someone to collect the money. Also, credit meters are more secure, i.e. there is not the danger of losses due to theft. The tariffs of BGC reflect this; it is advantageous to all customers, except very small users of gas, to have a credit meter. However, a

large number of prepayment meters remain. Hence it is necessary to estimate the split between prepayment and credit meters. Using the information available a split of 25 per cent prepayment and 75 per cent credit meters was estimated. Now BGC had 13,365 million domestic customers at the end of the 1975/76 financial year. On this basis 3,341,250 were prepayment customers and 10,023,750 were credit customers.

Using this information the replacement cost of meters could be estimated. For 1975/76 the replacement cost (R_{76}) would be given by:

$$R_{76} = P_{76}(ACP_{76}) + C_{76}(ACC_{76}) + I_{76}\ (ACI_{76})$$

where AC = average cost of meter
P = prepayment customers
C = credit
I = industrial and commercial.

However, whilst this approach is satisfactory for recent years it had to be abandoned for estimating replacement cost over the period 1960/61 to 1977/78. This is because it was impossible to obtain a full series of meter prices for the period as the manufacturer did not keep the information for this length of time. It also proved impossible to obtain information to verify that the proportions of types of customers, and of the split between credit and prepayment meters had remained constant.

The methodology used throughout the period was to estimate an age profile of meters in the same manner as that

described for previous assets. The age profile was estimated at fifteen years by this method. This compares with a depreciation life of meters and electronic control equipment of ten years used by BGC.[22] It is felt by the author that a fifteen year age profile errs on the correct side as casual empiricism would suggest that the life of the most meters is for longer than ten years. There is also some evidence (G7, para 4.5) that book depreciation lives are on the whole shorter than actual depreciation lives. This asset category has not been significantly affected by the changes necessitated by the coming of North Sea Gas. Rather than replace the whole meter, in order that the higher pressure natural gas could be controlled correctly, a governor was fitted to each meter. Hence a constant age profile over our period is assumed.

The annual investments in meters were adjusted by the following indices:

(i) process measuring and control instruments (MLH 354/2) for the period 1977/78 to 1957/58.

(ii) the wholesale price index spliced onto (i) prior to 1957/58.

The latter index was used because the index for 354/2 is not published before 1958Q1. A number of possible alternative indices were investigated, for examples the iron and steel index, the index for industrial hollow-ware and the US index for metal containers (unadjusted and adjusted for differential inflation rates). However, by inspection the wholesale price index proved to be the best fit.

Using the above information the gross replacement cost value of meters (R_T) may be obtained, for any given year by satisfying the following:

$$R_T = \sum_{t=T-15}^{T} r_t \left(\frac{RI_T}{RI_t}\right)$$

where r_t = annual investment in meters
RI_T = index for meters at end of age profile
RI_t = average annual index for meters for each year in the age profile

7. Motor vehicles and mobile plant

Ideally it would be preferred if data were available on the number of cars, vans, lorries etc. owned, together with an age distribution. Obviously in the absence of a comprehensive asset register, this would be impossible to achieve. However, replacement cost valuation may be arrived at by taking the latest available year end total of gross investments less historic cost displacements and disposals since vesting day and then adding back the investments made in each year until this figure is arrived at.[23] This should range between three and five years, as these are the current depreciation periods of cars and vans, and commercial vehicles respectively.[24] This provides an approximate age distribution. When the exercise was carried out the age profile was found to range from seven years (1977/78) to eight years (pre 1970/71). This may be explained by the fact that until recently the depreciation period for this category was five to ten years, so that the change to a shorter depreciation period is still working its way through.

Given the age profile the gross replacement cost value of mot r vehicles may be estimated in two ways. The first method is to estimate the average cost of an item in this category (ACV_t), typically the "gasboard van", in the year of purchase, and dividing it into the annual investment (v_t) the number of vehicles purchased (w_t) each year is obtained.

The gross replacement cost valuation of motor vehicles and mobile plant (V_t) is then obtained by:

$$V_T = N_T(ACV_T) \qquad \text{where } N_T = \sum_{t=T-n}^{T} w_t$$

ACV_T = average cost of a van in the current year.

However, whilst this method can be used with the available data,[25] it was felt that a more appropriate method would be to take the age profile as calculated and to multiply each V_t by the ratio of the index of motor vehicle prices at the end of the period to the average motor vehicle price index for each year (t) in the age profile. Symbolically, the following expression is to be solved:

$$V_T = \sum_{t=T-n}^{T} v_t \left(\frac{VI_T}{VI_t}\right)$$

where: v_t = annual investment in vehicles
n = length of age profile
VI_T = index for motor vehicles at end of age profile
VI_t = average annual index for motor vehicles, for each year in age profile.

This second method is to be preferred because the index takes into account more than one type of motor vehicle, which is more representative of the real state of affairs. Moreover, purely from a pragmatic viewpoint, the data is more readily

available. It proved almost impossible to obtain prices for one van throughout the whole period since records are not kept for that length of time, nor was the model in existence throughout the period.

The indices used for adjusting the annual investment-data were:

(i) wholesale price index for motor vehicles (covering MLH classes 380 to 385) for 1977/78 to 1960/61.

(kk) the general wholesale price index, non-food manufacturing, for pre 1960/61.

The index for motor vehicles using MLH 381 was thought to be most appropriate but this index was not published prior to 1963. Other indices were investigated, for example the UK Iron and Steel index, and US motor vehicle index (adjusted for different general inflation rates). By inspection on a graph the general wholesale price index was seen to approximate best to the index for MLH 380-385.

8. Furniture, fittings and office machinery

Since no method of estimating numbers of "typical" furniture, fittings and office machinery could be readily identified the approach used was as described in previous sections of this chapter, such that the following equation is solved to yield the gross replacement cost of furniture etc (F_T):

$$F_T = \sum_{t=T-n}^{T} f_t \left(\frac{FI_T}{FI_t}\right)$$

where: f_t = annual investment in furniture.
n = length of age profile
FI_T = index for furniture etc. at end of age profile

FI_t = average annual index for motor vehicles for each year in age profile

The age profile of furniture and fittings was found to range from eight years (1977/78) to eleven years (prior to 1968/69). This compares to a depreciation life of five years used by BGC. The difference is accounted for by a reduction in the depreciation life from ten years which is still working its way through existing furniture and fittings.

The indices used were:

(i) Wholesale price index for metal furniture, office and works equipment (MLH 399/1) for 1977/78 to 1957/58.

(ii) wholesale price index for domestic furniture, spliced into (i), for 1957/58 to 1952 Q1.

(iii) the US Commercial Furniture series adjusted for different levels of general inflation for 1952 Q1 to 1949/50.

As with all other assets, where the age profile extended back beyond 1949/50,[26] annual investments were estimated by assuming that they were equal, in real terms, to the average of the annual investments in the years 1949/50 to 1951/52.

9. Miscellaneous

The very nature of this category makes it difficult to arrive at anything more than a very rough estimate of its replacement cost. The data as presented in the accounts indicate that there has been much change in the definition of miscelleneous since vesting day.

The age profile was thus estimated by summing backwards

until the annual investments equalled the total of investments less displacements, for each year in the period 1977/78 to 1960/61. The age profile was found to range from sixteen years (1977/78) to nine years (1974/5).

Since this asset is heterogeneous it is possible only to use a general index to make adjustments. The index thus chosen was the index of wholesale prices: all manufacturing industry manufactured products: home sales, not seasonally adjusted.

By solving the following equation the estimated replacement cost valuation (Z_T) is obtained:

$$Z_T = \sum_{t=T-n}^{T} z_t \left(\frac{ZI_T}{ZI_t}\right)$$

where z_t = annual investment in miscellaneous in year t.
ZI_T = price index for miscellaneous at end of age profile
ZI_t = annual average index for each year in the age profile
n = length of age profile

Summary and Conclusions

In summary, it is seen that the methodology used was the same for each asset. For any year in the period an age profile was estimated by summing back the gross annual investments in each asset until the sum equalled the total of investments less displacements and disposals since vesting day at that year end. Each annual investment was then adjusted to obtain the estimated replacement cost valuation. This was achieved by multiplying the annual investment by the ratio of the year's end index to the average annual index

for each year in the age profile.

That this method is not perfect is readily admitted. But data deficiencies prevented the use of any alternative method. Even where data were available so that alternative methods could be used, for example in the case of motor vehicles, there were stronger arguments in favour of using price indices. Price indices provide a broader base than the average cost of a "typical" asset. Secondly, there is at least some evidence that price indices are better guides to estimating replacement cost than current suppliers price lists (3, pp 249-50). Two further arguments are adduced in favour of the methodology used here. It provides a consistent approach for each asset and it provides a suitable basis for the calculations of annual depreciation provisions, which are used to estimate net book values. These are discussed in the next chapter.

A final point concerning the methodology used by the author relates to the problem of whether this methodology estimates exactly, underestimates or over-estimates the actual replacement cost of the assets of BGC. It is felt that in total replacement cost will be slightly over-estimated because of the weighting introduced by using a long age profile for mains, which is by far the largest asset category.

At the beginning of this chapter a table showing the historic cost gross book values of the assets of BGC was presented. The following table reproduces the information shown there and presents the estimated gross replacement cost of the assets of BGC for 1977/78. The results for the

Table 2: Comparison of the Historic Cost and Replacement Cost Gross Book Values of BGC - 1977/78

Type of Asset	Historic Cost		Replacement Cost		Replacement Cost as a proportion of Historic cost
	£m	%	£m	%	
Land and Building	133.7	5.6	339.9	4.0	2.5
Mains	1365.8	57.2	5770.2	67.8	4.2
Services	261.3	11.0	888.9	10.4	3.4
GasHolders and other Storage	89.6	3.8	249.8	2.9	2.8
Plant and Machinery	324.8	13.6	763.0	9.0	2.4
Meters	123.0	5.2	301.7	3.5	2.5
Motor Vehicles	24.7	1.0	54.9	0.6	2.2
Furniture, Fittings etc.	18.7	0.8	32.7	0.4	1.8
Miscellaneous	42.2	1.8	117.1	1.4	2.8
Total	2383.8	100.0	8518.2	100.0	3.6

period 1960/61 to 1977/78 are presented in Part 3 Appendix IV table 1(a).

Clearly, gross historic cost book values understate replacement cost gross book values. Historic cost gross book values are only about one quarter the size of replacement cost gross book values. Whilst for most assets replacement cost is about two to three times greater than historic cost for mains and services it is 4.2 and 3.4 times as great, respectively. As these two assets together account for two thirds of historic cost valuation it is they who are mainly responsible for the excess of replacement cost over historic cost being as large as it is. To some extent this difference is accounted for by the longer age profile used in calculating the replacement cost of mains, but as the age profile for services was shorter than the historic cost depreciation life the difference must be attributable to the increase in the relative price of the steel content of steel tubes.

In part 2 of this thesis, the attempts of BGC at inflation accounting were outlined. It was pointed out there that, whereas BGC have introduced a supplementary depreciation charge they have published no data on the replacement cost of the assets to which this depreciation relates. However, estimates of replacement cost were made available to the author on the understanding of confidentiality. On the whole it appears that the estimates presented here are within about ten per cent of the estimates made by BGC.

Part 3. Ch. 2

Estimates of the Replacement Cost Rates of Return of BGC - 1960/61 to 1977/78

Introduction

In the previous chapter estimates of gross replacement cost of the fixed assets of BGC were presented. This chapter presents the results of adjusting the profit and asset data of BGC for inflation along the lines laid out in part 1.

Adjustments to Historic Cost Data

A. Asset Valuation

1. Fixed Assets

Fixed assets were revalued using specific indices. The methodology was outlined in the previous chapter. The same approach was used to value fixed assets using the general, i.e. retail price, index (see Pt.3 Appendix IV Table 1(b) for the results).

To arrive at net book value the following approach was used. Firstly annual replacement cost depreciation was calculated. This is also necessary for calculating pre-interest income. For any year in the period 1960/61 to 1977/78 each estimated replacement cost of the annual investment for each year in the age profile was divided by the length of the age profile. The totals of each of these provide the annual depreciation provision for each asset. Symbolically, the general expression for

annual depreciation provision for any asset (D_T) is given by:-

$$D_T = \sum_{t=T-n}^{T} \frac{x_t}{n} = \sum_{t=T-n}^{T} d_t$$

where: x_t = replacement cost of each annual investment in the age profile

n = length of age profile

$d_t = \frac{x_t}{n}$

Having obtained d_t and D_T the net book value (NBV) of any asset in any year can be found by the following. It was argued in part two that the net book value is not the replacement cost gross book value less the sum of the annual replacement cost depreciation provisions, since earlier provisions serve to provide for the replacement cost of the asset at what it is estimated to be in the ealier years not at the end of its life. Rather the NBV is estimated by subtracting from each annual investment's replacement cost the current depreciation provision multiplied by the number of years of that investment's life that have expired. Thus with an eight year age profile the latest investment has subtracted from it one years' depreciation and the investment made eight years ago has eight years depreciation subtracted.[27] Thus, symbolically, the NBV of each annual investment in the age profile (b_t) is given by:

$$b_t = x_t - (d_t \ a)$$

where a = no. of years in the age profile that have expired.

The NBV for each asset in any year (B_T) is thus given by:

$$B_T = \sum_{t=T-n}^{T} b_t$$

The annual replacement cost depreciation estimates, using specific indices are presented in Part 3, Appendix IV Table 2, and the replacement cost NBV's using both specific and general indices are given in Part 3, Appendix IV Tables 3(a) and (3(b).

An additional adjustment was made to the estimated Net Book Values for the years 1975/76 to 1977/78.[28] In 1975/76 BGC began to charge the cost of replacing certain categories of assets directly to revenue. For purposes of this exercise it was decided that this charge rightly belonged to annual investment. It was treated separately because it is not clear precisely to which assets this amount relates. The results of the adjustment are shown alongside the NBV of fixed assets in Table 1.

2. Other Assets and Liabilities

(i) Stocks were revalued using the general wholesale price index, as this category includes gas, appliances and other stores.

(ii) all other assets and liabilities are regarded as being monetary and thus are entered at the same amounts as shown in the historic cost accounts. This includes "Displaced Plant" account which contains the historic cost, less depreciation provisions, of assets made obsolete by the advent of natural gas. As such the replacement cost valuation is of no interest.

The total net assets, broken down by type, are shown for the period 1960/61 to 1977/78 in Table 1.

B. Profit Valuation

(i) Turnover and operating costs

These were adjusted by the retail price index (1970 =100) such that recognition was made of the fact that turnover accrues and costs are incurred throughout the year. Thus in order that all turnover and costs are measured in year-end £s' the totals at the end of the year were multiplied by the ratio of the year end index to the average index for the year.

It was assumed that deferred charges and displaced plant were deducted at the year end.

(ii) Replacement cost depreciation

See section A above for method of calculation.

(iii) Cost of Sales adjustment

See part 1 Appendix IV part I for the methodology.

(iv) Adjustment for maintenance of real value of net monetary assets

Net monetary assets, are, basically, net trade assets. These were adjusted, using the retail price index, by the averaging method, as for stocks etc, to convert to year-end £s'. This provides the amount to which net monetary assets would have to rise to maintain their real value. The difference between this and historic cost is the necessary adjustment to maintain real value.

Table 1: Replacement Cost Net Assets of BGC £m

	1977/78	1976/77	1975/76	1974/75	1973/74	1972/73	1971/72	1970/71	1969/70
1. Fixed Assets replacement cost NBV	4839.9	4356.8	3457.4	3159.7	2034.5	1791.7	1685.4	1638.6	1472.6
2. Capital expenditure charged to revenue by BGC - replacement cost NBV.	203.1	110.6	49.5	-	-	-	-	-	-
3. Deferred charges: conversion to natural gas	-	148.3	273.3	295.9	293.2	256.5	248.0	173.9	76.3
4. Displaced plant	-	82.3	137.6	143.2	122.0	90.6	64.0	25.0	16.2
5. Investments	33.7	65.5	57.6	32.8	21.6	22.8	20.8	20.6	18.1
6. Hire purchase and deferred payment accounts	73.7	65.4	59.3	51.3	52.9	54.3	54.3	49.2	51.3
7. Balance of Compensation & balance of discount on British Gas Stock	-	-	-	-	-	-	4.8	6.0	6.8
Current assets & liabilities									
8. Stock replacement cost	120.3	135.5	112.6	97.4	79.3	80.4	78.0	91.3	90.5
9. Monetary assets‡	591.0	520.4	451.5	377.8	314.8	239.0	248.4	244.0	208.8
Less:									
10. Monetary liabilities*	(347.0)	(278.8)	(266.4)	(229.4)	(177.7)	(148.5)	(148.6)	(165.0)	(150.1)
11. Net bank overdraft+	21.4	(5.0)	(6.6)	(5.1)	(6.3)	(6.1)	(5.9)	(7.4)	(8.3)
Total after bank overdraft	5536.1	5201.0	4324.8	3923.6	2734.3	2380.6	2249.2	2076.2	1782.2
Add back bank overdraft	(21.4)	5.0	6.6	5.1	6.3	6.1	5.9	7.4	8.3
Total net assets	5514.7	5206.0	4331.4	3928.7	2740.6	2386.7	2255.1	2083.6	1790.5

Notes: Fixed Assets of former undertakings, shown in Gas Council accounts pre 1973, disappear here as they are included within the replacement cost estimates.

‡ includes debtors, accrued revenue, prepayments, money market investments, government compensation receivable; excludes cash.

* includes current liabilities and provisions, and other temporary deposits: excludes bank overdrafts.

+ BGC distinguish "Bank loans and overdrafts" and "Bank overdrafts", the former is treated as a capital liability, the latter as a current liability. Here they are all treated as capital liabilities.

Table 1 (contd): Replacement Cost Net Assets of BGC £m

	1968/69	1967/68	1966/67	1965/66	1964/65	1963/64	1962/63	1961/62	1960/61
1. Fixed Assets replacement cost NBV	1194.3	1067.7	848.0	685.8	609.2	568.9	518.3	504.9	499.4
2. Capital expenditure charged to revenue by BGC - replacement cost	-	-	-	-	-	-	-	-	-
3. Deferred charges	30.6	6.4	0.9	-	-	-	-	-	-
4. Displaced Plant	7.7	1.3	1.5	1.5	1.5	1.1	1.2	0.2	-
5. Investments	16.1	7.4	4.6	4.9	4.8	5.0	5.5	5.8	5.5
6. Hire purchase and deferred payment accounts	51.4	50.1	52.2	58.2	56.9	50.9	46.7	45.2	46.0
7. Balance of compensation & balance of discount on British Gas Stock	8.6	8.7	9.3	9.5	11.3	14.6	15.1	17.9	18.5
Current assets & liabilities									
8. Stocks replacement cost	87.5	92.2	81.8	65.1	63.8	58.4	51.0	53.8	54.2
9. Monetary assets	194.4	165.1	144.1	133.8	123.6	115.9	110.1	96.9	85.5
Less:									
10. Monetary liabilities	(159.5)	(152.4)	(117.3)	(104.0)	(83.5)	(78.8)	(76.5)	(66.0)	(60.0)
11. Net bank overdraft	(6.3)	(8.4)	(4.1)	-	(4.1)	(4.1)	(4.1)	(2.8)	(0.5)
Total after bank overdraft	1424.8	1238.1	1021.0	854.8	783.5	731.9	663.3	655.9	648.6
Add back bank overdraft	6.3	8.4	4.1	-	4.1	4.1	4.1	2.8	0.5
Total net assets	1431.1	1246.5	1025.1	854.8	787.6	736.0	671.4	658.7	649.1

Table 2: Pre-interest replacement cost profit of BGC £m

	1977/78	1976/77	1975/76	1974/75	1973/74	1972/73	1971/72	1970/71	1969/70
Turnover‡ - adjusted for inflation	2694.1	2128.3	1731.4	1335.7	1033.0	947.8	811.6	718.3	678.7
Less:									
Operating costs - " " "	1653.5	1286.5	1147.5	934.9	714.2	632.6	564.4	522.2	505.7
Deferred charges - (unadjusted)	155.7	148.3	87.0	73.9	44.6	32.8	16.9	11.3	5.7
Displaced plant - (")	83.2	80.6	48.7	38.2	30.0	13.4	-	-	-
Pre-interest, pre-depreciation trading surplus	801.7	612.9	448.2	288.7	244.2	269.0	230.3	184.8	167.3
Deduct:									
Replacement cost depreciation+	367.1	322.1	274.3	262.3	203.8	176.6	161.6	140.5	124.9
Cost of sales adjustment	14.1	20.6	15.4	19.3	11.1	4.9	4.2	7.0	4.7
Adjustment for maintenance of real value of net monetary assets	10.5	18.6	17.7	14.2	7.4	4.3	3.6	3.3	1.4
	410.0	251.6	140.8	(7.1)	21.9	83.2	60.9	34.0	36.3
Add:									
Real holding gain on assets*	1234.7	1008.7	604.4	943.6	222.2	67.3	78.5	80.4	106.2
Real holding gain on stocks	1.8	1.6	(1.5)	2.1	1.4	(1.3)	(0.8)	(0.3)	0.1
Pre-interest replacement cost profit	1646.5	1261.9	743.7	938.6	245.5	149.2	138.6	114.1	142.6

‡ includes interest receivable.

