CHAPTER 10

POST MORTEM ON FIVE YEARS OF CEPG FORECASTING

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This issue of the *Economic Policy Review* is the sixth annual exercise carried out by the Cambridge Economic Policy Group (CEPG). The first five, beginning with 'Problems in the Management of the Economy' produced in February 1972, gave a four-year projection of likely developments in the economy, and last year's *Review* extended the horizon to five years. It is therefore now possible to provide a full evaluation of the analysis in the first two exercises and at least a partial *post mortem* on the next three.

This chapter is divided into two parts. The first part presents a quantitative appraisal of forecasts given in each exercise, in terms of *ex post* conditional prediction errors of the most important behavioural relationships. The second part is a qualitative retrospective assessment of the policy analysis provided in each exercise on the basis of quantitative medium-term projections.

1. Quantitative assessment of forecasting errors

All five assessments contained a forecast of the growth of productive potential required for the balance of payments and resources available for consumption. All except the first also contained forecasts of the balance of trade conditional on the volume of world trade, GDP and some measure of the UK's cost competitiveness *vis-a-vis* other countries. Since all the forecasts were based on precisely defined rules of adjustment, the published predictions can be adjusted for deviations of actual exogenous conditions from those assumed when the forecasts were made. The discussion below is based on systematic analysis of predictions *adjusted for such exogenous differences*, in order to establish the size of the *ex post* errors implicit in each published analysis.

In this section, three summary tables are presented, relating to productive potential, the balance of trade on goods and services and resources made available for consumption. The details of adjustments to the original forecasts,[1] together with information on prediction errors for components of the balance of payments and for investment, are given in the Appendix to this chapter.

Table 10.1 presents a *post mortem* on forecasts of productive potential by means of a comparison of the actual movement of unemployment with that which would have been forecast, given the actual movement of output, using the equation published with each annual exercise. Productive potential is measured as the GDP which can be obtained, given the labour supply, when unemployment is maintained at some given constant rate. Its year-to-year movement is not directly observable because it is a hypothetical concept. But errors in forecasts of actual unemployment conditional on GDP give an indication of probable errors in estimates of productive potential. The earliest model predicted unemployment directly from the movement of output. Later models predicted unemployment as a function of output and then unemployment as a function of employment. All made some assumption about growth of labour supply for which *no ex post* correction has been made.

The accuracy of the conditional forecasts should be judged primarily in relation to the objective of medium-term economic projections – as an aid to thinking about likely economic developments and problems of economic management. Towards the end of the forecast period 1972 to 1976 unemployment rose to levels which had not been experienced in the past period on which our relationships were based. It could have been expected that the forecasting would be reasonably accurate up to 1974, but much less accurate since. In the event the terminal year forecasts of the February 1972 and January 1973 publications are both within 200 thousand of the outcome. These forecasts overpredicted the level of unemployment in relation to output, suggesting that the estimates of productive potential may have been too optimistic[2] by about 2 per cent of GDP or, in terms of growth rates, by one-half % a year. The forecast errors for 1976 drawn from the three more recent exercises are all very small indeed. The most consistent and serious errors, those in predictions for 1973 and 1974 in the 1973 and 1974 publications, were positive in the first year and negative in the second, suggesting an overestimate of the speed of adjustment of unemployment to a change in the rate of growth of output. In the 1975 and 1976 publications a rather longer lag was assumed, and this seems to have performed well up to the present.

The balance of trade on goods and services is presented in Table 10.2, measured as the money surplus or deficit scaled to allow for inflation measured in terms of export prices. The formal verification of the trade analysis of the February 1972 exercise, shown in Table 10.2a, has been treated differently from that for later exercises because, unlike the others, it contained no explicit model of competitiveness. Imports were functionally related to domestic output and, given any target balance of trade, it was assumed that the target could be met by a forced change in the terms of trade. Table 10.2a gives forecasts of the terms of trade, based on the 1972 model, conditional on actual growth of exports and GDP. The outcome was strongly affected in 1973 and 1974 by changes in the world terms of trade between manufactures and raw materials, caused by the commodity boom and by the rise in the oil price – not foreseen in the 1972 exercise. Figures in parentheses in Table 10.2a show the conditional forecast terms of trade adjusted to include the estimated effect on the terms of trade of oil and commodities. It appears that the 1972 forecast was right in indicating a considerable deterioration in the

[1] Note that the adjustments include a procedure for dealing with data revisions and the shift from a 1963 to 1970 price base since the earlier exercises were undertaken (see Appendix).

[2] It could however be argued that lower-than-expected unemployment in 1975 and 1976 was caused by job creation schemes.