\+ includes an apportionment of "capital expenditure charged to revenue" 1975/76 to 1977/78.

* includes holding gain on "capital expenditure charged to revenue" 1975/76 to 1977/78.

Table 2 (cont) : Pre-interest replacement cost profit of BGC £m

	1968/69	1967/68	1966/67	1965/66	1964/65	1963/64	1962/63	1961/62	1960/61
Turnover‡ - adjusted for inflation	663.9	600.0	565.0	574.1	538.9	500.1	486.0	448.9	420.7
Less:									
Operating costs - " " "	514.7	509.1	479.1	489.2	459.1	435.1	423.1	388.7	364.7
Deferred charges - (unadjusted)	2.2	0.5	-	-	-	-	-	-	-
Displaced plant - (")	-	-	-	-	-	-	-	-	-
Pre-interest, pre-depreciation trading surplus	147.0	90.4	85.9	84.9	79.8	65.0	62.9	60.2	56.0
Deduct:									
Replacement cost depreciation+	105.7	94.8	79.7	68.7	62.6	59.2	55.5	54.7	53.3
Cost of sales adjustment	2.1	3.0	1.2	1.5	2.1	1.1	0.5	0.8	1.3
Adjustment for maintenance of real value of net monetary assets	1.1	0.2	0.5	0.6	0.9	0.2	0.5	0.7	0.3
	38.1	(7.6)	4.5	14.1	14.2	4.5	6.4	4.0	1.1
Add:									
Real holding gain on assets*	(28.5)	22.9	16.0	10.5	18.2	32.0	24.8	32.0	43.5
Real holding gain on stocks	(1.6)	0.1	(0.8)	(0.6)	(0.3)	0.2	(0.5)	(0.8)	(0.1)
Pre-interest replacement cost profit	8.0	15.4	19.7	24.0	32.1	36.7	30.7	35.2	44.5

‡ includes interest receivable.

\+ includes an apportionment of "capital expenditure charged to revenue" 1975/76 to 1977/78.

* includes holding gain on "capital expenditure charged to revenue" 1975/76 to 1977/78.

(v) Real holding gains

These are calculated by taking the difference between NBV on a specific index basis and NBV using a general index. For fixed assets these are presented in detail in Part 3, Appendix IV Table 3(c).

After all these adjustments had been carried out pre interest replacement cost profit was estimated. The results are presented in Table 2.

Digression

Before considering the replacement cost rate of return a digression is made to compare the replacement cost depreciation provisions calculated here with those used by BGC. The comparative data are shown in Table 3.

Table 3: Comparison of Replacement Cost Depreciation Provisions

	1977/78		1976/77	
	£m	£m	£m	£m
MY DATA		351.6		313.9
BGC[1] Historic	196.0		176.4	
Supplementary	145.4		102.6	
BGC Total		341.4		279.0
MY ERROR	+3.0%		+ 12.5%	

Notes: 1. Source: D12, p.38.

Comparison can only be made for two years as BGC have only provided supplementary depreciation provisions for this number of years. Consequently, it is not clear whether the 1977/78 data represent a sustained convergence of the two approaches. It is known that the BGC approach was different for 1976/77 than the approach used by the present author, and that the method used by BGC was likely to lead to an underestimate rather than the reverse. For example not all assets were revalued. Nor did BGC have a complete asset register in 1976/77 on which to base revaluations. It is suggested that the convergence in 1977/78 is due to improvements made by BGC in these areas of their methodology. The method used by the present author may lead to overestimates particularly with respect to mains where a long age profile was used.

In sum the two approaches may reasonably be said to produce results which are not too dissimilar.

Replacement Cost Rate of Return on Net Assets

In Table 4 the results of the exercise for the full period 1960/61 to 1977/78 are presented. It should be noted that the data on historic cost rates of return have been adjusted to fit the definitions of profit and capital laid out in part one of this thesis.

The trends of the historic cost series and the replacement cost series (excluding holding gains) appear similiar, but with the former about four per cent per annum higher, until 1973/74. After this date the two series diverge, a very

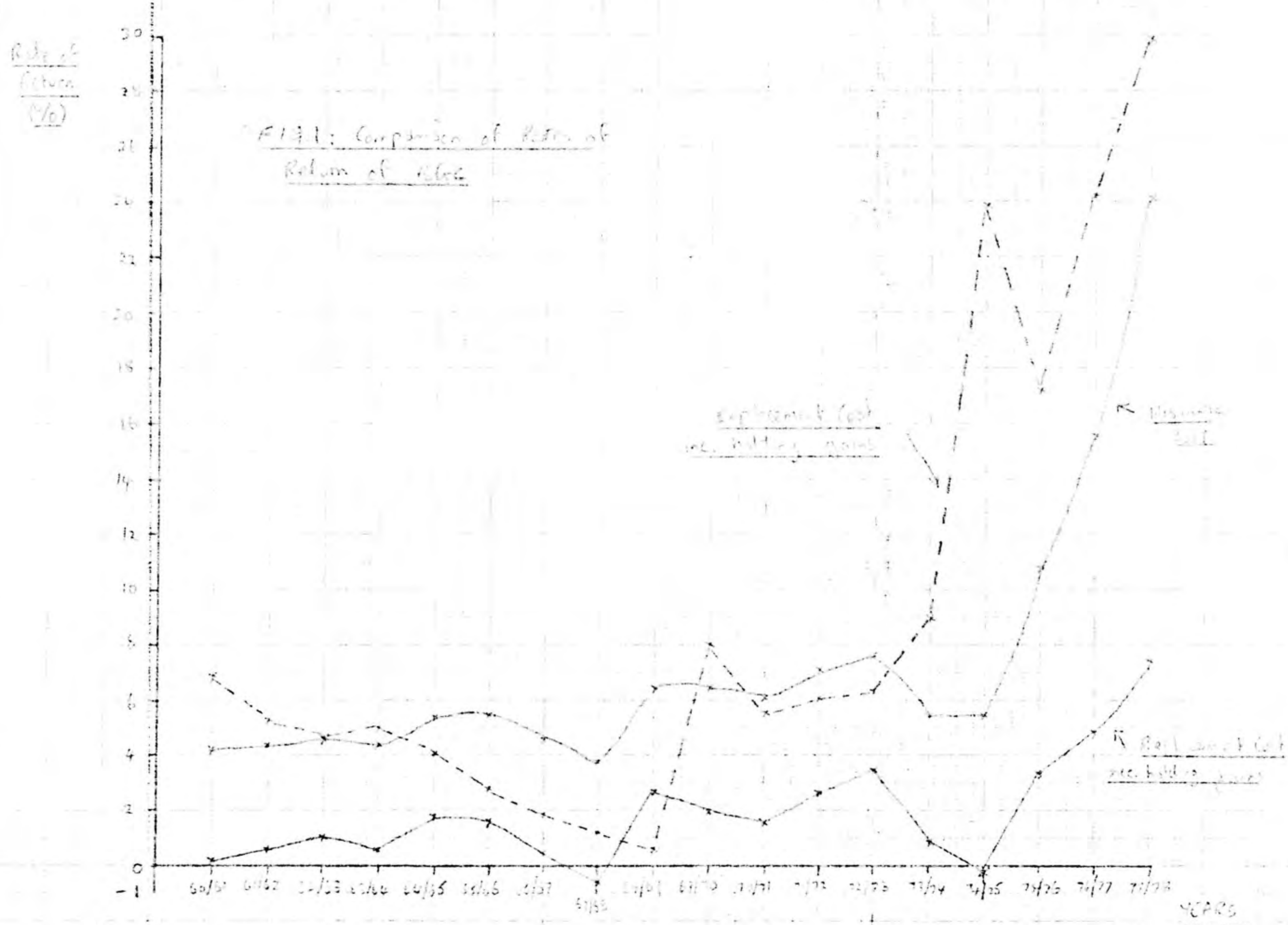
Table 4: Pre-interest Rates of Return of BGC - (bank overdraft included in assets)

YEAR	RATE OF RETURN*		
	Historic cost**	Replacement Cost***	
		inc.holding gains	exc.holding gains
	%	%	%
1960/61	4.2	6.9	0.2
1961/62	4.4	5.3	0.6
1962/63	4.6	4.6	1.0
1963/64	4.4	5.0	0.6
1964/65	5.4	4.1	1.8
1965/66	5.5	2.8	1.6
1966/67	4.6	1.9	0.4
1967/68	3.8	1.2	- 0.6
1968/69	6.5	0.6	2.7
1969/70	6.5	8.0	2.0
1970/71	6.1	5.5	1.6
1971/72	7.1	6.1	2.7
1972/73	7.7	6.3	3.5
1973/74	5.5	9.0	0.8
1974/75	5.5	23.9	- 0.2
1975/76	10.8	17.2	3.3
1976/77	15.6	24.2	4.8
1977/78	24.1	29.9	7.4

* as defined in pt.1.

** Average net assets as the denominator. See Part 3 Appendix IV Table 4 for details.

***The method of calculation of replacement cost takes into account that assets are acquired throughout the year, thus there is no need to take the average.



Note: Discontinuities in Replacement cost series indicate years where pre interest losses were made

clear demonstration of the overestimation inherent in historic cost data in times of rapid inflation.

When the replacement cost series, including holding gains, is considered a different picture emerges. This series appears to be very erratic, as might be expected since this reflects changes in relative prices.

It is interesting to note that this series rises above the historic cost rate of return series after 1972/73. From Part 3, Appendix IV Table 3(c) it is apparent that this is due to the real unrealised holding gains being obtained on mains and services after this date. This is a reflection of the change in the relative prices of steel, and hence of steel products.

Replacement Cost Rate of Return for BGC compared with that for industry in general

A number of institutions have produced estimates of the replacement cost rate of return on capital for industry in general. Four of the most readily accessible series of estimates are reproduced in Part 3, Appendix IV Table 6. The Monopolies Commission series and the NEDO series are estimates for large, quoted, U.K. Manufacturing companies. The Trade and Industry and Bank of England series are for industrial and commercial companies.

In choosing the most suitable series to compare with the BGC series the Monopolies Commission and the NEDO series may be readily disposed of. As BGC is not a manufacturing concern it seems unrealistic to compare its performance

with that of manufacturing companies.[29] The series for industrial and commercial companies is to be preferred.

Both the industrial and commercial companies series considered used the same data base,[30] but different adjustments are made to the data. As Part 3, Appendix IV Graphs 1 and 2 show, both series follow almost exactly the same trend for most of the period. The only years of divergence are 1968 to 1971. The choice between the two must be somewhat arbitrary, but it was decided to use the Trade and Industry series on the grounds that it was slightly more complete and demonstrated a slightly smoother trend.

Before direct comparisons could be made, however, it was necessary to make adjustments, so that the BGC and the Trade and Industry series were constructed on comparable bases. This entailed the deduction of the net bank overdraft from net assets in the BGC historic cost and replacement cost series; and the adjustment of the BGC income data to reflect only replacement cost depreciation and the effects of stock appreciation. The adjusted data are presented in Table 5 (for details see Part 3, Appendix IV Tables 5,6)

The BGC and Trade and Industry series are compared in Figure 2.

The comments on Figure 2 fall into two areas:

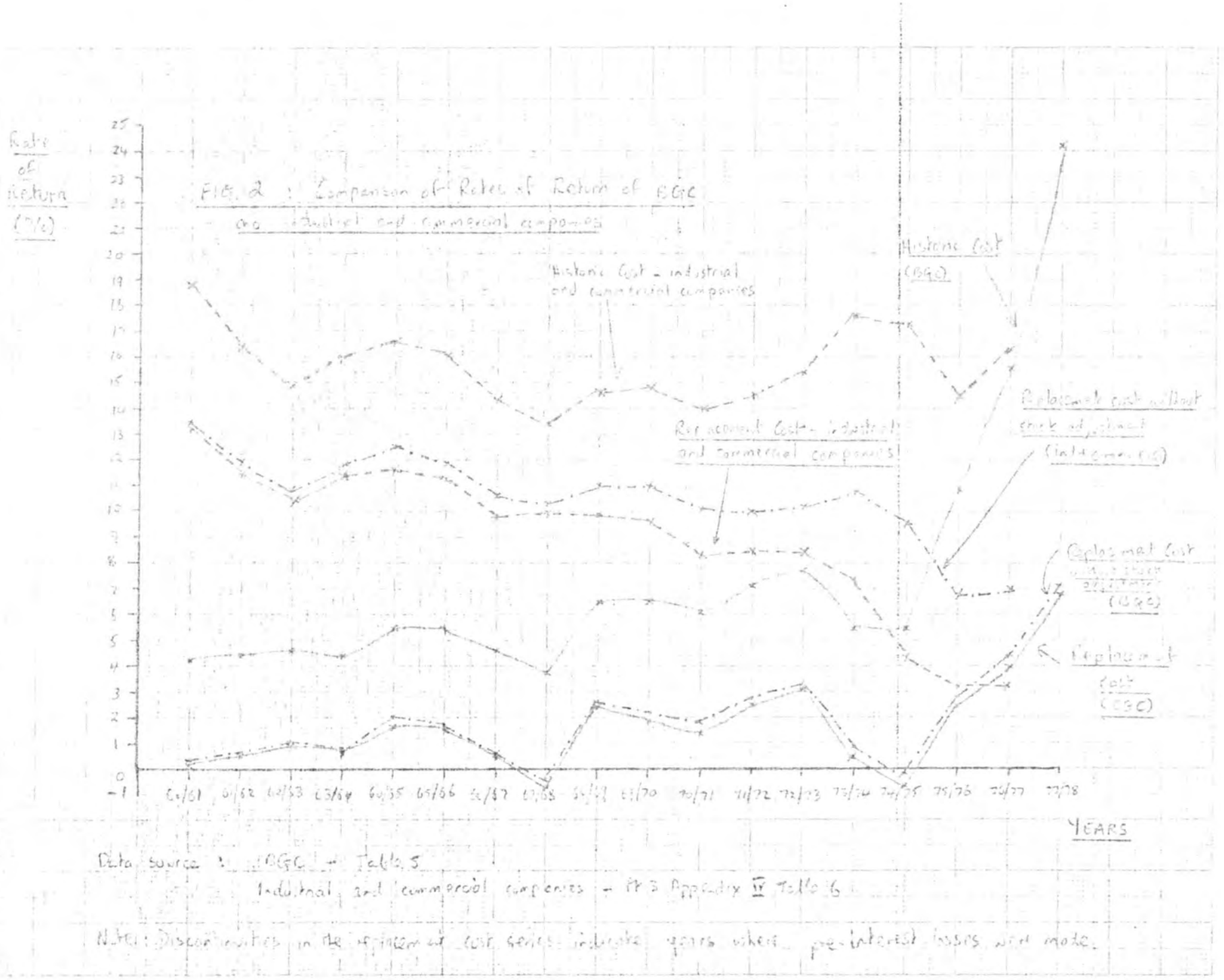
(i) the recovery of BGC since 1974/75, using the historic cost yardstick, is striking. It is not matched by a recovery in the general historic cost index. That the historic cost

Table 5: Pre-interest rates of return of BGC - (excluding bank overdraft; inflation adjustments limited to depreciation, cost of sales and replacement cost fixed asset valuation).

Year	Historic Cost* Rate of Return	Replacement Cost Rate of Return	
		With stock adjustment	Without stock adjustment
	%	%	%
1960/61	4.2	0.1	0.3
1961/62	4.4	0.5	0.6
1962/63	4.6	0.9	1.0
1963/64	4.4	0.6	0.7
1964/65	5.5	1.7	2.0
1965/66	5.5	1.5	1.7
1966/67	4.6	0.4	0.5
1967/68	3.8	-0.7	-0.5
1968/69	6.5	2.4	2.6
1969/70	6.5	1.9	2.2
1970/71	6.1	1.4	1.8
1971/72	7.1	2.5	2.7
1972/73	7.7	3.1	3.3
1973/74	5.5	0.5	0.9
1974/75	5.5	-0.7	-0.2
1975/76	10.9	2.5	2.8
1976/77	15.6	4.0	4.4
1977/78	24.2	6.8	7.1

* average net assets

Source: See Part 3, Appendix IV, Tables 4,5 for details.



Data source : BGC - Table 5

Industrial and commercial companies - PR 3 Appendix IV Table 6

Note : Discontinuities in the replacement cost series indicate years when pre-interest losses were made.

rate of return of BGC has so improved is attributable, basically to the expansion in demand for gas since the 1973 fuel crisis, the relaxation of price controls in the nationalised industries and the increases in gas prices sanctioned, against the industrys advice, in April 1977 as part of the efforts by the Chancellor of the Exchequer to reduce the public sector borrowing requirement.

It should be borne in mind that the pre-interest historic cost rates of return as published by BGC since 1975/76 are 8.6 per cent (1975/76), 9 per cent (1976/77), and 14.2 per cent (1977/78). These are to be compared with the historic cost rates of return for these years shown in Table 5. Since 1975/76 BGC have deflated their historic cost rate of return by charging capital to revenue, and by charging supplementary depreciation (since 1976/77). The data in Table 5 have these deductions added back so that the rates of return are comparable for the whole period.[31].

(ii) The real rate of return on capital in the gas industry is almost as high as that for industrial and commercial companies if deductions are not made from profit for stock appreciation.When stock appreciation is deducted the real rate of return of BGC exceeds that for industrial and commercial companies for the last two financial years in the period. Clearly, stocks are fairly negligible in the context of BGC when compared with industry in general.

The findings presented here would suggest that in the

last two years the real rate of return of BGC has not been below that earned by the private sector, which is the claim of BGC in justifying its profit levels (D12,p8). On the contrary, it has exceeded the real rate of return in industry generally.

Summary and Conclusions

The method of adjusting the gross asset replacement cost data presented in part 3 chapter 1 has been outlined here. By subtracting replacement cost depreciation net replacement cost book values were obtained. Adjustments were also made in respect of the replacement cost of certain assets charged to revenue by BGC but which, using the definition of assets outlined in part 1 chapter 1, should be added to capital stock. Stocks were revalued using the general price index whilst other assets were regarded as monetary and were left unadjusted.

The adjustments to profit were also made according to the model set out in part 1 chapters one and two.

It was shown that, despite the problems of obtaining data to make the adjustments for inflation, the depreciation provisions produced here compare reasonably well with those provided by BGC over the two years for which comparisons can be made. But it is possible that the method used here overestimates slightly, particularly in the case of mains where a long age profile was used.

Two series of replacement cost rates of return have

been produced. The first, using the model developed here, enabled comparisons to be made with the historic cost rates of return earned by BGC. The series excluding real holding gains follows a similar trend to the historic cost series but at a level of about four per cent per annum lower, until 1973/74 when the two series diverge. This reflects the increased burden of providing for the replacement of assets. The series including holding gains behaves more erratically since relative prices may be expected to move in favour of or against the gas industry over time. Much of the excess of this series over even the historic cost series after 1972/73 is attributable to the massive real holding gains on mains and services.

The second series confined its adjustments to revaluing capital at replacement cost, and adjusting income for replacement cost depreciation and for the increased cost of sales. These adjustments are those suggested by the Hyde Guidelines. A number of replacement cost series for industry in general exist. It was decided that the series produced in Trade and Industry was the most suitable for comparisons with BGC. The main points to emerge from the comparison of BGC with industry in general are, firstly, that using historic cost data BGC has recovered relative to general industry after 1974/75. Indeed, after 1976/77 the historic cost rate of return of BGC exceeds that for general industry. Secondly, the replacement cost rate of return of BGC is below that of industry in general for most of the period but exceeds it in

the last two financial years if stock appreciation is deducted. This is a finding contrary to the view expressed by BGC (D12, p.8) that its profit levels have been below those for private industry.

Part 3 Footnotes

1. It is important to remember that since the formation of BGC in 1973 no regional accounts are published. This has meant a great reduction in the published information available to the public.

2. Prevesting day, 1st May 1949, gas, electricity and water often were controlled by local authorities under the general heading of public utilities. These were usually based on the same site. On nationalisation it was considered too complex a task to identify each separately for accounting purposes. Thus a lump sum was entered into the accounts for each region. The problem is complicated as some of these assets will have been disposed of by now.

3. Although Post Office telephone directory areas do not conform to BGC regional boundaries, each gas entry in the telephone directory is clearly labelled with the region it belongs to.

4. The Rating Valuation Lists are open to public inspection at all local authority rating offices, and information may also be obtained by telephone. For economy reasons the representative sample would consist of the rateable values of BGC premises in the Northern Region. If a similar size distribution for all regions is assumed then regional indices could be applied to produce a national figure.

5. See Lawrance D.M., Rees, W.H., and Brittan W. (80) for a comprehensive description of rating valuation methods.

6. I am indebted to Mr. G.B. Brook, District Valuer and Valuation Officer for Durham, for this and other information on rateable values.

7. It will also sharply affect the net profits declared by BGC. This is considered in detail below.

8. Source, Economic Trends Auqust 1974 (p.20) and other issues.

9. Source Price Index numbers for Current Cost Accounting p.4, various issues.

10. We may estimate the trend of the new dwellings index before 1956 by regressing the quarterly average price of new dwellings index (APNDI) as the dependent variable, on the quarterly new construction index (CNCI) the independent variable to estimate the equation:

$(APNDI)_t = a + b(CNCI)_t + \varepsilon_t$ where t is a time subscript and ε_t is an error term.

Using 1956 to 1976 data the equation was estimated as:

$$(APNDI)_t = -41.67736 + 1.38632\ (CNCI)_t$$

$n = 81$

$R^2 = 0.92482$

s.e.= 17.15167

The estimated observations are plotted in Fig. 1, but the following compares the estimated observations with the spliced observations.

Table A

	estimated (1970=100)	spliced (1970=100)
1955 Q1	51.0	41.9
1954 Q1	45.7	39.4
1953 Q1	45.7	39.4
1952 Q1	48.4	40.7
1951 Q1	41.5	37.6
1950 Q1	30.4	32.6
1949 Q1	29.0	31.9

Clearly, the spliced series provides a smoother trend. It also avoids the "bump" between 1956 and 1955 where the estimated series joins the APNDI actual series.

It is assumed from this that for other instances, where indices have to be joined because observations do not stretch back far enough, that a more accurate estimate is obtained by use of the splicing technique rather than regression estimates.

11. Source Monthly Digest of Statistics 1946 to 1949.

12. The average index is used to take account of the continuous nature of investments, and is found by:

$$\frac{\text{end year index + beginning year index}}{2}$$

13. An alternative approach is to use data on mileage of mains in use and annual investment in mains (in terms of cost and new mileage laid).

The average cost per mile of new main (ACM_t) will equal

the additional cost of new mains laid in a particular year (CM_t) divided by the number of miles of new mains laid (NM_t) in any year, i.e.

$$ACM_t = \frac{CM_t}{NM_t}$$

Using data from the 1977/78 accounts (D12, pp 40,64) the above becomes:

$$ACM_{78} = \frac{£95.2_m}{1685 \text{ miles}} = £56.500 \text{ per mile}$$

Total mileage in use at the end of 1977/78 financial year was 136,000 miles. Thus the replacement cost of mains at the end of 1977/78 (M_{78}) is

$$M_{78} = 136,000 \times £56,500 = £7,684 \text{ m}$$

However, this method was rejected as it was considered that the overall average cost was a poor proxy for average cost of different types and sizes of mains. This is confirmed when it is considered that using the above calculation for 1975/76 data produces a replacement cost estimate of £13,185m. Clearly, the replacement cost of an asset is not going to fall by over forty per cent over two years especially when it is realised that an extra 3,000 miles of main were in use at the end of 1977/78!

14. The number of services may be estimated by taking the number of consumers, which is published in the annual report. These are shown below for 1977/78

Table B

BGC customers at the end of the 1977/78 financial year

Type	No.(000)
Domestic	13,963
Industrial	70
Commercial and Public admin.	483
Total	14,516

Source: BGC Annual Report and Accounts 1977/78 p.64

15. The annual report and accounts provides data on the number of new services laid, and annual investment in services, so that using the data outlined in footnote 14, above, the average cost and replacement cost of services may be estimated in the same way as for mains.

Let ACS_t = average cost of the new service pipe in year t; CS_t = additional cost of new services laid in year t; and NS_t = no. of new services laid in year t.

$$\therefore \quad ACS_t = \frac{CS_t}{NS_t}$$

Using data from the 1977/78 accounts (D12, pp 40, 64) the above becomes

$$ACS_{78} = \frac{£25.5m}{322,000} = £79.2 \text{ per service.}$$

The Estimated Total number of services in use at end of 1977/78 was 14.516m, thus the replacement cost valuation of services (S_{78}) is estimated at:

$$S_{78} = £79.2 \times 14.516m = £1149.67m.$$

However, this method was rejected for the same reasons given for not using the method outlined in footnote 13, above, i.e. an unweighted average is biased because it does not take proper account of differences in type and size of service. Also, this method appears to give inconsistent results, when compared with those for mains over the twoyears from 1975/76 to 1977/78. Whereas the replacement cost of mains was estimated to fall by over forty per cent, that of services was estimated to rise by over sixty per cent (from about £702m). Clearly as these two assets are closely related it would be expected that changes in valuation would move in the same direction.

16. U.S. indices were considered here and in the cases of one or two other assets on the grounds that where certain commodities are traded in world markets the trend of the indices in different countries should be approximately the same. It should also be the case that if the US index is adjusted to take account of the differing rates of general inflation between US and UK the fit should improve. This adjustment was made but it provided no better fit. The adjustment was made as follows. If the specific US index = x, general US index = G_{US}, general UK index = G_{UK} and UK specific index = y, then $y = x. G_{UK}/G_{US}$. This holds as long as there is a constant relationship between the general UK and US indices.

By inspection this was found not to be the case and to some extent accounts for the relatively poor fit of the adjusted US index.

17. O.P.C.S. 1971 Census Housing Statistics Report Part II/ III, England and Wales, Table 9 p.178.

18. For Scotland o.4 per cent of the 1.72 million dwellings are multiple occupancy. See: General Register Office Edinburgh 1971 Census Housing Report Table 9, p. 116.

19. Undertakings of confidentiality prohibit the publishing of the exact figures.

20. It is worth bearing in mind that for practical purposes the Gas Corporation owns all the meters in existence, according to one of the main manufacturers (UGI(meters) Ltd) who are contracted to the Gas Industry. A few meters are bought privately but these may be ignored for asset valuation purposes.

21. This and all other meter prices were supplied by UGI(Meters) Ltd, 170 Rowan Road, SW16 and refer to prices at the end of the 1975/76 financial year, exclusive of connecting pipes, V.A.T., or Department of Energy stamping fee.

22. See D12 , p.43, notel(v)

23. As with all assets whose replacement cost is estimated by this method it is assumed that none of the assets purchased within the age profile will have been disposed of.

24. See D12 p.43 note 1.(v)

25. For example the gross replacement cost for 1975/76 was eestimated, the following table summarising the relevant data.

See page 60, Table C

Thus V_{76} = 37074. 1316.75 = £48.8m. Note that this is gross replacement cost. As all cars are not new net replacement cost is estimated - see below

26. This applies to all assets except motor vehicles and plant and machinery where the age profiles were short.

27. Note that for purposes of the calculations made here depreciation has been calculated in whole year's provisions only. The effect of this is to understate, slightly, the NBV.

Table C: Numbers of vehicles purchased by BGC, annual investment in vehicles, cost when new and motor vehicle index.

Year	Cost of Van - new [1] £	Annual investment in vehicles [2] £m	No. of Vehicles purchased	Average annual motor vehicle price index 1970=100 [3]
1969/70	506	3.1	6126	92.0
1970/71	523	3.2	6119	101.6
1971/72	599.33	4.0	6674	111.1
1972/73	641.67	3.6	5610	118.6
1973/74	733.67	2.1	2862	129.4
1974/75	922.33	4.7	5096	163.5
1975/76	1316.75	6.0	4557	202.6
Total		26.7	37074	

Notes:

1. Derived from average price of a six cwt. Ford van in each based on information supplied by Marketing Dept. of Ford Motor Co.
2. Source: BGC and Gas Council annual reports and accounts for the period. Note also that the sum of seven years investments slightly exceeds the gross book value for motor vehicles at end of 1975/76 (£25m).
3. Source: Trade and Industry, Board of Trade Journal (pre 1971), and C.S.O. Price Index Numbers for Current Cost Accounts of 1976.

28. The relevant replacement cost data for capital expenditure charged to revenue was calculated as follows:

Table D: Capital Expenditure charged to Revenue

	75/76	76/77		77/78	
	£m	£m	£m	£m	£m
Historic Cost	48.1		103.7		192.7
Replacement Cost (specific)	52.0	62.3		70.1	
		60.6	122.9	68.2	
				94.2	232.5
(general)	52.7	61.5		67.1	
		59.9	121.4	65.3	
				92.8	225.2
real holding gain	(0.7)		1.5		7.3
depreciation (specific)	3.5	4.2		4.7	
		4.0	8.2	4.5	
				6.3	15.5
NBV	49.5		110.6		203.1

A depreciation life of fifteen years was assumed, this being a rough average for all assets.

29. We may adduce other reasons for rejecting the Monopolies Commission and NEDO series. Neither series covers the whole of the period under study. The Monopolies Commission series only makes adjustments for stock appreciation, retrospectively, post-1964.

30. See notes to Part 3, Appendix IV Table 6 for details.

31. It may also be noted that BGC depressed their profits data for the financial years 1975/76 to 1977/78 by increasing the charge against revenue for costs of conversion to natural gas and plant mode obsolete by the advent of natural gas. These deductions were not added back.

PART FOUR

SUMMARY AND CONCLUSIONS

SUMMARY AND CONCLUSIONS

SUMMARY

As stated at the outset the aim of this thesis has been to develop an optimal yardstick for measuring performance in the nationalised industries. We take as a base the arguments in the White Papers (G2,G3,G6) that the nationalised industries should, as far as possible, be run on commercial lines with the government left to solve the social welfare problems.

Accordingly, the possible methods of measuring performance have been surveyed and appraised. One of the main points to emerge from this discussion was that no single yardstick can describe everything that we may wish to know about the firm. We require different tools for different jobs - for measuring producivity, liquidity and profitability. But, it was argued that we should strive to use one yardstick as a preliminary indicator of the health of the industry. The yardstick chosen was a rate of return on capital employed.

However, its definition and use are not without problems. The conceptual problems of capital and income valuation were examined in some detail. It was seen that the objective at hand would determine what should be included in capital and income valuation. As the objective here is the measurement of the overall performance of the firm all resources available to the firm should be taken into account. Thus, for example, loans, inclusive of bank overdrafts, should be included in

capital. Income should be assessed before the deduction of loan interest since it is the existence of the loan which enabled the firm to perform in the way that it did. Interest payments were regarded as payments to the suppliers of capital, not as a cost. In other words an entity view of the firm was taken. In addition income was assessed after charging the cost of replacing the assets of the firm, i.e. after depreciation.

The point was also made that comparisons of performance over time would be distorted if firms charged capital items against profit. This practice reduces profits in the current year since it deducts the full cost in one year of items which last longer than one year.

Three possible methods of capital valuation were discussed - net realisable value, present value and replacement cost. The assumptions were made, which are consistent with standard accounting practice, that the firm would remain in business for the foreseeable future and that the firm was not declining or in a declining industry. Hence, it was argued that the opportunity cost of the assets was best measured by their capital value not their net realisable value. It was further argued that replacement cost provides the best approximation to capital value. In the case of income measurement it was contended, using a Hicksian definition of income, that the maintenance of capital should be interpreted as meaning the maintenance of the real level of the

income stream to the firm. Thus we are concerned with maintaining the purchasing power of the assets of the entity, rather than maintaining its physical assets.

The above definitions were arrived at under the assumption of a world with no general inflation but with shifts in relative prices (i.e. specific inflation). In times of general inflation the firm must make further adjustments if it is to abide by our definitions of income and capital used above. For examples, it must provide for the increased cost of replacing assets and stocks. These adjustments alter the information produced by our yardstick and hence the interpretation we place on its meaning.

Thus it was necessary to survey the inflation accounting debate and to assess which adjustments would be most appropriate for the task of measuring performance. It was concluded from the arguments presented that the proposals made by the Hyde Committee seem to be all that are likely to be implemented by the accounting profession in general, because of the necessity to appease conflicting interests. But, from the point of view of measuring performance in the nationalised industries they were not sufficient adjustments to the rate of return on capital employed.

Taking an entity view it was suggested that the following adjustments should be made:

(i) Capital - Revalue at replacement cost using specific indices.

(ii) Income - (a) depreciation should be based on the replacement cost of the assets of the firm. No provisions should be made for back-log depreciation.

(b) a further deduction should be made from income for the increased cost of replacing stocks.

(c) an adjustment should be made for maintaining the real value of net trade monetary assets.

(d) the gearing gain was irrelevant from an entity viewpoint, but the real gain, i.e. the difference between the specific-index valuation and the general-index valuation of non-monetary assets should be added back to income.

(e) turnover, other income and operating costs should be revalued to the value of the monetary unit at the year end.

Thus we have our yardstick model. Before it is possible to use this model it is necessary to analyse the methods of inflation accounting which have been introduced into the accounts of the nationalised industries, since we wish to know what efforts have been made already to provide more meaningful data for performance measurement. The results of this survey were presented in part 2 chapter 1. The second chapter in part 2 presented a survey of inflation accounting in selected comparable private firms and industries. This was necessary, since if significant differences are observed in the methods of inflation accounting employed by the public and private industries comparisons of performance will be distorted.

The following conclusions were drawn from the discussion in part 2: (i) the introduction of inflation accounting had

not progressed very far in either the nationalised industries or the private firms studied, principally because of the lack of uncertainty in the accounting profession; (ii) inter-industry comparisons have been distorted because of the heterogeneity of ad hoc methods introduced; (iii) there has been little improvement in the information available to measure performance; (iv) the introduction of inflation accounting in the nationalised industries would be more feasible than some of the criteria laid down in governmental White Papers (G2, G3); (v) the reduction of declared profit levels by the use of inflation accounting may help to protect the industries against the crude use of profits figures by the Price Commission and the Press; but it may help to obscure the true rate of return being earned; (vi) there is little difference between the attempts at inflation accounting made by private and nationalised industries; (vii) the nationalised industries, in implementing the recommendations of the Hyde Guidelines, should declare profit before interest and without a gearing adjustment, since an entity view should be taken.

Thus the evidence presented in part 2 seems to reinforce strongly the argument that the correct information is not being provided to decision makers and commentators. Moreover, it could be said that there is a certain lack of understanding, on the parts of decision makers and commentators, of the information presented to them.

Having examined the measures already introduced the ground was clear to use the model developed in part 1.

The gas industry was taken as a case study since it has undergone a vast transformation in the last twenty years; it has progressed farthest of all the nationalised industries in the introduction of inflation accounting, encountering much criticism inthe process with respect to its motives and the data it has used.

The period 1960/61 to 1977/78 was chosen to reflect the effects of the transformations that the industry has undergone in terms of changing fuel sources and the change to a centralised administrative structure. The period chosen also encompasses the effects of restraints on pricing in the mid-1970's.

The methodological problems encountered in estimating a replacement cost rate of return series for the gas industry in this period have been discussed in detail. These problems centre on the sources of data. Since it was not possible to obtain unpublished material on costs, values, and numbers of buildings, cars and other assets data published in the annual reports and accounts of the industry were used. This necessarily reduces the degree of accuracy which may be placed on our data. Nevertheless, estimating the age profiles of assets using this data and then calculating replacement cost depreciation provisions still provides a reasonable comparison with the provisions made by B.G.C. The reduction in the difference between the estimates made by BGC and our own, from a difference of 12.5 per cent in 1976/77 to 3 per cent in 1977/78, may be attributable to refinements made

by BGC. Principally, these refinements are in respect of the use of a more up to date asset register. Alternatively it is conceded that it may equally be due to chance. In any case, the estimates provided by our model can be said to correlate reasonably well with those produced by BGC as a certain member of BGC financial accounting department commented "a million pounds either way makes little difference".

Two basic series of replacement cost data were produced. The first, using the model developed here, enabled comparisons to be made with the historic cost rates of return earned by BGC. The replacement cost series was presented with and without an adjustment for real holding gains on assets. The series including real holding gains behaved in an erratic fashion - which may be expected as relative prices may move in favour of or against the gas industry. The effects of changes in the relative prices of land and, latterly, steel were clearly demonstrated. The series excluding real holding gains was observed to move in a similar trend to the historic cost index, but at an appreciably lower level. This, clearly, reflects the increased burden of providing for the replacement of assets.

The second series confined its adjustments to those suggested by the Hyde Guidelines, i.e. capital was revalued at replacement cost and income was adjusted for replacement cost depreciation and the increased cost of sales. This enabled comparisons to be made with data produced for industry

in general. It is interesting to compare the replacement cost series for both BGC and general industry since if resources in the public sector do not earn a comparable rate of return to that earned by resources in the private sector this may be indicative of a misallocation of resources. Comparisons with sectors of manufacturing industry were rejected since BGC is not a manufacturing concern. Nor is it a service industry in the same sense as, say, the retail trade. It has retail outlets but these deal with a minor proportion of its business. Hence it was felt that industry in general provided the most suitable comparison.

The main points to emerge from the comparison with replacement cost rates of return earned in the private sector was that the replacement cost rate of return for BGC is below that for industry in general throughout the period, except for the last three years. Since 1974/75 a recovery is observed in the BGC series whereas the general industry series declines. This is attributable to the relaxation of price controls in the nationalised industries, and to the effects of stock appreciation. The greater effect of the latter on general industry than on BGC is clearly shown in part 3 chapter 2 figure two. As BGC draws its gas direct from the North Sea (except gas required to meet peak loads) its stocks are low relative to the volume of its sales. This is patently at variance with the position in general industry.

If the historic cost data had been presented in the way BGC present it in their accounts the recovery of

BGC's performance since 1975/76 would have been greatly reduced. However, for purposes of comparisons any ad hoc deductions made by BGC have been added back.

General Conclusions

It is felt that the following conclusions should be stressed:

(i) the evidence from part two of this thesis strongly suggests that the accounting profession should reach a consensus on a standard code of accounting for inflation, otherwise intra and inter firm/industry comparisons will become increasingly distorted. The government has put forward a discussion document relating to improvements in company reports (G6) and whilst it is agreed that many of the proposals contained therein are meritable they are surely secondary to the fundamental need for companies to introduce a coherent system of inflation accounting.

(ii) on the evidence presented here both the replacement cost series produced, our model and the Hyde Guidelines, provide a better measure of performance than historic cost data.

(iii) the model developed here should be preferred to that outlined by Hyde since it provides a more comprehensive set of adjustments for inflation.

(iv) the argument that a model such as that advanced here is too complex to implement in practice surely holds little water. If reasonable results can be produced given the limited resources available to the author, then large

firms with large accounting departments should be able to do likewise. In any case once the groundwork has been done for earlier years the task is a relatively simple one in succeeding years.

(v) it is hoped that the example presented here will be followed by the introduction of inflation adjusted Rate of Return data in the nationalised industries as a whole. But, as already pointed out this may have to await a consensus of opinion in the accounting profession.

(vi) the replacement cost rate of return series presented here will, it is hoped, indicate to decision makers and commentators the real position, with respect to performance, in the gas industry. Hopefully, it may serve to remove some of the accusations that excessive profits are being earned by the gas industry. It is only within the very recent past that the gas industry has caught up with industry in general. But the evidence presented in part two lends weight to the argument that BGC is attempting to obscure the true <u>historic cost</u> position.

(vii) the fact that a replacement cost series has been produced indicates that the model outlined here can be used in practice in the nationalised industries. As such it may be preferred to some other efficiency criteria such as marginal cost pricing and investment appraisal techniques for assessing <u>overall</u> performance.

(viii) the results outlined here go some way towards satisfying the recommendations of the 1961 White Paper (G2,

p.7 para. 19(b)) that the nationalised industries should make replacement cost depreciation provisions. It also provides information to aid decision makers in setting inflation adjusted financial targets for the gas industry. Inflation adjusted financial targets were suggested recently in Cmnd 7131(G7, paras. 69-75)

(ix) but, it is stressed that the data presented here can be only one tool, albeit we believe the main one, in a range of tools necessary to measure the performance of the firm as a whole. This range of tools should include many of the performance measures discussed in Part 1. ch.1.

APPENDICES

Part 1: APPENDIX I

AN OUTLINE OF GOVERNMENTAL GUIDELINES ON PERFORMANCE MEASUREMENTS AND EFFICIENCY CRITERIA IN THE NATIONALISED INDUSTRIES 1948/1978

In the immediate post-war period there did not appear to be much serious concern with obtaining optimum performance in these industries. As the Select Committee on Nationalised Industries (S.C.N.I) recalled the initial financial obligation imposed upon the Nationalised industries was merely:

> "The duty of raising revenues that would, taking one year with another, be not less than sufficient to meet all items properly chargeable to revenue including depreciation, the redemption of capital and the provision of reserves".[1]

Clearly, this provided little information that would lead to an optimum allocation of resources in the nationalised industries.

However, it was not until 1961 that ministerial powers of control were reviewed.[2] The main proposals of the White Paper may be summarised as follows:

(i) Revenue Account

(a) surpluses should cover deficits over a five-year period after charging interest and depreciation on a historic cost basis.

(b) there should be provision for the amount necessary to cover the excess of replacement cost depreciation over historic cost depreciation.

(c) there should be allocations to general reserves in order to cover capital development costs and such contingencies as premature obsolescence.

(d) each industry should earn a target rate of return on capital investments or, depending on the industry, a target level of internal funding.

(ii) Capital Account

(a) discussions will be held with regard to each industry's plans for the next five years.

(b) the government will fix an upper limit of capital expenditure for the next two years in each industry.

(c) the government will approve proposed borrowings on the basis of annual estimates.

(d) the government is to be informed of the extent of investment on new projects with a low rate of return.

Variations in the required rate of return between industries were allowed and were meant to take into account the differing "social obligations" amongst the industries.