Table 10·1 Post mortem on productive potential: forecasts of unemployment conditional on output (thousands)

		1972	1973	1974	1975	1976
Actual unemployment	(a)	869	672	550	706	1176
	(b)				1132	1310
	(c)					1274
Problems in the Management of the Economy 1971-75, Feb. 1972	(a)	806 (+63)	797 (−125)	631 (−81)	879 (−173)	.... (....)
Prospects for Economic Management 1972-75, Jan. 1973	(a)		769 (−97)	404 (+146)	1033 (−327)	1351 (−175)
Prospects for Economic Management 1973-77, Jan. 1974.	(a)			394 (+156)	891 (−185)	1221 (−45)
Economic Policy Review, No. 1, Feb. 1975	(b)				1216 (−84)	1327 (−17)
Economic Policy Review, No. 2, March 1976	(c)					1310 (−36)

Notes: definitions of unemployment used:
(a) wholly unemployed excluding school leavers and adult students in Great Britain, 1st quarter average, seasonally adjusted.
(b) as (a) but refers to United Kingdom, 4th quarter average, seasonally adjusted.
(c) as (b) but refers to annual average.
The figures in parentheses are the forecast errors, defined as actual less forecast unemployment.

Table 10·2 The balance of trade on goods and services at 1970 export values (£(1970)m.)

	1972	1973	1974	1975	1976
Actual balance of trade on goods and services	−463	−1980	−3598	−1819	−1373e
Prospects for Economic Management 1972-76, Jan. 1973		−2499 (+502)	−1863 (−1735)	−1804 (−15)	−1869 (+496)
Adjusted for the oil price rise			−3763 (+165)	−3304 (+1485)	−3369 (+1996)
Prospects for Economic Management 1973-77, Jan. 1974			−2345 (−1253)	−1699 (−120)	−565 (−808)
Economic Policy Review, No. 1, Feb. 1975				−2001 (+182)	−822 (−551)
Economic Policy Review, No. 2, March 1976					−1328 (−45)

Table 10·2a The terms of trade for goods and services (index 1970=100)

	1972	1973	1974	1975	1976
Actual terms of trade	102·9	94·6	81·6	87·6	90·0
Problems in the Management of the Economy 1971-75, Feb. 1972	103·3	100·6 (96·6)	96·5 (85·0)	96·6 (85·1)	....

The balance of trade on goods and services is defined as $X'_{70}\,[X-M/TT]$ where:
X'_{70} is the value of exports of goods and services in 1970
X is an index (1970=1·00) of the volume of exports of goods and services
M is an index (1970=1·00) of the volume of imports of goods abnd services
TT is an index (1970=1·00) of the terms of trade for goods and services.
e: estimate.
The figures in parentheses are forecast errors, defined as actual less forecast balance of trade.

Table 10·3 The resource balance: resources available for consumption (index 1970=100)

	1972	1973	1974	1975	1976
Actual consumption	108·7	113·6	112·5	111·8	112·3e
Problems in the Management of the Economy 1971-75, Feb. 1972	108·1	116·4	117·9	115·9	....
Prospects for Economic Management 1972-76, Jan. 1973		116·1	115·7	115·6	117·3
Prospects for Economic Management 1973-77, Jan. 1974			110·1	108·4	108·9
Economic Policy Review, No. 1, Feb. 1975				111·1	110·8
Economic Policy Review, No.. 2, March 1976					112·4

e: estimate

terms of trade between 1972 and 1975 over and above that due to the abnormal rise in world oil and commodity prices.

The January 1973 forecast of the trade deficit also failed to anticipate the increase in oil prices, and figures adjusted for this are again given in parentheses in Table 10.2. There are large errors in the last two years of the forecast, which turns out to have been much too pessimistic because of underestimation of the growth of exports and overprediction of the growth of imports. On the other hand the conditional forecasts for 1976 implied by exercises in the following two years were too optimistic. The main difference in components of the trade forecast based on the 1974 model as compared with the previous exercise is a more rapid forecast of export growth (see Appendix to this chapter). The elasticities of exports with respect to world trade and relative costs were of similar magnitude to those in the January 1973 model, but the underlying trend growth of exports was assumed to be faster in the January 1974 version.

The forecast for 1975, based on the February 1975 *Review*, was reasonably good, the main error being an underestimation of the extent of the recovery in the terms of trade conditional on the movement of relative costs, and the over-optimistic forecast for 1976 was again mainly due to overprediction of the growth of exports. Last year's forecast for 1976, based on the March 1976 *Review*, conditional on world trade, relative competitiveness and domestic output, was close to the outcome. Despite a reputation for gloom in this respect, there is no consistent tendency for CEPG's conditional forecasts of the trade balance to have turned out too pessimistic after the event.