However, these proposals were criticised, mainly because of the claimed shortcomings of setting a target rate of return. This, it was argued, may make management take a short term view in order to achieve the set objective. This might not necessarily be best for the industry in the long run. It could lead to a reduction in investment because that would depress the short term rate of return. At the time the recommendations of the White Paper with respect to depreciation allowances

based on replacement cost seemed to be ignored, possibly because in 1961 the rate of inflation was not as high as it is now.

The 1967 White Paper[3] sought to overcome some of the shortcomings of the 1961 Paper. The major proposals were:

(i) the introduction of a Test Discount Rate (T.D.R) as a criterion of investment. This was originally set at 8 per cent but was subsequently revised to take account of the change in corporation tax. The T.D.R. was to be consistent with, "the average rate of return in real terms looked for on low-risk projects in the private sector in recent years".[4]

(ii) in an attempt to avoid cross-subsidisation and misallocation of resources the White Paper suggested pricing at short run marginal costs (SRMC) where there was spare capacity. In the long run to ensure continuous supply the industries were to price at long run marginal cost (LRMC)

(iii) whilst recognising the difficulty of reconciling the prescribed rate of return on new marginal investment and marginal cost pricing with an overall, or average, rate of return on assets it was proposed that ex post financial objectives would continue to be set. These would be set at different levels for different industries, to reflect their differing market conditions.

(iv) provision was made for compensation to be paid to the industries in the case of losses incurred by the industries being forced by the government to act against their own

interests. In addition to the above the recommendations of the 1961 White Paper with respect to replacement cost depreciation were reiterated.

By the introduction of ex ante in addition to ex post guidelines the 1967 paper went much further than the previous legislation. But it needs to be borne in mind that only a very small amount of investment in the nationalised industries is subject to full investment appraisal using the test discount rate.[5] Much investment is determined by prior strategic decisions, e.g. in British Gas the decision to purchase the output of the North Sea gas fields, meant large investments in a national gas distribution grid, but this cannot be disaggregated for appraisal because it is part of a total system.

Problems have been encountered which have prevented the introduction of marginal cost pricing to any great extent.[6] A detailed discussion of marginal cost pricing is outside the scope of this thesis, but see part 1, Appendix II for an annotated bibliography. Here it will be noted that economic theory implies a contraction or expansion of the industry and its services until Price = LRMC in each of its markets, but given the other obligations of the nationalised industries this is not possible. An example, is the case of BGC which has an obligation to supply all its existing customers.

A recent study by NEDO (120) has criticised the guidelines in the 1967 Paper as being too simplistic and has pointed to the problem of lack of continuity, which has meant there is no effective system for measuring performance and that there is no framework for setting out the Long Run Objectives and strategies of the Nationalised Industries. The study suggests that financial and economic objectives should be laid down for each industry individually. To this end it proposes that for each Nationalised Industry there should be a Policy Council to set the objectives and strategies and performance criteria, a separate corporation board to manage the industry within this framework, and that there should be more rational financing arrangements taking account of the environment of each industry.

These proposals suggest an important move away from the so-called "Morrisonian arms length" approach (see 152).

The NEDO study has been criticised for failing to define the role of the nationalised industries (152) and for failing to provide and consider much new or hitherto unpublished information (164). Pryke (146) has also pointed to instances of misleading information, e.g. overstatement of the rise in gas output in the decade 1964/5 to 1974/5; and inconsistencies such as its conclusions on the relative labour intensiveness of the nationalised industries.

At least one commentator (152) thought that some of the NEDO proposals should be tried, but expressed doubts

as to whether sponsoring departments were willing to forego some of their powers and whether trade unions and the corporations themselves would cooperate. However, the government's proposals rejected many of the suggestions of the NEDO report as it was considered they would slow down the decision process. Instead it was suggested[7] that the existing general powers of sponsoring departments should be extended and be made more specific, after consultations with the industry concerned. At the general level it was proposed that in future the sponsoring minister could appoint civil servants to the Board of an industry.[8] Also plans for tripartite discussions of forward planning, for cooperation with suppliers, for consultations on five year plans and for a three year period were laid down.[9]

More specifically the following financial and economic framework was out-lined:

1. Investment Appraisal[10]

(i) As the TDR system had proved useful only for small individual projects a required rate of return (RRR) was to be set, which was to be earned on new investment as a whole. This opportunity cost of capital to be earned on new investment over its working life was set at 5 per cent in real terms before tax. This takes into account the pre-tax rates of return earned in private companies and likely trends therein. Consideration of social time preference is also made, but as the Paper itself admits[11] this is difficult

to measure.

(ii) The general TDR will no longer be specified for investment appraisal. Instead specific rates will be set for each industry which take into account the sectoral and social objectives set for an industry.

2. Pricing Policy[12]

(i) It was recognised that in many cases LRMC could not be used as prices were market determined. In Price-making industries the government should determine the overall financial target and thus the general level of prices in the light of the general policy objectives.

(ii) To avoid arbitrary cross-subsidisation of groups of consumers the structure of prices should be related to the structure of costs e.g. with respect to peak and off- peak pricing.

3. Financial Targets[13]

(i) Each profitable industry will be set a percentage rate of return to be earned pre-interest on net assets. Alternatively a rate of return on turnover may be used where the industry is labour rather than capital intensive.

(ii) Self-financing ratio targets were rejected as the Paper points out, and as has been pointed out elsewhere (e.g. 68) self-financing ratios reflect changes in the level of investment as much as changes in the level of profitability.

(iii) financial targets were to be put on an inflation adjusted basis, dependent on the present accounting practices

of the industry in question and the timing and nature of the general move to inflation accounting.

(iv) The level of each financial target was to take account of the expected return from effective, cost conscious management of existing and new assets; market prospects; the scope for improved productivity and efficiency; the opportunity cost of capital; the implications of the Public Sector Borrowing Requirement; counter-inflation policy; and social and sectoral objectives.

4. Other[14]

(i) In addition to the above there will be industry performance indicators such as: labour productivity and standards of service.

(ii) cash limits will be imposed on loans, public dividend capital and grants. Provision was made for these to be exceeded in certain cases.

(iii) Public Dividend Capital will be made available only to those industries which are fully viable and especially subject to cyclical fluctuations. The paying of interest on these loans will be used as a discipline on the industries in the absence of a stock market stimulus.

(iv) Loans provisions will be changed so that the nationalised industries can include medium term loans in a capital debt structure which at present consists mainly of temporary and long term debt.

(v) Interest payable on loans for long term capital projects where returns will not accrue for a number of years will be capitalised and written off during the assets' lives rather than being charged to revenue.

The above proposals have been dwelt upon at length because it is felt that they represent a culmination of the previously diverse approaches, and that they represent a more realistic and comprehensive approach than hitherto seen. How the proposals will work in practice, however, remains to be seen.

Part I Appendix I: Footnotes

1. Para. 165 Commons Select Committee on Nationalised Industries, 1st Select Committee Report 1968

2. Treasury, The Financial and Economic Obligations of the Nationalised Industries, Cmnd 1337, April 1961 H.M.S.O.

3. Treasury, Nationalised Industries: A Review of Economic and Financial Objectives, Cmnd. 3437 Nov. 1967. H.M.S.O.

4. op.cit. para. 10.

5. Four case studies commissioned for NEDO (see 115 Appendix D) indicated that DCTF investment appraisal using the TDR was being used to some extent in cases of divisible Investment in B.S.C., British Rail, Post Office and B.G.C.

6. For example see (118) Appendix D.

7. Treasury, The Nationalised Industries, Cmnd. 7131, 1978 p.11. para. 20.

8. op.cit. paras 26-30

9. op.cit. paras 40-46

10. op.cit. paras 58-65.

11. op.cit. Appendix I.

12. op.cit. paras 66-68

13. op.cit. paras 69-75

14. op.cit. paras 76-92.

Part 1: Appendix II

An Outline of the Main Issues involved in the Practical Application of Marginal Cost Pricing and Investment Appraisal.

Introduction

A detailed discussion of the efficacy of Marginal cost pricing and investment appraisal is beyond the scope of this thesis. However, from the importance placed upon these techniques in successive White Papers on government guidelines for performance in the nationalised industries it is necessary to consider, briefly, the main issues involved in their practical application.

1. Marginal Cost Pricing

The usual argument for marginal cost pricing is that under conditions of market imperfection, and assuming profit maximisation, a misallocation of resources occurs, from the viewpoint of society. This may be clearly illustrated by taking the elementary comparative-static text-book diagram:

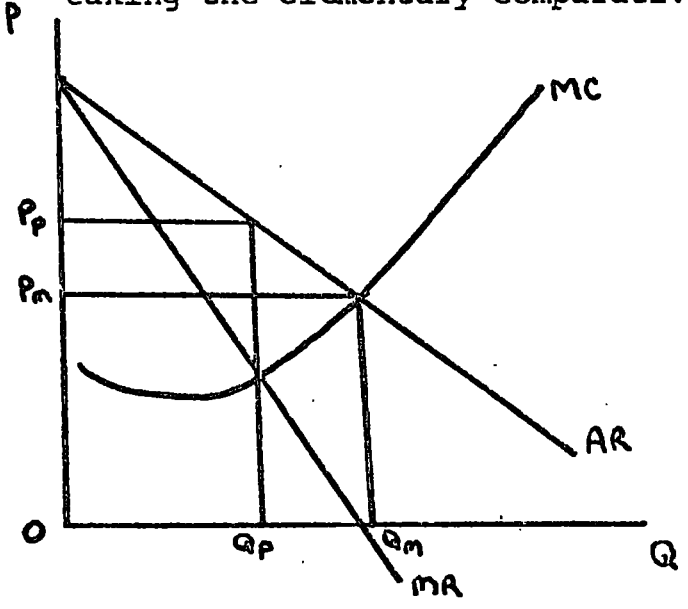


Fig. 1 Marginal Cost and Profit Maximisation Equilibria

MC = marginal cost

AR = average revenue
MR = marginal revenue

Under profit maximisation price is Op_p and output is OQ_p

However, there is some additional output which can be produced, at a price no less than marginal cost, but at less than Op_p, i.e. $OQ_m - OQ_p$. The resultant price is OP_m which leads to profits of less than the maximum level, but which may use resources previously engaged in a lower valued alternative use and which makes the good available to anyone prepared to pay P = MC = AR.

If the time dimension is introduced, with associated capacity utilisation and scale considerations, then the familiar result of P = SRMC = LRMC can be derived under assumptions of perfect knowledge, a new firm, no technical change, constant factor prices, and perfectly divisible plant (see Webb, 194, pp 15-21).

However a number of problems arise when marginal cost pricing using Paretian welfare assumptions is introduced in practice:

(i) In decreasing cost industries marginal cost pricing will lead to financial deficits being earned. (See Webb op.cit.) One solution to this is the use of multi-part tariffs where the running charge is related to marginal cost and the fixed charge (to be paid out of consumer surplus) is at a level designed to cover accounting costs. But this infringes the Pareto conditions because some consumers who value the marginal unit of consumption above its marginal cost could not consume the good as they have no consumer surplus out of which to meet the fixed charge. The solution to this problem, that of perfectly discriminatory pricing, is faced with problems of

insufficient information relating to individuals' demand curves and prohibitive costs of administration. We return to other problems related to the absence of Pareto optimality below:

(ii) In practice plant may not be perfectly divisible. Thus pricing at SRMC will encounter capacity constraints as output is expanded. Boiteux (122, p.70) and Williamson (203, pp 68-69) have shown that whilst it may be socially optimal to increase capacity, since there is a welfare gain, financial losses may be earned as p = SRMC $\neq$ LRMC. Turvey (180) has taken the analysis a stage further by introducing the problem of a multi-plant industry with plants of different ages and vintages. Usually incremental capital will be more efficient than its predecessor. If so, LRMC pricing must be based on the total costs of the marginal unit (i.e. on SRMC of the marginal unit subject to total costs of that unit being recovered). In this case the more inefficient units will make a loss and it can lead to an overall loss for the firm.

Webb (193, pp 93-5) suggests instances where indivisibilities may not present a problem for example ex ante the investment decision, the length of the time period and the use of credit arrangements. But these go only a little way to solving the problems of indivisibilities. Indivisibilities will also present problems when peak-load pricing is considered.

(iii) In practice the demand curve is unlikely to be of the form portrayed by elementary analysis. For example irregularities

in demand occur for gas and electricity at breakfast and evening meal times.

At its simplest the peak-load may be considered for a period of a day with equal length off-peak and peak period and with only one plant of fixed capacity operating at full or less than full capacity depending on the time of day. Boiteux (Op.cit. p. 73 et.seq) has shown that if the two demands are close together or plant cost is high it is optimal to depress the peak. Williamson (203) carries the argument a stage further by considering unequal length of off-peak and peak periods. Williamson shows that peak load price will always exceed, LRMC, and off-peak load price less than LRMC, assuming divisible plant. Also it is only when the off-peak load fails to use plant to capacity when priced at SRMC that the peak load bears the whole burden of capacity costs. The firm will earn net revenue of zero in this analysis. Williamson goes on to show (op.cit. pp 80-81) that if indivisibilities are introduced the firm need not necessarily earn zero profits because with indivisibilities the peak load price is not necessarily greater than LRMC.

Whilst the above impart some of the complexities of reality to basic marginal cost pricing a number of reservations remain. For example Turvey (183) has alluded to the following, multi-plant firm with plants of different ages and vintages; capacity cost may not be a simple function of peak demand (e.g. hydroelectric power); available capacity may be less than installed capacity because of maintenance thus the capacity

constraint is reached sooner than expected; interdependence of demand curves over the cycle, the load curve is likely to be continuous rather than two-level in practice; from the point of view of administration of tariffs and comprehensibility of them by consumers there is a limit to the number of tariffs that may be used in practice; the development of off-peak consumption resulting from higher peak charges may require subsidiary changes (e.g. night tariffs in electricity required the development of storage appliances); system interdependence may exist, with the result that the incremental system costs following the construction of new capacity will not be the sum of its capital and running costs; peak load pricing will have different effects depending on whether the peak-load is firm or shifting; and peak load pricing may affect the distribution of income. Turvey (182,186) and Boiteux (op.cit p.107) have shown that if the firm is faced with an investment decision the system interdependence problems may be solved by considering marginal operating costs, which can be equated with marginal expansion costs. They show that at the margin the present value of the output of a new plant, with each unit of output valued at marginal system operating cost equals the present value of its capital and operating costs. If an increase in peak load is considered, with system interdependence, it can be shown (Turvey, 182) that the marginal system cost of the increase in peak-hour consumption will be the cost of the new plant less the present value of the saving in total off-peak running costs. Problems remain in the estimation of

incremental capital costs. But as Turvey (182) points out these may be directly determined only by simulating the running of the system over a number of years. If the peak is shifting peak load pricing may be advantageous since depressing the peak may reduce the amount of capacity required (Boiteux op.cit. pp 81-82). The question of maintenance effects on available capacity has been recently studied, for example by Crew and Kleindorfer (26) who suggest conditions for optimal reliability levels. A number of writers have considered the problem of the uncertainty of forecasting peak loads; foremost amongst whom have been Brown and Johnson (18,19) and Turvey (185). Brown and Johnson show under the assumption of physical rather than price rationing that with uncertainty the appropriate price to charge is that price which clears the market when demand is at its lowest peak position. They also show that under certain conditions peak and off-peak prices should be equal. Turvey (185) has questioned, as being unrealistic, their assumption of physical rationing; preferring prices as rationing devices.

Peak load pricing has been used in practice, for example the 'tarif vert' of EDF, and the 'white meter' tariff of the Electricity Boards. Tzoannos (188) has shown how seasonal tariffs can be used in the gas industry in Britain, whilst Levy-Lambert (91) has described examples in the French public sector. The welfare effects of peak load pricing and multi-part tariffs have been outlined in (i) above.

It must also be noted that, in effect, peak load pricing

deals with multiple products. For example, electricity units sold at different times of the day are different products, since the consumer wants electricity at 5p.m. for cooking, he can't substitute cheaper units of electricity at 3p.m.

(iv) The foregoing argument about marginal cost pricing is based mainly on the assumption that P = MC in the rest of the economy, as Rees (148) has pointed out this requirement is not met in practice because of various imperfections. Lipsey and Lancaster (93) showed that under non-pareto optimal conditions the determination of output based on marginal cost pricing could result in a less than optimal allocation of resources Mishan (108) has demonstrated that it is necessary to consider to what extent competing sectors depart from optimality and whether the competing sectors are substitutes or complements. More operational approaches by Davis and Whinston (31,32) and Turvey (186, pp 22-27) take a piecemeal approach arguing that it is permissible to disregard ignorance about optimality elsewhere and to include only that which is known if it is important. Turvey's analysis provides pricing rules for the case where the final product of a single product industry in the public sector is closely related to a similar final product produced by the private sector. But there are problems with this analysis. Firstly, it requires information on the relationship between prices and marginal costs in the private sector, which may not be available. Secondly, industries in the public

sector are usually multi-product, which complicates the resulting price structure. Thirdly, with information levels being so imperfect it is not possible to tell if this is better than average pricing or not. Fourthly, as pointed out by Ruggles (156) and other writers, pricing proportional to marginal costs, which under certain conditions Turvey's solution may require, has disadvantageous welfare implications, such as altering the trade-off between work and leisure. But Turvey's method may provide a practicable solution in a second best world, where the optimum conditions are not met in general.

The effect on optimality of the introduction of financial targets has been studied by a number of writers. In the case of an absolute profit constraint Baumol and Bradford (8) have shown that this will lead to a deviation of prices from marginal cost throughout the economy, the precise nature of the deviation depending upon the nature of price changes, differences between marginal revenue and marginal cost and changes in output levels. However, they do provide a "quasi-optimal" solution, i.e. the maximisation of the level of satisfaction of any one individual, given the utility level of each other individual. For quasi-optimality, and for minimisation of departures from marginal cost pricing because of an absolute profit constraint, they show that the relative quantities of outputs should be kept unchanged from their optimal marginal cost pricing propositions. In the case of a return on capital constraint Gravelle (49,50) has shown

that optimal prices will be equal to actual marginal costs but will differ from first best prices since actual costs are greater than minimum costs due to the effect of the financial constraint on the input mix. Gravelle concludes that if financial targets serve as some form of "tax" the rate of return target is inferior to the absolute profit constraint since it leads to inefficient means of production, more complex pricing rules and requires more information. However, this analysis ignores (a) the problem of setting correctly the absolute profit levels which, if it is to mean anything in terms of efficiency must be related to the industry's capital stock, (b) ex ante it may not be possible to set the financial constraint to cover costs (although imperfect information may produce this result under any pricing formula), (c) it may be impossible to obtain the required information on elastisities of demand etc.

(v) Time lags in constructing new plant may mean that by the time it comes into production the demand conditions for the products of the industry may have changed. The extent to which this presents a problem will depend on how accurately forecasting has developed within a particular industry.

(vi) Turvey (186, p.69) has shown that the introduction of time into the analysis requires a reassessment of the pricing rule producing a different set ofmarginal costs. Notions of a planned time stream of outputs, of discount rates and expected future capital and running costs must be taken into account. The existence of time introduces ambiguities to the

terms short run and long run, since as the time in the future when new plant will be introduced approaches the amount of the new capacity ceases to be variable. Planned investment decisions become realised. This distinction must be made between the "short term pricing rule" and the "long run investment rule". Turvey (op.cit) shows that the following guides are necessary. In each period price is whichever is the greater of (a) the running cost of that capacity which is partly utilised or (b) the level required to restrict demand to capacity. The amount of new capacity coming into operation in any period, if positive, is such as to make the expected discounted sum of cost savings from having the extra unit of capacity of vintage v in period t equal to the present worth now of the capital cost of the unit of new capacity which becomes operational in t = V. Planned discounted price equals planned discounted marginal cost in all future periods except where new capacity is to come into operation in an amount which is now irrevocably determined.

Conclusions on marginal cost pricing

The main issues involved in marginal cost pricing have been outlined above. It has been seen that a comprehensive set of tools exist for the use of marginal cost pricing.

In practice the introduction of marginal cost pricing under Pareto optimality assumptions has been shown to be virtually impossible. Basically such assumptions as perfectly divisible plant, perfect foresight, and prices equal to marginal costs throughout the economy are too

restrictive to allow practical applications. Other problems also arise such as the accounting losses resulting from pricing at long run marginal cost in decreasing cost industries. This would be inconsistent with a government imposed financial constraint. If departures from Pareto optimality are assumed then marginal cost pricing in practice is possible, for example peak loading price and multi-part tariffs. Questions arise regarding the inequity of preventing some from consuming the good because, although they value the good at the price charged for the marginal unit, they have no consumer surplus out of which to pay the fixed charge.

However, a number of other problems remain which cast doubt on the efficacy of marginal cost pricing in practice:

(i) the problem of forecasting marginal costs based on output streams at current prices, because of uncertainty and/or inflation. (Bates and Fraser op.cit. p.71)

(ii) LRMC pricing does not determine the proper rate of adjustment of actual prices to changes in costs. In making such changes account may also have to be taken of the effect on the industry's surplus (Tivey, 180)

(iii) time lags may occur in the adjustment of demand to changes in price, and actual change in demand may be different from expected (Bates and Fraser op.cit. p. 65)

(iv) in practice the price/quantity relationship may not be constant even for one product in one market. For example, Johnson (67) has described the existence of three such relationships in the industrial market for gas (load retention,

new business and changeover). This price may not be determined by marginal cost but by a "building brick" approach where, in the case of the price of industrial gas, price depends on such factors as the market price of the competing fuel, the operating costs of competing fuel, the installed cost of a competing fuel burner, installed competing fuel storage cost, installed cost of a gas burner, changeover inertia and gas premium over other fuels.

(v) Marginal cost pricing, may lead to underpricing since whilst allowance may be made for replacement of capital it may be difficult to allow for such costs as developing new gas fields and gas making processes.

2. Investment Criteria

The principles of investment appraisal are well described in Henderson (58).

In making its decision whether to invest or not the firm wants to be fairly certain that the returns on that investment will cover the initial outlay. Capital projects may be viewed as a series of cash flows, and the company must look at those cash flows that are incremental to the acceptance of a proposed project. The DCF rate of return on an investment is that discount rate required to equate the present value of its stream of future cash flows with the present value of the capital outlay. To assess the validity of a project in the nationalised industries, in the following equation set V = 0, and compare r with the test discount rate (T.D.R.).

$$V = -K_o + \frac{B_1}{(1+r)} + \frac{B_2}{(1+r)^2} + \ldots + \frac{B_n}{(1+r)^n}$$

where v = present value

K_o = capital outlay in year o

$B_1, B_2 \ldots B_n$ = net benefits in each year to some final year n

r = rate of return required on the investment project.

However, the extent to which this type of exercise may be carried out in practice will be constrained by the following:

(i) the determination of the rate of discount

The question arises as to whether or not the TDR is the optimal proxy for opportunity cost. The possible alternatives such as, the rate at which the government can borrow on long dated securities, the social time preference (STP) rate, the social opportunity cost (SOC) rate or the private market incremental rate of return are discussed well in Webb (193, Ch.4) and Henderson (op.cit.) The main problem reduces to that of reconciling the rate at which society discounts the future (the STP) with the rate which discounts the use to which the resources employed in a project would otherwise have been put (the SOC). One way of achieving this is to adjust the money costs of a project to produce a "shadow-price" which reflects S.O.C. (see Henderson op.cit. p. 133, and Reed 147 ch.2) The shadow price acts as a rationing constraint to reflect the opportunity cost of capital. But it is imperfect since lags in project implementation may change shadow prices. Also true opportunity cost is measured by the future effect not by what is currently displaced. It may be impossible

to achieve STP = SOC, if there is capital rationing since there is likely to be excess demand thus the equilibrium condition is not satisfied (see Turvey 186).

(ii) strategic and tactical decisions and interdependence of investments

As noted by NEDO (120) and reiterated by Cmnd 7131 (G5) the TDR system had proved useful only for small individual projects. It was of little use for strategic decisions or where there was interdependence of investments. For example the decision by BGC to exploit North Sea Gas resulted in many other decisions relating to distribution networks, storage facilities etc. The problem of inter-dependency is related to the problem of finding the optimal plant mix. By utilising information on load curves and plant load factors and by taking a programming approach, so that the investment problem is to minimise the costs of the output programmes Bates and Fraser (7, ch.6) have demonstrated the marginal optimality conditions of investment decisions. The model is also developed to take account of differing plant lives and technical progress (7, pp. 102-104).

If we consider investment in north sea oil and gas, this will be affected by the optimal depletion rate of these resources. Prescriptions for the optimal depletion of exhaustible natural resources are varied and usually rely on fairly restrictive assumptions, for examples Dasgupta and Heal (30) assume a constant level of population through time, whilst Weinstein and Zeckhauser(195) assume

perfect competition and a perfect capital market. In essence the optimal depletion rate will be set by society's time preference rate. As the references cited in (i) above, show this is almost impossible to determine in practice. The effects on the rate of depletion of the differing relationships of the STP to the market rate of interest, of changes in the STP, of uncertainties in the size of the natural resource, of uncertainties regarding future demand, of the conservationist lobby, etc. are discussed well in Robinson and Morgan (151). They also suggest a possible solution. This involves improving the signalling of the market; producing better long term forecasts of demands, supplies, prices etc. so that it may be determined how North Sea supplies would fit into the energy market on the assumption of free depletion. Intervention would only occur if free depletion is identified to have substantial problems. A Commission could be set up to deal with this, and would suggest various policy objectives and solutions.

(iii) Capital rationing

Introducing a limited budget means that not all projects satisfying the TDR will be implemented. Capital rationing may ignore the interdependence of projects thus preventing economies of scale in distribution and transmission from being achieved. It may also mean less capital intensive investment and the incurring of additional future costs to secur savings in the short run. Capital rationing may only be imposed for a single period, but this raises problems with funds that have already been committed. Bates and Fraser (op.cit. p.80)

argue that, in appraising a project, if parts of a programme are firm commitments and a switch to another project would incur costs these costs should be subtracted from the programme. If a new programme can be introduced but with costs of transition then costs should be added to the stream. They also provide a suggestion of how the TDR may be used to minimise costs subject to the capital rationing constraint (ibid)

(iv) Uncertainty

If we take the case of the gas industry, uncertainty may affect the investment decision in five ways - uncertainties in demand, supply, demand and supply combined, interruptible loads and technical changes. Bates and Fraser (op.cit) describe how the effects of these may be simulated by using information from load duration curves, degree days and estimates of the probability of supply failure. In this way whereas the existence of uncertainty means that future cash flows and costs of expansion cannot be determined with accuracy it is possible to estimate the extent to which plant or store size may need to be changed. Linear programming may be used to estimate optimum demand patterns and main transmission systems over time and hence provide information on the investments needed to satisfy these problems (see for example P. Masse and R. Gibrat, 122 Ch. 11).

Conclusions on investment criteria

The main aim of using investment criteria is to take account of the opportunity cost of funds being invested. In

this necessarily brief outline of the main issues it has not been possible to discuss in detail the problems of estimating the social opportunity cost rate of return. However, it should be clear that the task is complicated by the existence of competing rates of return and of other real world conditions such as taxation and inflation. But as Webb (ibid) shows these problems may, to some extent, be overcome. But it is the existence of other factors such as project interdependency, strategic decisions, capital rationing and uncertainty that restricts the use of investment criteria, so much so that whereas the Select Committee on Nationalised Industries had hoped that by the use of marginal cost pricing and investment appraisal techniques optimisation in the nationalised industries could be achieved, in practice this has been possible in only a limited number of circumstances.

In recognition of this, alternative methods of investment appraisal and marginal cost pricing have been suggested in Cmnd 7131 (G5). More importantly it is recognised therein that the use of ex ante measures alone is not sufficient to ensure efficiency in the nationalised industries. The complexities of the real world mean actual events turn out differently than expected.

Part 1: Appendix III

Outline of Inflation Accounting Proposals

The first set of proposals put forward by the Institute of Chartered Accountants (I.C.A.) was concerned with removing the distorting effects of general changes in the purchasing power of money and were published in 1974. (64).

The main proposals were:

(a) companies will continue to keep their records and present their basic annual accounts in historical pounds i.e. in terms of the value of the pound at the time of each transaction or revaluation.

(b) in addition all listed companies should present to their shareholders a supplementary statement in terms of the value of the pound at the end of the period to which the accounts relate. This statement was to contain separate figures for depreciation and the loss or gain on net monetary items because of inflation.

(c) the conversion of figures in the basic accounts to those in the supplementary statement should be by means of a general index of the purchasing power of the pound, which from 1962 onwards was to be the Retail Price Index based on 1974= 100.

(d) there was to be a note to the supplementary statement explaining the basis on which it has been prepared with comments on the significance of the figures.

(e) in all supplementary statements except the first all corresponding amounts shown for the preceding year should be changed from the pounds of current purchasing power (C.P.P) at last year to pounds of CPP at this year. This entails adjustments to the data shown for turnover and operating costs in addition to adjustments to depreciation provisions and cost of sales.

(f) distinction should be made between monetary and non-monetary items. If a company had a net monetary liability rather than a net monetary asset then it was to show a gain in purchasing power in its supplementary CPP statement. This is a real gain to the equity shareholders in terms of purchasing power but because it may be accompanied by a reduction in liquidity or excessively high gearing it should be shown as a separate figure. SSAP7 pointed out that the argument that it should not be shown as profit because it might not be possible to distribute it without raising additional finance confused the measurement of profitability with the measurement of liquidity. Further, even without inflation all a company's profit may not be distributable without raising additional finance, perhaps for example because it has invested in non-liquid assets. It is also inconsistent to exclude the gain on monetary items when profit has been debited with the cost of borrowing and with additional depreciation consequent upon the converted cost of fixed assets.

With respect to the adjusting of non-monetary items

for inflation the test of lower of historic cost and Net Realisable Value (NRV) was to be applied to stocks and adjustment made to the figures if necessary. Also, Fixed Assets may need to be further adjusted in the light of a review of value to the business, the adequacy of the depreciation charge needed to be considered; and whether it was necessary to include in the supplementary statement an allowance for corporation tax, chargeable if a gain was made on the sale of assets.

Thus in these proposals the ICA was setting out to take account purely of inflationary effects and to ensure that the earning power of the company was preserved intact.

In rejecting current cost accounting (C.C.A.) the ICA did recognise its potential as a valuable management tool (op.cit. Appendix I, p.12) rather than its being predominantly shareholder orientated. This was because replacement cost (CCA) accounting does not isolate and record general effects of changes in purchasing power,but looks at specific, or relative, price changes and thus aims to show the extent to which the firm is maintaining its physical assets rather than the amount of purchasing power originally invested in the assets. It was suggested that firms who wished could include, in an additional and separate supplementary statement, replacement cost information. But on the whole replacement cost (CCA) was rejected because of subjectivity with respect to choosing of indices,

complexity of calculation; because changes in replacement cost may not be due to inflation; and because changes in technology, for example, may make replacement cost valuation meaningless unless it is calculated for the whole of a particular industry.

These proposals gained fairly widespread support, with many companies publishing comparable CPP accounts in their annual reports, (see part 2 for a discussion of these).

However, the government decided that further discussion was necessary and set up a committee to look at the problem. This committee reported in 1975 (G4) and the ICA produced its draft proposals based on this Report about one year later. (65) The main proposals of ED18 were:

(a) depreciation to be calculated on the value to the business of the assets concerned in terms of replacement cost and not on their historical cost and will thus give a more realistic measure of the cost of resources used. In most cases the depreciation will be calculated on the replacement cost of assets

(b) cost of sales will be calculated in most cases on the cost of replacing the goods sold and not on their original cost.

(c) there will be a new statement in the annual accounts - the Appropriation Account - in which there will be brought together the current cost profit, the revaluation surpluses, the amount which the directors consider should be retained within the business having regard to their assessment of its

needs, and dividends.

(d) the balance sheet will show current values for most assets and will no longer show their historical cost.

(e) a statement on the change in the amount attributable to ordinary shareholders - the equity interest - after allowing for the change in the value of money. This will clearly show how the company has performed in relation to the rate of inflation and will also show its losses or gains from the holding of monetary items.

So in essence this CCA system in arriving at profit charges income for stocks consumed and fixed assets used based on current replacement cost rather than outdated historic costs. Further, it also provides a distinction between the profits earned from the operations of the business and the money gains resulting from changes in the value of a company's assets.

Despite claims that the proposals of ED18 had received wide support from both sides of Parliament, industry and the City, (78), a majority of the members of the English I.C.A. voted against making any system of CCA mandatory, mainly on the grounds of complexity and making too great a leap forward.

A subsequent set of proposals, produced by a group chaired by Mr. W. Hyde simplified the Morpeth proposals embodied in ED18, with three main recommendations (63):-

(a) supplementary depreciation charge

(b) an adjustment for the increased cost of sales thus showing the time cost of consumption during the period.

and (c) a gearing adjustment which allows companies with net monetary liabilities to reduce (a) and (b) by the extent to which net debt forms part of the company's total capital.

There seems to be a certain amount of agreement concerning the first two proposals but the third is considered to have theoretical shortcomings (92). These points will be discussed fully in Ch.2.

Although the above presents the three attempts at setting up an accounting standard the wide diversity in the proposals suggests very strongly that there is little agreement on the underlying theoretical aspects of inflation accounting both from the accountant's viewpoint and the economist's. Moreover, even if there was agreement amongst the theoreticians it is possible, that any proposals which are theoretically consistent may be rejected on grounds of practicality.

Part 1: Appendix IV

(I) The calculation of the stock adjustment

(i) Revise opening and closing stock to average current cost for the year.

(a) opening stock. opening stock x $\frac{\text{average index for the year}}{\text{beginning of year index}}$

(b) closing stock closing stock x $\frac{\text{average index for the year}}{\text{index at end of year}}$

(ii) Take difference between adjusted closing stock and adjusted opening stock.

(iii) Subtract this from difference between unadjusted closing and opening stock. This produces the cost of sales adjustment.

(II) The calculation of the depreciation adjustment

If an asset is purchased and has a life of n years then each annual replacement cost depreciation provision, assuming a straight-line method of depreciation, is $\frac{1}{n} \times R.C._t$ and if scrapped at the end of n years depreciation in the final year is $\frac{1}{n} \cdot RC_t$ - scrap proceeds. If from one year to the next the estimated replacement cost increases then the depreciation provision will be $\frac{1}{n} \cdot RC_{t+1}$

In practice it is likely that the firm will be continually acquiring each type of asset. The annual depreciation charge for each asset is calculated on the same basis as above, only now the process as a whole becomes more complex. Note, though, that it is not necessary to

calculate "backlog" depreciation. But it is essential to have an age profile for each asset. Depreciation provisions are outlined in more detail in part 3.

(III) Calculation of real gain on holding non-monetary assets

A firm has one asset which yields income

Let y_o = income in year o

K_o = capital value in year o, which produces y_o

I_g = general price index

I_s = asset specific price index

y_1 = income in year 1

K_1 = capital value in year 1, producing y_1

H_c = real holding gain on capital

r = rate of return on asset

$k_o = \frac{y_o}{r}$ - (1) if it yields y_o in perpetuity;

If general prices rise by I_g and specific prices rise by I_s then at the end of year,

$$K_1 = K_o I_s \quad - (2)$$

$$y_o I_g = y_1 \quad - (3)$$

The new value of K_o required to maintain the real purchasing power of the asset is given by:

$$K_o^n = \frac{y_1}{r} \quad - (4)$$

Now $K_1 - K_o^n = H_c$ - (5)

substituting (4)

$$K_1 - \frac{y^1}{r} = H_c \quad - (6)$$

From (3) $K_1 - \frac{y_o I_g}{r} = H_c$ - (7)

Using (1) $K_1 - K_o I_g = H_c$ - (8)

Finally from (2) $K_o(I_s - I_g) = H_c$ - (9)

That is the real holding gain is the difference between the value of K_o on a specific index basis and its value using a general index.

(IV) Calculation of gain (loss) on holding monetary liabilities (assets)

It is assumed that money is only affected by the general index (I_g). Therefore defining monetary liabilities by L and following the same approach as above the holding gain on monetary liabilities is given by:

$$H_L = -L_o (1-I_g)$$

and on monetary assets

$$H_A = L_o (I-I_g).$$

Part 3: Appendix I: Specimen of Letter sent to all Gas Regions

University of Durham Department of Economics

23/26 Old Elvet, Durham, DH1 3HY, England
Telephone: Durham 64466 (STD code 0385)

Mr. M. Wright Ext. 628

17th February, 1977.

Dear Sir,

I am at present engaged upon research for an M.A. (Economics) Thesis. The subject of my research is the performance of the Gas Industry, the intention being to compare performance over the period before the formation of the British Gas Corporation, and afterwards, up to the end of the 1975/76 financial year. I am hoping to use a replacement cost valuation of assets in order to obtain replacement cost rates of return on capital and replacement cost rates of return on investments over this period.

It is in this context that I am writing to ask for your assistance.

My request for assistance concerns the problem of valuation of land and buildings. I note from the accounts that land and buildings acquired before 1949 were written out of the records on 31st March 1973. I understand, also, that detailed information on land and buildings purchased by Area Boards (subsequently Regions) since vesting data, is held by the Region concerned.

In order to obtain a complete replacement cost figure of land and buildings I need to have some idea of the value or volume of land and buildings (that is in terms of acres of land or numbers of buildings).

Further, as buildings are depreciated for periods of up to fifty years, it is thus difficult to assess from the accounts exactly what land and buildings the Corporation possess and thus impossible to make a replacement cost valuation. Would it be possible then, to provide me with information on how much land and buildings your region possesses?

I hope that this is not too much of an imposition on your time, and that you will appreciate that in the light of recent discussions on the use of replacement cost accountancy and the performance of the Nationalised Industries what I am attempting to do is to contribute to improving the guidelines for measuring the performance of the Public Sector.

May I also assure you that any information you are able to give will be treated as confidential and will not be disclosed. Thank you.

Yours sincerely,

Part 3: Appendix II

Estimation of Showroom Numbers

Inspection of the telephone directories revealed incomplete information on showroom numbers for two regions, Wales and Southern.

Intuitively the number of showrooms in a region will be mainly dependent upon some function of the population, density of population, and number of gas customers.

In practice it seems that taking a figure of population per square mile for density hides great variations in population density, especially true of regions such as Scotland. Taking area in thousands of square miles seems to perform better as a proxy for density.

A number of equations were fitted using the above reasoning. The following semi-log function appeared to perform best:

$s = a + b_1 A + b_2 \log P$

where s = No. of showrooms
A = Area in thousands of square miles
P = Population

Using the available data the estimated equation was

$s = -496.28936 + 0.0008A + 67.92533 \log P$
$\quad (-3.4394)^* \quad (1.4704) \quad (3.976)^*$ t values in parentheses

$R^2 = 0.72382$ F ratio = 9.173^* se. 13.53967

*significant at 5% level d.f. = 7 n = 10

The actual and predicted results for the regions where data were available are shown below.

TABLE A

PREDICTED AND ACTUAL SHOWROOM NUMBERS

Region	SA	SP	Error	% Error
Scottish	110	109	+ 1	0.9
Northern	48	53	- 5	10.4
North West	126	106	+20	15.9
North East	70	56	+14	20.0
East Midlands	78	91	-13	16.7
West Midlands	70	88	-18	25.7
Eastern	76	79	- 3	3.9
North Thames	80	89	- 9	11.3
South East	102	95	+7	6.9
South West	75	68	+7	9.3
Total	835	834	+ 1	-

Table A: Land and Buildings of BGC in 1975

REGION	TYPE											
	NATIONAL/ REGIONAL H.Q. 1	AREA H.Q. 2	CUSTOMER SERVICE CENTRES 3	SHOW-ROOMS	GAS-WORKS 4	NATURAL GAS TERMINALS	COMPRESSOR STATIONS 5	HOLDER STATIONS 6	DISTRICT DISTRIBUTION OFFICES 3	L.N.G. STORES	TRANSPORT DEPTS. 7	MISC. 8
1. B.G.C.	2 [10]	-	-	-	-	-	-	-	-	-	-	5
2. Scottish	1	6	7	110	20	1	-	-	1	1	1	6
3. Northern	1	4	1	48	6	-	1	-	-	-	-	-
4. North West	2	8	6	126	-	-	-	9	6	1	2	5
5. North East	1	5	-	71	2	1	-	3	8	-	-	4
6. East Midlands	1	5	5	78	-	1	2	5	3	1	2	5
7. West Midlands	1	5	5	70	2	-	2	1	-	-	1	2
8. WALES	1	4	-	48	6	-	-	-	1	-	-	3
9. EASTERN	2	6	2	76	1	2	3	1	-	-	2	2
10. North Thames	4	6	7	80	1	1	-	3	-	2	-	-
11. South East	1	n.a. [9]	12 [9]	102	1	-	-	-	-	-	-	5
12. Southern	1	6	1	64	1	-	-	-	-	-	-	-
13. South West	2	11	2	75	1	-	-	1	4	-	3	6
Total	20	66	48	948	41	6	8	23	23	5	11	44

Table A - Notes

1. Number of H.Q. exceeds no. of regions because of split sites.

2. May also exceed number of Areas due to split sites

3. Where these can be separated from Area H.Q. s.

4. Obtained from 1975/76 accounts.

5. Completed ones. Another 16 are planned or under construction.

6. As distinct from gas works, which will also have gasholders on the same site.

7. Often located on gas holder sites. Efforts have been made to avoid double-counting here by cross-checking addresses.

8. Includes Research Stations, Training Centres, Industrial/Commercial Centres, Liquid Gas Centres, Central stores etc.

9. On the information from the Telephone Directories Area H.Q. could not be separated from Customer Service Centres which are probably on the same site.

10. It is known that these are both leasehold.

Source: Post Office Telephone Directories covering the twelve British Gas Regions for 1975.