The final aspect of the five assessments which is examined here is the forecast of consumption as a residual claim on available resources, from which inferences were drawn in the early models on the medium-term requirement for changes in the burden of taxation and also, in the later models, on the consequences for inflation. A convenient way of summarising the combined accuracy of predictions of each component of final expenditure is to calculate consumption as the residual, given actual GDP, actual public expenditure (which was always treated as exogenous) and conditional forecasts of private investment, stockbuilding and net exports (the latter based on actual world trading conditions and relative costs). The results of these calculations are presented in Table 10.3.

The broad impression conveyed by the table is that conditional forecasts of resources available for consumption based on the 1972 and 1973 analyses rise too rapidly in 1973 but thereafter, like the outcome, show little change. The 1974 analysis, on the other hand, underpredicts resources for consumption available, while the 1975 and 1976 analyses produce quite accurate conditional forecasts. The change in the estimated trend of exports between the 1973 and 1974 analyses, noted above, was a major reason for the early overprediction and later underprediction of consumption.

This assessment of *ex post* forecasting errors generally confirms our view that quantitative projections of economic developments over a medium-term horizon can play a useful role in thinking about problems of economic management, even though the projections can only indicate broad orders of magnitude, given the uncertainties of medium-term forecasts. It is quite encouraging to note that in January 1973, the conditional forecasts for 1976 (the terminal year of the exercise) show errors of only 175,000 on unemployment, about £1 billion at current prices on the balance of trade for goods and services, and 4% on the resources available for consumption. By January 1974 the conditional error in forecasts for 1976 was down to 45,000 on unemployment, but had risen to £2½ billion (on the optimistic side) for the balance of trade, and remained at nearly 4% for private consumption. By February 1975 the error on unemployment was trivial the predicted balance of trade was still too optimistic (but by under £2 billion at current prices) and the error on private consumption was down to 2%. The conditional forecasts for 1976 published in March of that year were in all three respects almost perfect!

2. Qualitative assessment of policy analysis

The above assessment of five years of quantitative forecasting covers only a limited part of CEPG's activities. The Group's quantitative model has been in a state of evolution throughout the period and the development of analysis and policy implications derived from it has always outrun the pace at which the quantitative model itself could be developed. For example, as early as 1972, the inflationary consequences of devaluation as a macroeconomic instrument were noted, but it was not until an analysis of inflation had been formalised in the model in 1975 that a quantitative analysis of this effect could be given.[1]

The following qualitative assessment is based on published CEPG work. Inevitably the choice of quotations is selective and, some may think, too selective. It is open to anyone who so thinks to read the original articles from which the quotations are taken. Full references are given for all quotations used.

(i) *February* 1972
The February 1972 analysis was based on a simple medium-term resource balance model, in which consumption was treated as the residual claim on resources, the government's public expenditure plans being taken as exogenous. Trends in the behaviour of exports and imports were analysed and projected to 1975. The resource cost of achieving any balance of trade target was estimated by requiring an appropriate change in the terms of trade. Yet from this simple framework some important and rather startling conclusions emerged. At a time when the balance of payments surplus was large and there was considerable spare capacity in the economy, it was argued that an 'unusually acute strategic dilemma in bringing down unemployment, in managing consumers' expenditure and in keeping the balance of payments out of serious deficit is likely to present itself over the next few years'. The conclusion was that 'if output is now made to rise at a satisfactory rate by measures which stimulate domestic demand, the balance of payments is likely to turn into deficit'.[2] Given the resource cost of securing an adequate balance-of-payments target, consumption would have to grow less rapidly than output, requiring an increase in the burden of taxation. Without devaluation the deficit on goods and services would be about £1,000m in 1974 and nearer £2,000m in 1975 (in current prices).[3] Since the lag between expenditure decisions and their effect on resource claims was long, further immediate increases in public spending to stimulate employment would aggravate the balance-of-payments problems emerging in 1974 and 1975. It was therefore recommended that no further commitments to increase public expenditure be entered into beyond what was already agreed in the existing expenditure plans.

The diagnosis of the 'unusually acute strategic dilemma' proved to be remarkably prescient, particularly when the short-term conditions looked favourable for a prolonged period of economic expansion starting from a high level of unemployment and balance of payments surplus. Much of the detail of the forecast had to be filled in qualitatively; for example, the model could not predict the scale of devaluation required since it contained no explicit model of competitiveness. Nevertheless it gave an accurate warning of some of the problems that lay ahead.