Part 3 Appendix IV Table 1(a): Replacement Cost of Assets of BGC - Gross Book Value - Specific Indices £m

ASSET	FINANCIAL YEAR																	
	1977/8	1976/7	1975/6	1974/5	1973/4	1972/3	1971/2	1970/1	1969/70	1968/9	1967/8	1966/7	1965/6	1964/5	1963/4	1962/3	1961/2	1960/1
1. Land and Buildings	339.9	316.6	307.0	286.9	294.5	287.3	194.9	168.4	150.5	152.8	142.6	138.4	127.6	117.5	106.5	97.0	92.9	87.8
2. Mains	5770.2	5061.2	3859.6	3514.5	2072.7	1644.0	1512.8	1361.4	1208.6	894.1	784.1	601.2	583.7	547.3	528.4	499.6	488.2	472.0
3. Services	888.9	793.7	620.4	596.7	353.1	270.4	239.3	210.1	188.9	142.7	126.9	107.9	91.6	80.4	71.9	64.2	58.9	53.0
4. Gasholders & other storage	249.8	226.3	185.5	180.4	131.3	110.1	103.7	93.5	86.2	74.6	68.7	63.6	63.4	65.9	66.5	64.9	65.6	66.3
5. Plant and Machinery	763.0	637.7	642.9	671.7	638.5	668.7	656.8	684.3	613.4	554.8	543.6	434.0	348.0	303.9	285.6	265.1	262.3	263.0
6. Meters	301.7	262.9	235.5	196.2	144.9	130.3	120.7	109.2	95.0	88.9	83.8	80.5	83.7	82.2	83.2	83.6	85.3	87.7
7. Motor vehicles and mobile plant	54.9	50.8	44.8	39.5	30.5	27.6	25.2	25.6	22.0	19.7	18.0	16.7	15.8	15.3	14.3	13.0	11.7	10.7
8. Furniture, fittings, office machinery	32.7	33.0	31.9	30.6	27.1	23.5	21.8	18.7	15.0	11.8	9.3	7.8	6.3	5.8	4.8	4.6	4.6	4.7
9. Miscellaneous	117.1	88.1	65.1	42.6	33.5	27.4	24.3	20.3	16.1	12.4	9.2	6.5	4.5	3.5	3.2	2.9	2.7	2.5
TOTAL	8518.2	7501.9	5992.7	5559.1	3726.1	3189.3	2899.5	2691.5	2395.7	1951.8	1786.2	1456.6	1324.6	1221.8	1164.4	1094.9	1072.2	1047.7

PART 3 Appendix IV

Table 1b, Replacement Cost of Assets of BGC - Gross Book Value - General Index

£m

ASSET	FINANCIAL YEAR																	
	1977/8	1976/7	1975/6	1974/5	1973/4	1972/3	1971/2	1970/1	1969/70	1968/9	1967/8	1966/7	1965/6	1964/5	1963/4	1962/3	1961/2	1960/1
1. Land and Buildings	308.4	299.2	262.1	214.9	183.6	168.5	153.9	143.7	130.4	131.3	117.8	112.4	103.4	96.8	90.0	86.3	82.8	79.1
2. Mains	3919.6	3528.0	2934.1	2245.2	1757.6	1541.0	1368.3	1223.1	1030.0	872.8	718.8	599.8	525.6	476.5	434.2	402.2	378.5	355.4
3. Services	621.2	567.3	485.9	400.3	314.9	267.7	230.3	201.9	174.1	152.9	130.1	111.8	96.9	83.9	72.0	64.1	57.4	50.7
4. Gasholders and other storage	221.8	207.0	170.7	153.2	128.6	116.9	104.0	95.1	84.7	79.5	69.1	61.6	58.5	57.3	56.4	57.5	57.8	57.0
5. Plant and machinery	723.9	633.8	628.2	570.7	621.1	674.7	644.1	651.0	594.0	557.9	527.9	419.6	333.4	297.7	281.3	272.5	269.1	258.7
6. Meters	301.1	280.9	245.4	207.3	167.4	146.3	130.1	114.2	102.8	95.3	87.7	86.2	87.1	85.8	84.1	85.7	86.1	84.8
7. Motor vehicles and mobile plant	46.0	45.5	42.9	36.1	29.9	28.3	25.2	25.6	22.7	21.0	18.6	17.4	16.3	15.6	14.4	13.2	12.2	10.9
8. Furniture fittings, office machinery	32.0	33.2	32.6	28.6	26.6	25.2	22.5	18.7	14.6	12.6	9.6	8.0	6.6	5.9	4.9	4.9	4.9	5.1
9. Miscell-aneaus	103.9	86.9	66.0	41.5	34.4	29.3	25.4	21.0	16.7	13.0	9.4	6.8	4.7	3.7	3.4	3.1	2.9	2.6
Total	6277.9	5681.8	4867.9	3897.8	3267.1	2997.9	2703.8	2494.3	2170.0	1936.3	1689.0	1423.6	1232.5	1123.2	1040.7	989.5	951.7	904.3

PART 3 APPENDIX IV

Table 2 : BGC - Annual Replacement Cost Depreciation - Special Indices

£m

Asset	FINANCIAL YEAR																	
	1977/8	1976/7	1975/6	1974/5	1973/4	1972/3	1971/2	1970/1	1969/70	1968/9	1967/8	1966/7	1965/6	1964/5	1963/4	1962/3	1961/2	1960/1
1. Land and buildings	26.1	24.4	21.5	22.1	21.0	19.2	13.0	11.2	10.0	9.0	8.4	7.7	7.1	6.5	5.9	5.4	5.2	4.9
2. Mains	144.3	126.5	96.5	88.3	51.8	41.1	37.8	34.0	30.2	22.4	19.6	16.6	14.6	13.7	13.2	12.5	12.2	11.8
3. Services	59.3	52.9	41.4	39.8	23.5	18.0	16.0	14.0	12.6	9.5	8.5	7.2	6.1	5.4	4.8	4.3	4.1	3.5
4. Gasholders and other storage	13.2	11.9	9.8	9.5	6.9	5.8	5.5	4.9	4.5	3.9	3.6	3.3	3.3	3.5	3.5	3.4	3.5	3.5
5. Plant and machinery	69.4	63.8	71.4	75.4	79.8	74.3	73.0	62.2	55.8	50.4	45.3	36.2	29.0	25.3	23.8	22.1	21.9	21.9
6. Meters	20.1	17.5	15.7	13.1	9.7	8.7	8.1	7.3	6.3	5.9	5.6	5.4	5.6	5.5	5.5	5.6	5.7	5.8
7. Motor Vehicles and mobile plant	7.8	7.3	6.4	5.6	4.4	3.9	3.6	3.2	2.7	2.5	2.2	2.1	2.0	1.9	1.8	1.6	1.5	1.3
8. Furniture, fittings, office machinery	4.1	4.1	4.0	3.8	3.0	2.6	2.2	1.9	1.5	1.1	0.8	0.7	0.6	0.5	0.4	0.4	0.4	0.4
9. Miscellaneous	7.3	5.5	4.1	4.7	3.7	3.0	2.4	1.8	1.3	1.0	0.8	0.5	0.4	0.3	0.3	0.2	0.2	0.2
Total	351.6	313.9	270.8	262.3	203.8	176.6	161.6	140.5	124.9	105.7	94.8	79.7	68.7	62.6	59.2	55.5	54.7	53.3

Part 3 Appendix IV Table 3(a) Replacement cost of Assets of BGC - Net Book Value - Specific Indices

£m

ASSET	FINANCIAL YEAR																	
	1977/8	1976/7	1975/6	1974/5	1973/4	1972/3	1971/2	1970/1	1969/70	1968/9	1967/8	1966/7	1965/6	1964/5	1963/4	1962/3	1961/2	1960/1
1. Land and Buildings	114.9	114.7	115.5	114.0	124.4	136.5	96.8	85.8	76.2	80.1	72.1	68.2	60.6	54.7	48.6	43.3	41.1	39.2
2. Mains	3718.4	3324.9	2569.7	2349.1	1383.3	1110.3	1034.2	935.6	819.8	587.9	490.3	388.5	325.0	297.7	281.5	257.7	249.7	243.8
3. Services	377.9	362.5	305.0	313.8	191.7	150.0	135.4	120.7	109.7	83.3	73.7	62.1	52.7	46.5	42.1	37.6	34.8	31.5
4. Gasholders & other storage	123.7	116.1	95.4	96.3	70.4	58.5	54.4	49.1	43.8	37.2	32.8	26.8	25.3	26.3	27.0	26.9	27.9	28.6
5. Plant and machinery	272.0	232.2	183.9	135.6	144.2	224.0	258.1	351.6	343.2	337.0	340.6	251.5	175.0	139.5	125.8	110.4	108.8	112.4
6. Meters	133.8	125.3	121.2	108.1	81.6	74.0	68.1	59.2	49.0	43.2	38.0	34.4	33.8	32.6	33.1	32.9	33.7	35.5
7. Motor vehicles & Mobile plant	19.5	18.9	18.1	15.3	11.9	12.1	11.5	11.9	10.4	9.3	8.3	7.6	7.3	7.0	6.8	6.0	5.7	5.2
8. Furniture, fittings, office machinery	11.9	10.5	9.8	10.7	11.9	11.7	12.3	11.3	9.2	7.5	5.5	4.5	3.4	3.1	2.4	2.1	1.9	2.0
9. Miscellaneous	67.8	51.7	38.8	16.8	15.1	14.6	14.6	13.4	11.3	8.8	6.4	4.4	2.7	1.8	1.6	1.4	1.3	1.2
TOTAL	4839.9	4356.8	3457.4	3159.7	2034.5	1791.7	1685.4	1638.6	1472.6	1194.3	1067.7	848.0	685.8	609.2	568.9	518.3	504.9	499.4

Part 3 Appendix IV

Table 3(b): Replacement Cost of Assets of BGC - Net Book Value - General Index

£m

ASSET	FINANCIAL YEAR																	
	1977/8	1976/7	1975/6	1974/5	1973/4	1972/3	1971/2	1970/1	1969/70	1968/9	1967/8	1966/7	1965/6	1964/5	1963/4	1962/3	1961/2	1960/1
1. Land and Buildings	114.1	119.0	109.0	93.9	88.7	86.8	82.1	78.8	70.7	72.2	62.2	58.1	50.7	46.3	42.4	40.1	38.7	37.7
2. Mains	2630.2	2410.0	2030.6	1543.4	1211.2	1078.3	973.8	879.5	734.7	608.8	480.1	384.6	327.6	289.6	259.9	234.0	219.0	206.9
3. Services	281.1	271.4	247.2	215.4	171.7	148.2	129.7	115.2	100.1	88.3	75.1	64.1	55.8	48.9	42.7	38.1	34.5	30.7
4. Gasholders and other storage	110.4	107.0	92.8	82.0	68.6	62.0	54.8	50.2	43.1	40.0	33.5	26.5	24.0	23.7	23.9	25.1	26.2	26.5
5. Plant and machinery	261.0	233.2	183.1	129.8	141.0	227.5	255.5	337.2	334.6	341.2	334.1	245.8	169.1	137.3	123.8	112.4	110.4	110.1
6. Meters	130.0	130.4	123.0	111.2	91.9	81.3	71.8	60.7	52.1	45.4	39.1	36.0	34.5	33.7	33.4	34.1	34.9	35.6
7. Motor vehicles and mobile plant	17.0	17.3	17.7	14.2	11.7	12.4	11.5	11.7	10.7	9.8	8.5	7.8	7.4	6.4	6.8	6.1	5.9	5.2
8. Furniture, fittings, Office machinery	9.8	10.6	10.0	10.0	12.3	13.1	12.6	11.2	8.8	7.9	5.6	4.6	3.5	3.2	2.4	2.2	2.0	2.0
9 Miscellaneous	58.9	50.7	38.9	16.2	15.2	14.8	15.1	13.7	11.6	9.2	6.6	4.5	2.7	1.9	1.6	1.4	1.3	1.2
TOTAL	3612.5	3349.6	2852.3	2216.1	1812.3	1724.4	1606.9	1558.2	1366.4	1222.8	1044.8	832.0	675.3	591.0	536.9	493.5	472.9	455.9

Part 3 Appendix IV Table 3(c): BGC Gains on Holding Assets £m

ASSET	FINANCIAL YEAR																	
	1977/8	1976/7	1975/6	1974/5	1973/4	1972/3	1971/2	1970/1	1969/70	1968/9	1967/8	1966/7	1965/6	1964/5	1963/4	1962/3	1961/2	1960/1
1. Land and Buildings	0.8	(4.3)	6.5	20.1	35.7	49.7	14.7	7.0	5.5	7.9	9.9	10.1	9.9	8.4	6.2	3.2	2.4	1.5
2. Mains	1088.2	914.9	539.1	805.7	172.3	32.0	60.4	55.7	85.1	(20.9)	10.2	3.9	(2.6)	8.1	21.6	23.7	30.7	36.9
3. Services	96.8	91.1	57.8	98.4	20.0	1.8	5.7	5.5	9.6	(5.0)	(1.4)	(2.0)	(3.1)	(2.4)	(0.6)	(0.5)	0.3	0.8
4. Gasholders & other storage	13.3	9.1	2.6	14.3	1.8	(3.5)	(0.4)	(1.1)	0.7	(2.8)	(0.7)	0.3	1.3	2.6	3.1	1.8	1.7	2.1
5. Plant and machinery	11.0	(1.0)	0.8	5.8	3.2	(3.5)	2.6	14.4	8.6	(4.2)	6.5	5.7	5.9	2.2	2.0	(2.0)	(1.6)	2.3
6. Meters	3.8	(5.1)	(1.8)	(3.1)	(10.3)	(7.3)	(3.7)	(1.5)	(3.1)	(2.2)	(1.1)	(1.6)	(0.7)	(1.1)	(0.3)	(1.2)	(1.2)	(0.1)
7. Motor vehicles & mobile plant	2.5	1.6	0.4	1.1	0.2	(0.3)	-	0.2	(0.3)	(0.5)	(0.2)	(0.2)	(0.1)	0.6	-	(0.1)	(0.2)	-
8. Furniture, fittings, office machinery	2.1	(0.1)	(0.2)	0.7	(0.4)	(1.4)	(0.3)	0.1	0.4	(0.4)	(0.1)	(0.1)	(0.1)	(0.1)	-	(0.1)	(0.1)	-
9. Miscellaneous	8.9	1.0	(0.1)	0.6	(0.1)	(0.2)	(0.5)	(0.3)	(0.3)	(0.4)	(0.2)	(0.1)	-	(0.1)	-	-	-	-
TOTAL	1227.4	1007.2	605.1	943.6	222.2	67.3	78.5	80.4	106.2	(28.5)	22.9	16.0	10.5	18.2	32.0	24.8	32.0	43.5

Part 3 Appendix IV Table 4: Historic Cost Rate of Return data £m

	1977/8	1976/7	1975/6	1974/5	1973/4	1972/3	1971/2	1970/1	1969/70	1968/9	1967/8	1966/7	1965/6	1964/5	1963/4	1962/3	1961/2	1960/1
Turnover	2582.0	1976.2	1580.4	1219.2	979.5	904.8	783.2	689.4	662.4	644.5	590.2	555.5	562.6	527.6	496.8	478.5	438.6	416.3
Less:																		
operating costs	1585.1	1194.5	1047.4	853.3	677.2	603.9	544.7	501.2	493.5	499.7	500.8	471.0	479.4	449.5	432.2	416.6	379.8	360.9
deferred charges	155.7	148.3	87.0	73.9	44.6	32.8	16.9	11.3	5.7	2.2	0.5	-	-	-	-	-	-	-
displaced plant	83.2	80.6	48.7	38.2	30.0	11.6	13.4	-	-	-	-	-	-	-	-	-	-	-
pre depreciation trading surplus	758.0	552.8	397.3	253.8	227.7	254.7	221.6	176.9	163.2	142.6	88.9	84.5	83.2	78.1	64.6	61.9	58.8	55.4
Deduct historic cost depn	196.0	176.4	147.3	135.2	113.3	96.7	82.6	68.7	60.8	52.6	45.1	40.1	36.9	35.5	32.7	30.8	30.0	28.8
pre interest historic cost profit	562.0	376.4	250.0	118.6	114.4	158.0	139.0	108.2	102.4	90.0	43.8	44.4	46.3	42.6	31.9	31.1	28.8	26.6
Assets																		
1.Fixed Assets NBV	1591.8	1586.6	1556.3	1433.3	1412.1	1465.0	1480.1	1448.9	1346.9	1250.4	1100.9	879.4	711.8	635.3	589.9	536.2	511.9	500.6
2.Cap.expend. charged to revenue	192.7	103.7	48.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.deferred charges	-	148.3	273.3	295.9	293.2	256.5	248.0	173.9	76.3	30.6	6.4	0.9	-	-	-	-	-	-
4.displaced plant	-	82.3	137.6	143.2	122.0	90.6	64.0	25.0	16.2	7.7	1.3	1.5	1.5	1.5	1.1	1.2	0.2	-
5.Investments	33.7	65.5	57.6	32.8	21.6	22.8	20.8	20.6	18.1	16.1	7.4	4.6	4.9	4.8	5.0	5.5	5.8	5.5
6.Hire purchase,etc.	73.7	65.4	59.3	51.3	52.9	54.3	54.3	49.2	51.3	51.4	50.1	52.2	58.2	56.9	50.9	46.7	45.2	46.0
7.Others	-	-	-	-	-	-	4.8	6.0	6.8	8.6	8.7	9.3	9.5	11.3	14.6	15.1	17.9	18.5
Current Assets																		
Stocks	113.6	124.3	104.1	87.0	73.9	78.0	76.1	87.9	88.2	86.5	90.7	81.1	64.3	62.7	57.8	50.7	53.4	53.6
Net monetary assets	244.0	241.6	185.1	148.4	137.1	90.5	99.8	79.0	58.7	34.9	12.7	26.8	29.8	40.1	37.1	33.6	30.9	25.5
Less:																		
Net Bank overdraft	21.4	(5.0)	(6.6)	(5.1)	(6.3)	(6.1)	(5.9)	(7.4)	(8.3)	(6.3)	(8.4)	(4.1)	-	(4.1)	(4.1)	(4.1)	(2.8)	(0.5)
Total after O/D	2228.1	2412.7	2414.8	2186.8	2106.5	2051.6	2042.0	1883.1	1654.2	1479.9	1269.8	1051.7	880.0	808.5	752.3	684.9	662.5	649.2
Total before O/D	2249.5	2417.7	2421.4	2191.9	2112.8	2057.7	2047.9	1890.5	1662.5	1486.2	1278.2	1055.8	880.0	812.6	756.4	689.0	665.3	649.7

Source: D7- D12, D52 supplementary statements

Part 3 Appendix IV

Table 5: Replacement Cost Rate of Return - replacement cost depreciation and cost of sales adjustments to profits and replacement cost asset valuation only. £m

	1977/8	1976/7	1975/6	1974/5	1973/4	1972/3	1971/2	1970/1	1969/70	1968/9	1967/8	1966/7	1965/6	1964/5	1962/4	1962/3	1961/2	1960/1
Turnover	2582.0	1976.2	1580.4	1219.2	979.5	904.8	783.2	689.4	662.4	644.5	590.2	555.5	562.6	527.6	496.8	478.5	438.6	416.3
Less:																		
operating costs	1585.1	1194.5	1047.4	853.3	677.2	603.9	544.7	501.2	493.5	499.7	500.8	471.0	479.4	449.5	432.2	416.6	379.8	360.9
deferred charges	155.7	148.3	87.0	73.9	44.6	32.8	16.9	11.3	5.7	2.2	0.5	-	-	-	-	-	-	-
displaced plant	83.2	80.6	48.7	38.2	30.0	13.4	-	-	-	-	-	-	-	-	-	-	-	-
pre int, pre dep. surplus	758.0	552.8	397.3	253.8	227.7	254.7	221.6	176.9	163.2	142.6	88.9	84.5	83.2	78.1	64.6	61.9	58.8	55.4
Deduct:																		
Repl.cost depn.	367.1	322.1	274.3	262.3	203.8	176.6	161.6	140.5	124.9	105.7	94.8	79.7	68.7	62.6	59.2	55.5	54.7	53.3
Cost of sales adj.	14.1	20.6	15.4	19.3	11.1	4.9	4.2	7.0	4.7	2.1	3.0	1.2	1.5	2.1	1.1	0.5	0.8	1.3
Pre interest repl.cost profit	376.8	210.1	107.6	(27.8)	12.8	73.2	55.8	29.4	33.6	34.8	(8.9)	3.6	13.0	13.4	4.3	5.9	3.3	0.8
Assets*																		
after o/d	5536.1	5201.0	4324.8	3923.6	2734.3	2380.6	2249.2	2076.2	1782.2	1424.8	1238.1	1021.0	854.8	783.5	731.9	663.3	655.9	648.6
before o/d	5514.7	5206.0	4331.4	3928.7	2740.6	2386.7	2255.1	2083.6	1790.5	1431.1	1246.5	1025.1	854.8	787.6	736.0	671.4	658.7	649.1
after o/d but stock at historic cost	5529.4	5189.8	4316.3	3913.2	2728.9	2378.2	2247.3	2072.8	1779.9	1423.8	1236.6	1020.3	854.0	782.4	731.3	633.0	655.5	648.0
before o/d but stock at historic cost	5508.0	5194.8	4322.9	3918.3	2735.2	2384.3	2253.2	2080.2	1788.2	1430.1	1245.0	1024.4	854.0	786.5	735.4	671.1	658.3	648.5

* see Part 3 Ch. 2 Table 1 for details.

PART 3 APPENDIX IV

Table 6 : Estimated Replacement Cost Rates of Return for Industry in General - by various institutions

Year (calendar)	(1) Monoplies Commission "Method 4" Mean	NEDO study (2)			TRADE AND INDUSTRY (3)			Bank of ENGLAND Q.B. (4)		
		Historic Cost	Replacement Cost	Adj.Rept Cost	Historic Cost	Rept Cost	Adj.Rept Cost	Historic Cost	Rept Cost	Adj Rep Cost
	%	%	%	%	%	%	%	%	%	%
1960	13.1	n.a	n.a	n.a	18.8	13.5	13.2	19.0	13.7	13.4
1961	11.1	n.a	n.a	n.a	16.4	11.9	11.4	16.5	12.0	11.5
1962	9.5	n.a	n.a	n.a	14.9	10.8	10.4	15.0	10.9	10.5
1963	10.2	n.a	n.a	n.a	16.0	11.8	11.3	16.1	11.8	11.4
1964	11.4	n.a	n.a	n.a	16.7	12.5	11.7	16.8	12.6	11.8
1965	10.7	12.7	11.3	10.2	16.0	11.9	11.2	16.0	12.0	11.2
1966	9.2	11.3	9.5	8.7	14.3	10.6	9.8	14.3	10.7	9.8
1967	9.4	11.2	9.7	9.5	13.5	10.3	10.0	13.6	10.3	9.8
1968	11.0	12.5	10.8	8.6	14.7	11.0	9.9	14.7	11.2	10.0
1969	n.a	11.9	9.9	8.9	14.8	11.0	9.7	13.8	9.9	8.8
1970	n.a	11.0	8.6	7.0	14.1	10.1	8.3	13.5	9.1	7.8
1971	6.2	12.0	8.9	7.4	14.6	10.0	8.5	14.3	8.9	8.3
1972	8.7	13.5	n.a	8.8	15.5	10.2	8.5	15.9	9.3	8.8
1973	10.3	15.4	n.a	6.0	17.6	10.8	7.4	18.2	10.1	7.8
1974	5.8	n.a	n.a	n.a	17.3	9.6	4.3	17.9	9.3	4.6
1975	5.7	n.a	n.a	n.a	14.6	6.8	3.2	15.1	n.a	3.5
1976	n.a	n.a	n.a	n.a	16.3	7.0	3.3	16.8	n.a	3.5
1977	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a

Table 6 Notes

(1) Source: Monopolies Commission Reports (D61 to D64) and Rowley (D60). See D61 Appendix 4 p.119 for explanation of derivation. Data relates to large quoted UK manufacturing companies, and was based on Economic trends data originally and DOI Business Monistor M3 latterly.

(2) Historic Cost data derived from DOI Business Monitor M3. Replacement Cost data found by adjusting historic cost data by conversion factor derived from Monopolies Commission data (see NEDO (D53) pp. 81-3 for details). Data covers large quoted UK manufacturing companies.

(3) Source: Trade and Industry (D56 to D58) and Economic Trends (D59). Data derived from National Income and Expenditure "Blue Book" and Central Statistical Office, and relates to all industrial and commercial companies (see D57, p 112 for details of definition).

(4) Source: Bank of England Quarterly Bulletin (D54,D55) Data derived from National Income and Expenditure "Blue Book" and Central Statistical Office, and relates to all industrial and commercial companies (see D54, p.45-6 for details)

Definitions

1. Monopolies Commission "Method 4" mean - as defined by Rowley (D60, pp. 46-7) Replacement cost basis, but excludes adjustment for stock appreciation until post-1971

2. Historic Cost Rate of Return:
(i) NEDO - profits are pre-interest, pre-tax, assets are total assets less current liabilities plus short-term borrowing.

(ii) Trade and Industry, Bank of England.

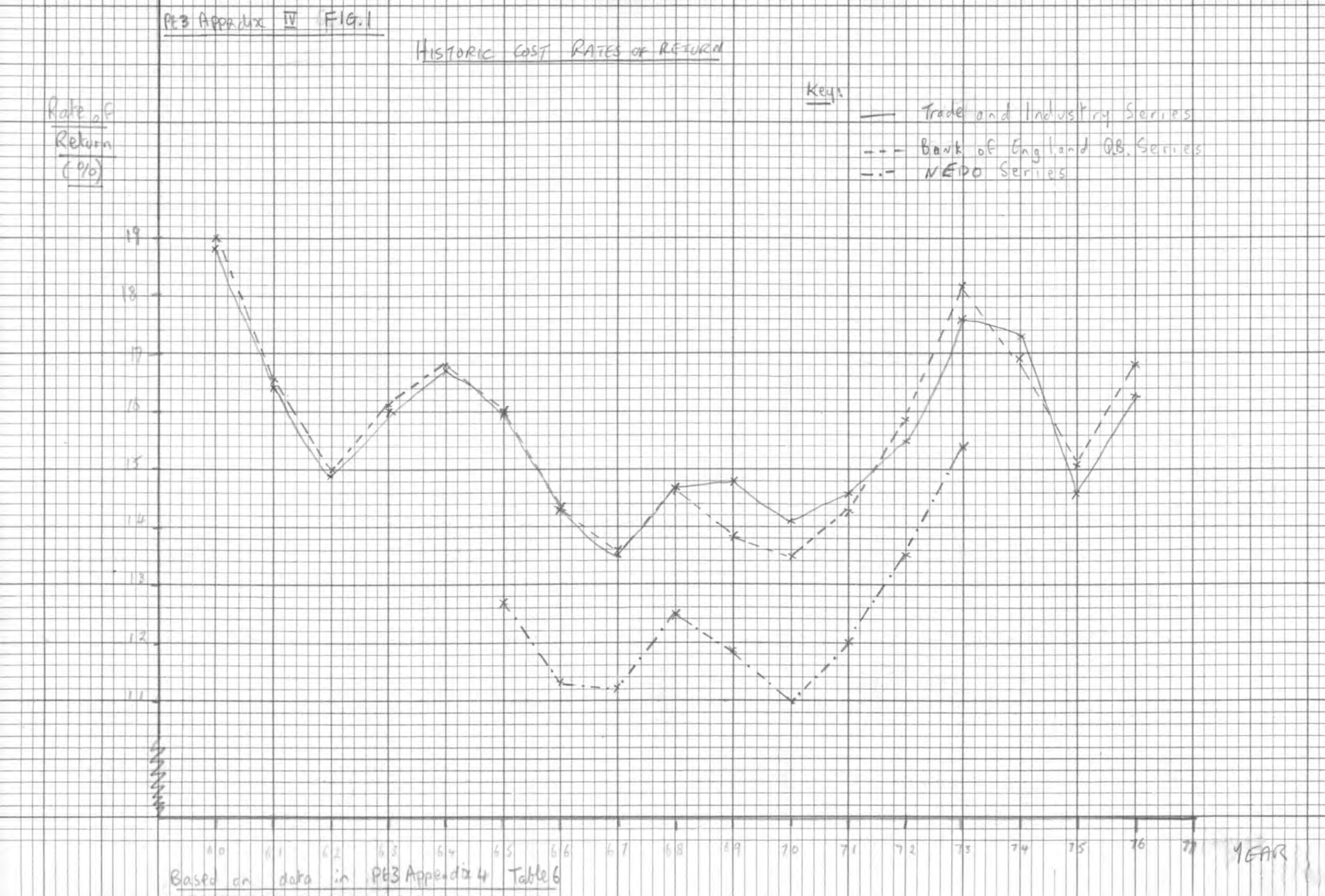
Profits are gross trading profits plus rent received less capital consumption at historic cost. Assets are fixed assets (exc. land) at historic cost plus book value of stocks.

3. Replacement Cost Rate of Return.
As for historic cost but depreciation and fixed asset valuation based on replacement cost.

4. Adjusted Replacement Cost Rate of Return.
As for replacement cost but profit further adjusted for stock appreciation.

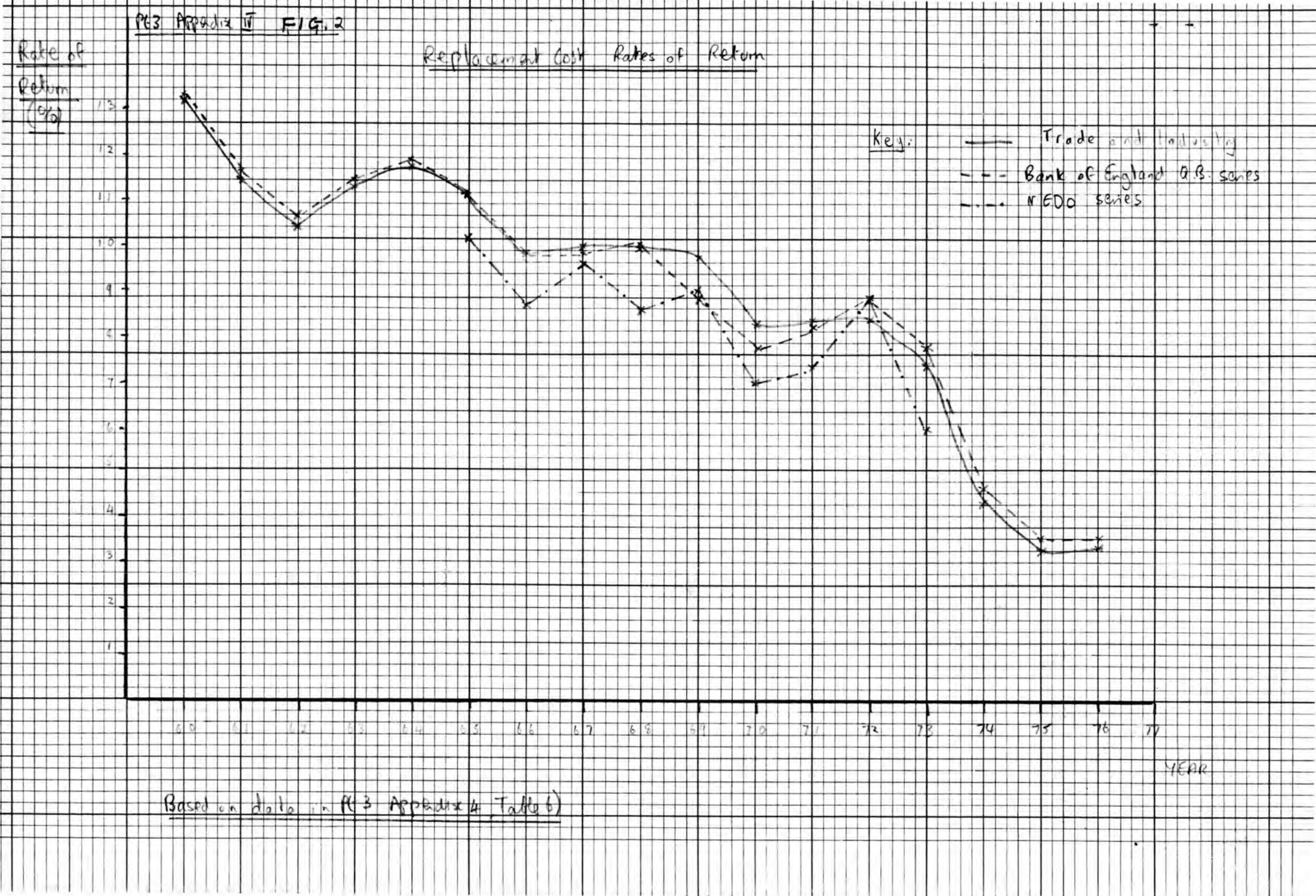
Pt 3 Appendix IV FIG. 1

Historic Cost Rates of Return



Based on data in Pt 3 Appendix 4 Table 6

P63 Appendix IV FIG. 2



Based on data in P63 Appendix 4, Table 6)

REFERENCES

1. S. Aaronovitch and M.C. Sawyer, Mergers, Growth and Concentration Oxford Economic Papers Vol. 27 1975 pp.136-155.

2. L.R. Amey, The Efficiency of Business Enterprises, Allen and Unwin 1969.

3. D.F. Arnold and R.J. Huefner, Measuring and Evaluating Replacement Costs: An Application, Jnl. Accounting Research Vol. 15, No. 2, 1977, pp.245-252.

4. F.A. Bailey, Inflation Accounting: Remedy for a Sandilands Difficulty, Times, p.20, 20.1.77.

5. S.J. Bailey, A Critique of U.K. North Sea Oil and Gas Policy, Univ. of Strathclyde Dept. Economics, Discussion Paper 76/2.

6. R.J. Ball, The Use of Value Added in Measuring Managerial Efficiency, Business Ratios, Summer 1968, pp.5-11.

7. R. Bates and N. Fraser, Investment Decisions in the Nationalised Fuel Industries, C.U.P. 1974.

8. W.J. Baumol and D.F. Bradford, Optimal Departures from Marginal Cost Pricing, A.E.R. June 1970.

9. W.T. Baxter, Accounting Values and Inflation, McGraw-Hill 1974.

10. ————, The Sandilands Report, Jnl. Business Finance and Accounting Spring 1976, Vol. 3, No. 1.

11. ————, The Accountants Safe Haven As Far Away As Ever, Financial Times, p.13, 1.12.76.

12. ————, Accountants and Inflation, Lloyds Bank Review, July 1977, pp.1-16.

13. D.M. Beattie, Value Added and Return on Capital as Measures of Managerial Efficiency, Jnl. Bus. Finance, Summer 1970.

14. R.G. Bird and A.J. McHugh, Financial Ratios - An Empirical Study, Jnl. Business Finance and Accounting, Vol. 4, No. 1, Spring 1977.

15. K. Bond, Applying Three Key Tests to Inflation Accounting, Times, p.21, 24.5.77.

16. M. Bourn et. al., Price Indices for Current Cost Accounting. Jnl. Business Finance and Accounting Vol. 3 No.5 Autumn 1976.

17. ————, Price Indices for Current Cost Accounting: A Rejoinder, Jnl. Business Finance and Accounting, Vol. 4, No. 1, Spring 1977, pp.145-7.

18. G. Brown and M.B. Johnson, Public Utility Pricing and Output Under Risk, A.E.R. March 1969.

19. ————, Public Utility Pricing and Output Under Risk: Reply, A.E.R. June 1970.

20. R.J. Bull, Accounting in Business, 3rd Edn. 1977, Butterworths.

21. B. Carlsson, The Measurement of Efficiency in Production: An Application

to Swedish Manufacturing Industries 1968, Swedish Journal of Economics 1972.

22. R.J. Chambers, Accounting, Evaluation and Economic Behaviour, Prentice-Hall 1966.

23. P. Chantler, The British Gas Industry - an Economic Study, M.U.P. 1938.

24. J. Clayton, Has Sandiland's Been Sabotaged, Times 17.1.77.

25. A.G. Coenenburg and K. Macharzina, Accounting for Price Changes - an Analysis of Current Developments in Germany, Jnl. Business Finance and Accounting, Spring 1976, Vol. 3, No. 1, pp.53-68.

26. M.A. Crew and P.R. Kleindorfer, Reliability and Public Utility Pricing, A.E.R. March 1978, pp.31-40.

27. R.S. Cutler and C.A. Westwick, The Impact of Inflation Accounting on the Stock Market, Accountancy, Vol. 83, No.955, March 1973, pp.15-26.

28. R. Cyert and J.G. March, A Behavioural Theory of the Firm, Prentice-Hall, Englewood Cliffs, N.J. 1963.

29. K.W. Dam, The Evolution of North Sea Licensing Policy in Britain and Norway, J.L.E. Chicago, October 1974.

30. P. Dasgupta and G. Heal, The Optimal Depletion of Exhaustible Resources, Rev. Econ. Stud. 1974.

31. O.A. Davis and A.B. Whinston, Welfare and the Theory of Second Best, Rev. Econ. Stud. 1965.

32. ————, Piecemeal Policy in the Theory of Second Best. Rev. Econ. Stud. 1967.

33. E.F. Denison, Why Growth Rates Differ, Brookings Inst. 1967.

34. P.J. Devine et. al. An Introduction to Industrial Economics, Allen and Unwin 1977.

35. J.L. Eatwell, Growth, Profitability and Size: The Empirical Evidence. Appendix A, pp.389-418 in R. Marris and A. Wood (eds.) The Corporate Economy, Macmillan 1971.

36. E.O. Edwards and P.W. Bell, Theory and Measurement of Business Income, California University Press, 1961.

37. D.R. Fairburn, A Howler in the Inflation Accounting Debate, Times, p.19 30.10.75.

38. M.J. Farrell, The Measurement of Productive Efficiency, Journal of Royal Statistical Society, Series A (General) Part III 1957.

39. K. Fleet, The Billion Pound Explosion in Gas, Sunday Times p.61 31.7.77.

40. ————, All Gas and Gaiters, Sunday Times, p.45, 7.8.77.

41. J.S. Flemming, Trends in Company Profitability Bank of England Quarterly Bulletin Vol. 16 No.1 1976 pp. 36-52.

42. T.D. Flynn, Why we should account for inflation Harvard Business Review Sep/Oct. 1977 pp. 145-157.

43. M. Gibbs, Why Sandiland's is not the full answer Times p. 19, 18.9.75.

44. _____, A Better answer to the Problem of Inflation Accounting Times 23.2.76.

45. R.R. Gilchrist, A Measure of Company Efficiency European Business April 1970, pp. 44-50.

46. _____, Company Appraisal and Control by Added Value Analysis Cost Accountants Journal Oct. 1970 pp. 573-580.

47. Godley W. and Cripps E, Profits, Stock Appreciation and the Sandiland's Report Times p. 19 1.10.75.

48. L.A. Gordon, Further Thoughts on the Accounting Rate of Return vs. The Economic Rate of Return Journal of Business Finance and Accounting Vol.4. No. 1 Spring 1977.

49. H.S.E. Gravelle, Public Enterprises under Rate of Return Financial Targets. Manchester School of Econ. and Soc. Stud. March 1976 pp. 1-16.

50. _____, Marginal Cost Pricing under Rate of Return Financial Targets, Manchester School of Econ. and Soc Stud. Sept. 1977 pp. 236-240.

51. S.J. Gray, Accounting for Price Changes: A Case Study of A Multinational Company. Journal of Business Finance and Accounting Vol 3. No. 1 Spring 1976, pp.1-14.

52. S.J. Gray and M.C. Wells, Asset Values and ex post Income. Accounting and Business Research Summer 1973 pp. 163-7.

53. _____, A Further Comment on Asset Values and Income Measurement, Accounting and Business Research Spring 1975 pp. 91-95.

54. R.S. Gynther, Why use General Purchasing Power? Accounting and Business Research Spring 1974 pp. 141-156.

55. A.C. Harberger, Monopoly and Resource Allocation American Economic Review 44(2) 1954 pp. 77-92.

56. J. Hardie, Unrealised Gains Times 13.11.1975.

57. C. Harlow, Innovation and Productivity under Nationalisation. published by George Allen and Unwin for P.E.P. 1977.

58. P.D. Henderson, Investment Criteria for public Enterprises (from notes on public investment criteria in the U.K. Bull. Oxford Univ. Inst. of Econ and Stats. Vol. 27 1965 pp. 55-89) reprinted in (66).

59. J.R. Hicks Value and Capital Oxford Clarendon Press 1946 Chs. XIV, XV.

60. H. Hotelling, The Economics of Exhaustible Resources Journal of Political Economy Vol. 39 pp. 137-175.

61. W.S. Howe, The Inflation Accounting Debate: An Economic Viewpoint Moorgate and Wall St. Jnl. Spring 1973.

62. _____, The Use of Accountancy Data in Measuring Economic Performance. Address to A.U.T.A. 1978.

63. Hyde Committee Inflation Accounting: An Interim Recommendation ICA 1977

64. I.C.A. Provisional SSAP No.7: Accounting for Changes in the Purchasing Power of Money May 1974 I.C.A.

65. _____. Exposure Draft E.D.18: Current Cost Accounting 1976 I.C.A.

66. P. Jay, A Simple Remedy for the Sandiland's Fallacy Times p. 19 16.10.75.

67. F.J. Johnson, Marketing Research Used in Tactical Decision Making. Conference Papers of Mkt. Research Society 17th Annual Conference 13-15 Mar. 1974 pp. 7-38.

68. C. Jones, The Problem of the Profits in State Industries Financial Times Dec. 1977.

69. _____. Nationalised Industries: The Limits to Action. Financial Times 14.3.78.

70. J.A. Kay, Inflation Accounting - A Review Article. Economic Journal June 1977 pp. 300-311.

71. C. Kennedy, Inflation Accounting, when profits and potential insolvency go hand in hand. Times p. 17 28.10.75.

72. _____, Cash Flow and Asset Value Times p.19 5.12.75.

73. _____, Sandilands and the Taxation Issue Times p.19 14.1.76.

74. _____, Sandilands: a transparent error Times Feb. 1976

75. _____, Inflation Accounting, Profits, Profitability and Share Valuation Journal of Business Finance and Accounting Spring 1976. Vol. 3 No.1 pp. 137-146.

76. _____, Comment Jnl. of Business Finance and Accounting Autumn 1976 Vol 3 No. 3.

77. _____, Inflation Accounting: Retrospect and Prospect Cambridge Economic Policy Review 1978 pp. 58-64.

78. M. Lafferty, Accounting Proposals Gain Wide Support Financial Times p.1 1.12.76.

79. _____, Agreement on Hyde Guidelines is expected Today Financial Times p.1 31.10.77.

80. Lawrance D.M. et.al. Modern Methods of Valuation Estates Gazette Ed. 6, 1975.

81. G.H. Lawson, Cash Flow Accounting The Accountant 28.10.71.

82. G.H. Lawson, Inflation Accounting: Another view Times 11.2.76.

83. _____, Exposing the Money Gains Fallacy Times 4.3.76.

84. _____, Sandilands: Holding Gains, Debt-Financing, Working Capital and Current Cost Accounting Jnl. Business Finance and Accounting Spring 1976 Vol. 3 No.1 pp. 105-114.

85. _____, A Reply to Professor Kennedy Jnl. of Business Finance and Accounting Vol.3 No.3. Autumn 1976.

86. _____, The Rationale of Cash Flow Accounting, in C.van Dam (ed.) Trends in Managerial and Financial Accounting Martinus Nijhoff, Social Sciences Division, Leiden/Boston 1978.

87. _____, Company Profits: The Grand Illusion Sunday Times p. 61 30.7.78.

88. T.A. Lee, Income and Value Measurement: Theory and Practice Nelson 1974.

89. T.A. Lee, Sandilands and User Comprehension Jnl. of Business Finance and Accounting. Spring 1976 Vol.3 No.1 pp. 85-96.

90. A.P. Lerner, The Concept of Monopoly and the Measurement of Monopoly Power. Rev. Ec. Stud. June 1943 pp. 157-175. Reprinted in Breit and Hochman Readings in Microeconomics.

91. Levy-Lambert, Investment and Pricing Policy in the French Public Sector A.E.R. Feb. 1977.

92. Lex Column, Dr. Morpeth and Mr. Hyde Financial Times 3.11.77.

93. R.G. Lipsey and K. Lancaster, The General Theory of Second Best. Rev. Ec. Stud. No.1. 1956.

94. I.M.D. Little, The Price of Fuel 1953.

95. S.C. Littlechild, Marginal Cost Pricing with Joint Costs. E.J. June 1970.

96. C. Lorenz, A European Yardstick for Nationalised Industries Financial Times 7.11.77.

97. _____, Banning Foul Play in the European Price League. Financial Times p.17. 8.11.77.

98. _____, The Hidden Items on a Phone Bill. Financial Times 9.11.77.

99. _____, Labour productivity: Why Britain may be up to the German Mark. Financial Times p.17 16.11.77.

100. _____, How the Post Office toned up its productivity Financial Times 22.11.77.

101. B.J. McCormick, Review of "Efficiency Criteria for Nationalised Industries" by Alec Nove. E.J. Mar. 1974 pp. 214-215.

102. G. MacDonald, Deprival Value: Its Use and Abuse Accounting and Business Research Autumn 1977 pp. 263-69.

103. M.B. McElroy, Capital Gains and Social Income Economic Inquiry Vol.XIV June 1976 pp. 221-240.

104. R. Marris and A. Wood (Eds.), The Corporate Economy Macmillan 1971

105. R.D. Mason, Statistical Techniques in Business and Economics Richard D. Irwin Inc. 1974.

106. G. Meeks, Disappointing Marriages: Gains from Mergers University of Cambridge Department of Applied Economics occasional Papers: 51 C.U.P. 1977.

107. A.J. Merrett, Measuring Trends in Profitability Lloyds Bank Review Oct. 1975. pp. 14-26.

108. _____ and A. Sykes, Sandilands: Considering the Sense and Nonsense of Asset Values. Times 20.10.75.

109. _____, Merely Metaphysical Lumber Times 18.11.75.

110. _____, Meaningful, not Metaphysical, Accounting Arrangements Times Nov.1975.

111. E.J. Mishan, Second Thoughts on Second Best. Oxford Economic Papers Vol.14 No. 3 1962 pp. 205-217.

112. O. Morgenstern, On the Accuracy of Economic Observations Princeton 1963.

113. R. Morley, The Rate of Unemployment and the Share of Profit in National Income Univ. of Durham W.P. No.12 Oct. 1977.

114. D. Morpeth, Accounting Under Inflation Financial Times p. 22 1.12.76.

115. I. Morrison, Current Cost Accounting Proposals Inappropriate for Financial Institutions Times p.19 27.11.75.

116. _____, Inflation Accounting: Seeking a True and Fair View of the Banks Times p.23 2.12.76.

117. R.A. Musgrave, and P.G. Musgrave Public Finance in Theory and Practice

118. D.R. Myddelton, Untitled Letter Times 20.11.75.

119. _____, Why Sandilands is Unacceptable. Jnl. of Business Finance and Accounting Spring 1976 Vol. 3 No.1. pp. 97-104.

120. N.E.D.O. Financial Performance and Inflation 1975.

121. N.E.D.O. A Study of U.K. Nationalised Industries No. 1976.

122. J.R. Nelson (ed.), Marginal Cost Pricing in Practice. Prentice-Hall 1964.

123. C. New, Factors in productivity that should not be overlooked Times Feb. 1st 1978. p.19.

124. G. Newbould, Management and Merger Activity Guthstead, Liverpool 1970.

125. N.H. Nie et.al. Statistical Package for the Social Sciences Manual 2nd Edn. McGraw-Hill 1975.

126. D.T. Nguyen and R.A. Whittaker, Inflation, Replacement and Amortisation Funds: A Case Study of U.K. Industries. Jnl. of Business Finance and Acc. pp. 43-52. Spring 1976 Vol.3. No. 1.

127. C.W. Nobes, C.C.A. - Valuation by Intent? Accounting and Business Research Spring 1977 pp. 95-99.

128. A. Nove, Efficiency Criteria for Nationalised Industries George Allen and Unwin 1973.

129. M. Panic and R.E. Close, Profitability of British Manufacturing Industry Lloyds Bank Review July 1973 pp. 17-30.

130. I. Papps, Government and Enterprise I.E.A. Hobart Paper 61 1975.

131. _____, Review of (4) J.E.L. Vol. XIV No. 2 June 1976 pp.504-5.

132. _____, Concepts of Income and the Measurement of Firm Performance Univ. of Durham Economics Department W.P. No.21 August 1978.

133. K.V. Peasnall and L.C.L. Skerratt, Price Indices for Current Cost Accounting - a Reply and some Further Evidence. Jnl. of Business Finance and Accounting. Spring 1977 Vol.4. No.1. pp. 139-144.

134. J.R. Perrin, Inflation Accounting is not economic Valuation. Journal of Business Finance and Accounting Spring 1976. Vol.3 No.1.

135. _____, Untitled Letter Times 4.3.76.

136. N. Pilkington, If Anyone is wrong it is not Sandilands Times Oct. 1975.

137. G. Polanyi, North Sea Gas and the Future of the Gas Industry N.West Fuel Luncheon Club Address April 6th 1966.

138. _____, What Price North Sea Gas? I.E.A. Hobart paper No. 38. 1968.

139. _____ and P. Polanyi, The Efficiency of Nationalised Industries Moorgate and Wall St. Jnl. Spring 1972.

140. P.E.P., Report on the Gas Industry P.E.P. 1939.

141. B. Popoff, The Informational Value of Replacement Cost Accounting for External Company Reports. Accounting and Business Research Winter 1974 pp. 61-70.

142. R.W.S. Pryke, Are Nationalised Industries Becoming More Efficient? Moorgate and Wall St. Jnl. Spring 1970.

143. R.W.S. Pryke, Public Enterprise in Practice MacGibbon and Kee 1971

144. _____, Book Review of (146) E.J. March 1974 pp. 215-217.

145. _____, Badly directed and badly managed. Guardian Dec.6th 1976 p.14.

146. _____, Book Review of (118) E.J. Sept 1977 pp. 598-600.

147. P.W. Reed, The Economics of Public Enterprise Butterworth & Co. 1973

148. R. Rees, Second Best Rules for Public Enterprise Pricing. Economica August 1968.

149. G.L. Reid et.al. The Nationalised Fuel Industries. 1973.

150. C. Robinson, A Policy for Fuel I.E.A. Occ. Paper 31. 1969

151. C. Robinson and J. Morgan, Economic Consequences of Controlling the Depletion of North Sea Oil and Gas. Trade Policy Research Centre London Guest Paper No.3 1976.

152. W.A. Robson, The Control of Nationalised Industries National Westminster Bank Review No. 1977 pp. 6-16.

153. Sir D. Rooke, Gas Accounts Soundly Based Sunday Times p. 48 7.8.77.

154. C.K. Rowley, The Monopolies Commission and Rate of Return on Capital Economic Journal March 1969.

155. _____, The Monopolies Commission and Rate of Return on Capital: A Reply Economic Journal Sept. 1971.

156. N. Ruggles, Recent Developments in the Theory of Marginal Cost Pricing Rev. Ec. Stud. Vol.17 1949-50 pp. 107-126.

157. M.F.G. Scott, Sandilands: Holding Gains Times 27.11.75.

158. L. Shashua and Y. Goldschmidt, A Tool for Inflation Adjustment of Financial Statements Journal of Business Finance and Accounting Spring 1976 Vol.3 No.1. pp. 33-47.

159. W.G. Shepherd, Economic Performance under Public Ownership Yale Univ. Press 1965.

160. _____, Alternatives for Public Expenditure. Ch.IX in R.E. Caves et.al. Britain's Economic Prospects George Allen and Unwin 1968..

161. _____ et.al. Public Enterprise: Economic Analysis in Theory and Practice Lexington Books. 1976.

162. M. Sherer and A. Southworth, Accounting for Nationalised Industries in B. Carsberg and T. Hope (eds.) Current Issues in Accounting Philip Allan 1977.

163. S. Siegel, Nonparametric Statistics McGraw-Hill 1956.

164. A. Silbertson and D. Solomons, Monopoly Investigation and the Rate of Return on Capital Employed. Economic Journal Dec. 1952.

165. J. Sizer, An Insight into Management Accounting Pelican 1972.

166. R.M. Solow, The Economics of Resources or the Resources of Economics. American Economic Review May 1974.

167. E. Stamp, ED18 and Current Cost Accounting: A Review Article Accounting and Business Research Spring 1977 pp. 83-94.

168. P.E.M. Standish, Implementing Sandilands: Issues for the Steering Group Jnl. Business Finance and Accounting Spring 1976 Vol.3 No.1. pp. 147-160.

169. O. Stanley, The Case for Reforming Company Taxation p.19 Times 10.3.76.

170. F.H. Stephen, On Deriving the Internal Rate of Return from the Accountants' Rate of Return Jnl. of Business Finance and Accounting Vol.3. No.2 Summer 1976.

171. G.J. Stigler, Production and Distribution Theories Macmillan 1946.

172. _____, and C. Friedland, What can Regulators Regulate? The Case of Electricity Jnl. Law and Economics Oct. 1962.

173. _____, Capital and Rates of Return in Manufacturing Industry. N.Y. PUP 1963.

174. M.T. Sumner, Neutrality of Corporate Taxation or on Not Accounting for Inflation Manchester School of Economic and Social Studies (43) 1975.

175. A. Sutherland, The Monopolies Commission: A Critique of Dr. Rowley Economic Journal June 1971.

176. D. Swann et.al. Competition in British Industry George Allan and Unwin 1973.

177. _____, Competition in British Industry - Case Studies Loughborough: Loughborough University 1973.

178. W.D. Targett, Financial Objectives: The Record of British Gas Public. Admin. Summer 1977. pp. 171-179.

179. L. Taylor Harrington, Problems of Using Return on Capital as a Measure of Business Success Manchester Statistical Society 8th March 1961.

180. L. Tivey, The Nationalised Industries Since 1960 George Allen and Unwin 1973.

181. D. Todd, On the Concept and Measurement of Business Efficiency: A Survey H.M. Treasury, London Sept. 1977.

182. R. Turvey, Marginal Cost Pricing in Practice Economica 1964.

183. _____. Peak Load Pricing Jnl. Political Economy Feb. 1968.

184. R. Turvey, (ed.) Public Enterprise Penguin Modern Economics 1968.

185. _____, Public Utility Pricing and Output Under Risk: Comment A.E.R. Sept. 1970.

186. _____, Economic Analysis and Public Enterprises George Allen and Unwin 1971.

187. _____, Demand and Supply London 1971.

188. J. Tzoannos, An Empirical Study of Peak Load Pricing and Investment Policies for the Domestic Market of Gas in Great Britain. Applied Economics Vol.9 No.2 June 1977 pp. 133-153.

189. M.A. Utton, On Measuring the Effects of Industrial Mergers Scottish Journal of Political Economy Vol.21 1974 pp. 13-28.

190. P.T. Wanless, Inflation and the Comparability of Accounts Jnl. Business Finance and Accounting Spring 1976 Vol.3 No.1 pp. 69-84.

191. C.J. Warrell, The Enterprise Value Concept of Asset Valuation Accounting and Business Research Summer 1974 pp. 220-226.

192. P.L. Watson, Sandilands and Monetary Liabilities Times 10.3.76.

193. M.G. Webb, The Economics of Nationalised Industries George Allen and Unwin 1973.

194. _____, Pricing Policies for Public Enterprises. Macmillan Studies in Economics 1976.

195. M.C. Weinstein and R.J. Zeckhauser, The Optimal Consumption of Depletable Natural Resources. Quarterly Jnl. Economics 1975.

196. G. Whittington, The Prediction of Profitability and Other Studies of Company Behaviour University of Cambridge, Department of Applied Economics Occasional Paper:22 C.U.P. 1971.

197. G. Whittington, Asset Valuation, Income Measurement and Accounting Income Accounting and Business Research Spring 1974 pp. 96-102.

198. _____, Book Review- Baxter on Inflation Accounting, Accounting and Business Research Autumn 1975 pp. 314-317.

199. _____, Accounting for Inflation. The Sandilands Report - a Critique, The Banker Oct. 1975. pp. 1185-1189.

200. _____, Accounting and Economics in B. Carsberg and T. Hope (ed). Current Issues in Accounting Philip Allan 1977.

201. G. Whittington, A Critique of Accounting Ratios. Univ. of Glasgow Accounting Research Workshop W.P. 3-778.

202. C. Wilkins, Accountants Support Sandilands, but Leave Banks Position Open to Debate. Times 1.12.76.

203. O.E. Williamson, Peak Load Pricing, from Peak Load Pricing and Optimal Capacity under Indivisibility Constraints. A.E.R. Vol. 56 (1966) pp. 810-27. Reprinted in R. Turvey (ed).(184).

204. O.E. Williamson, Managerial Discretion, Organisational Form, and the Multi-Division Hypothesis, in R. Marris and P.A. Wood (eds.) The Corporate Economy Macmillan 1971.

205. G. Wilson, Inflation Accounting as a Defence Against Being Precisely Wrong Times p.23 1.12.76.

206. E.G. Wood, A New Light on Lame Ducks Financial Times May 16th 1972.

207. _____, Your Productivity Slip is Showing Financial Times Jan. 23rd. 1973.

208. _____, A Better Deal for Productivity. Times Oct. 17th 1973.

209. _____, How Wages Compare Financial Times 8.2.74.

210. _____, The Best Yardstick for Performance. Financial Times Sept. 4th 1974.

211. _____, Productivity Cannot be Bought. Financial Times Oct.22nd 1974.

212. _____, Manpower Productivity in British Industry. Work Study and Management Services Sept. 1975.

213. _____, Comparative Performance of British Industries Graham and Trotman Ltd. 1975.

214. _____, Stopping the Spiral - with Pay Linked to Company Income Times Nov. 10th 1975.

215. _____, Figuring out the Future of the British Steel Industry Times Mar. 1st 1976.

216. _____, Output in the year of the Great Inflation Times 2.5.77.

217. _____, A Policy for Pay and Productivity Times 4.5.77.

218. H. Yoshida, Some Comments on C.P.P. Accounting. Journal of Business Fiance Finance and Accounting Vol.3. No. 3. Autumn 1976.

219. C. Zwagerman, Accounting in the Netherlands Times 3.12.75.

Unattributed Articles

220. Definitive Draft Plans Published Financial Times 1.12.76. pp. 11-12.

221. Hyde Accounting Guidelines Given General Support Financial Times 4.11.77.

GOVERNMENT PUBLICATIONS

Government Acts

G1 Gas Act 1972

Command Papers

G2 The Financial and Economic Objectives of the Nationalised Industries Cmnd 1337 (April 1961.) HMSO.

G3 Nationalised Industries: A Review of Economic and Financial Objectives Cmnd 3437 (1967). HMSO.

G4 F. Sandilands Inflation Accounting Cmnd 6225 (1975). HMSO.

G5 Modification to the Price Code: A Consultative Document (1977).

G6 The Future of Company Reports Cmnd 6888 (1978).

G7 The Nationalised Industries Cmnd 7131 (1978).

House of Commons Papers

G8 Price Commission South of Scotland Electricity Board - Price Increases in the Supply of Electricity H.C. Paper 535 (1978).

Other HMSO Publications

G9 Government Statistical Service (C.S.O.) Price Index Numbers for C.C.A. HMSO. Annually from 1975.

DATA REFERENCES

I. INFLATION ACCOUNTING SURVEY

1. Public Sector

D1 BOAC Annual Report and Accounts 1969/70 HC Paper 45 (1969/70).

D2 B.A. Annual Report and Accounts 1973/4.

D3 " " " " 1974/5.

D4 " " " " 1975/6.

D5 " " " " 1976/7.

D6 " " " " 1977/8.

D7 BGC Annual Report and Accounts 1972/3.

D8 " " " " 1973/4.

D9 " " " " 1974/5.

D10 " " " " 1975/6.

D11 " " " " 1976/7.

D12 " " " " 1977/8.

D13 British Rail Annual Report and Accounts 1975.

D14 " " " " " " 1977.

D15 BSC Annual Report and Accounts 1975/6.

D16 " " " " 1976/7.

D17 " " " " 1977/8.

D18 Electricity Council Annual Reports and Accounts 1972/3.

D19 " " " " " " 1973/4.

D20 " " " " " " 1974/5.

D21 " " " " " " 1975/6.

D22 " " " " " " 1976/7.

D23 " " " " " " 1977/8.

D24 NBC Annual Report and Accounts 1974.

D25 " " " " 1976.

D26 " " " " 1977.

D27 NCB Annual Report and Accounts 1976/7.

D28 " " " " 1977/8.

D29 NFC Annual Report and Accounts 1972.

D30 " " " " " 1976.

D31 " " " " " 1977..

D32 Gen. Post Office Annual Report and Accounts 1947/48 H.C. Paper 22 (1947/8).

D33 Post Office Annual Report and Accounts 1975/6.

D34 " " " " " " 1977/8

2. Private Sector

Cement Industry

D35 Aberthaw and Bristol Portland Cement Co. Ltd. Annual Report and Accounts 1976

D36 " " " " " " " " " " " 1977

D37 Associated Portland Cement Manufacturers Ltd. " " " " 1976

D38 " " " " " " " " " " 1977

D39 Ketton Portland Cement Co. Ltd. " " " " 1973

D40 Rugby Portland Cement Co. Ltd. " " " " 1976

D41 " " " " " " " " " " 1977

D42 Tunnel Holdings Ltd. " " " " 1976

D43 " " " " " " " " 1977

Others

D44 I.C.I. Annual Report and Accounts 1976.

D45 " " " " " 1977.

D46 Shell UK Ltd. Annual Report and Accounts 1976.

D47 " " " " " " " 1977.

D48 Shell Transport and Trading Co. Ltd. Annual Report and Accounts 1976.

D49 " " " " " " " " " " 1977.

D50 British Petroleum Co. Ltd. Annual Report and Accounts 1976.

D51 " " " " " " " " 1977.

II COMPARISONS OF RATES OF RETURN

D52 Gas Council Annual Reports and Accounts 1949/50 to 1971/72.

D53 N.E.D.O. Financial Performance and Inflation 1975 pp. 4,15.

D54 Bank of England Quarterly Bulletin Mar. 1976 Trends in Company Profitability pp.36-52.

D55 ————————, Quarterly Bulletin June 1977 Supplementary Note to the Economic Commentary pp.156-161.

D56 Trade and Industry, 24th Oct. 1975 pp.244-247 Estimating Companies' Rate of Return on Capital Employed.

D57 ————————, 8th Oct. 1976 pp.110-112 Companies' Rate of Return on Capital Employed, 1960 to 1975.

D58 ————————, 16th Sept. 1977 pp.519-22 Companies' Rate of Return on Capital Employed 1960 to 1976.

D59 Economic Trends, Nov.1974 Estimating Companies' Rate of Return on Capital Employed.

D60 C.K. Rowley, The Monopolies Commission and Rate of Rate of Return on Capital. Economic Journal Mar. 1969 pp.42-65 at p.48.

D61 Monopolies Commission Report on Metal Containers 10.7.1970 H.C. Paper 6 (1970) H.M.S.O. Appendix 4 p.119 et. seq.

D62 ————————, Report on Flour and Bread 14.7.77 H.C. Paper 412 (1977) p.89 para. 396.

D63 ————————, Report on Flat Glass.

D64 ————————, Report on Frozen Foodstuffs 9.11.76 H.C. Paper 674 (1976).