(ii) *January* 1973
The major concern of the January 1973 exercise was to examine the feasibility of the government's announced plan to achieve 5% growth for two years, starting from the second half of 1972. It again concluded that 'the planned expansion of demand will run into severe balance of payments difficulties and that personal consumption would have to grow much less than output'.[4] The balance-of-payments difficulties were no longer a medium-term dilemma; they were a short-term problem. The March 1972 Budget had provided an unprecedented stimulus to domestic demand and further increases in planned public expenditure were announced in the White Paper (*Cmnd.* 5178). To maintain the 5% expansion, CEPG believed that further stimulus would be required in the March 1973 Budget. But, 'if the exchange rate were pegged at the present level of about \$2·35 and a fast expansion of output was maintained by fiscal stimulus; projections indicate a current account deficit of over £1,000m in 1973, widening to absurd proportions in the following years'.[5]

The major strategic problem was to halt this very rapid deterioration and ensure that exports net of imports made a significant positive contribution to the growth of real demand and output. 'The government is in no position to commit itself to a 5 per cent or any other growth rate unless it is prepared to ensure that the balance of trade does indeed make an adequate contribution to the expansion.'[6] This strategic problem simply could not be solved by floating the exchange rate in the absence of appropriate fiscal policy. 'It is not the case that, with a floating exchange rate, the balance of paymeets can always be left to take care of itself. If domestic demand is allowed to rise faster than output the balance of trade will deteriorate no matter how far the exchange rate floats down; and even if domestic demand is restrained to make adequate resources available for exports there is no guarantee that the floating rate will move to a level at which a sufficient growth of exports is achieved to bring the economy to reasonably full employment.'[7]

Alternative measures to promote net export growth were examined. It was recognised that devaluation would, by adding inflationary pressures to domestic costs, reduce its own effectiveness or alternatively would have to be repeated to maintain the required reduction in the dollar unit costs of exports. Wage subsidy schemes, such as an extension of the Regional Employment Premium or Lord Kaldor's more radical general wage subsidy financed by VAT, were also considered. Another possibility was quantitative restriction of the growth of manufactured imports. There was also a strong recommendation that public expenditure plans be cut from 1973 onwards, given that domestic demand was likely to grow faster than

[1]Oral evidence to the House of Commons Select Committee on Expenditure, in *Seventh Report from the Expenditure Committee*, July 1972, p. 93.
[2]W. A. H. Godley and T. F. Cripps 'Can we achieve a balance in our resources?' *The Times*, 9 December 1971.
[3]Presented in memorandum to the Select Committee. *Seventh Report*, op. cit.
[4]The London and Cambridge Economic Bulletin, published in *The Times*, 8 and 9 January 1973.
[5]LCEB, op cit.
[6]LCEB, op. cit.
[7]Ibid.

domestic output, since if this were not done the growth of personal consumption would have to be further curtailed by fiscal and credit policy, thus putting a severe strain on phases two and three of the pay policy.

In the event the 5% strategy was not achieved; the growth of output stagnated during 1973. The deficit in the current account deteriorated alarmingly through the year which provoked a further depreciation of sterling against other currencies of about 9%. In one respect, though, the forecasts failed to take account of a major conjunctural development – the rise in world prices of commodities during 1972 and 1973 and into the first three months of 1974, unprecedented since the Korean war. The resulting deterioration in the terms of trade between manufactures and commodities implied that real incomes could not be allowed to grow as rapidly as output while preserving the same balance of payments objective. This omission was remedied the following year.

(iii) *January* 1974

The January 1974 analysis, published during the period of energy restriction and the three-day working week, examined the conduct of the management of the economy over the previous two years and argued that mistakes had been made because the wrong principles had been adopted. This argument was reinforced by the introduction of what was later called the 'New Cambridge' doctrine. 'This argument demonstrates the need for a different set of principles to govern management of the economy. Fiscal policy should, with only small temporary exceptions, always be such as to ensure that the total domestic expenditure is in line with the national income, or different from it, only to the extent required to offset expected long-term capital flows by equivalent surpluses or deficits on current accounts. The budget deficit having been set in this way, success in achieving growth and full employment must then depend on our ability to gain access to foreign markets and on commercial policy.'[1]

The strategic problems for the future were identified as inflation, productive potential and the balance of payments.

Phase three of the government's prices and incomes policy, which included a threshold mechanism for indexing pay increases to the rate of inflation, purported to guarantee an increase in real wages that could not be warranted by the resources available for real consumption.

'Such a guarantee could only be made good given the appropriate macro-economic conditions, in particular the terms of trade, the growth of productivity and the pre-emption of resources by the public sector which govern the availability of goods and services to the personal sector.

'These conditions will be nowhere near fulfilled in the period ahead particularly because import prices (which were apparently expected to fall) have continued to rise extremely fast. So any benefits the [threshold mechanism] may have brought through obtaining acceptance of lower initial awards is likely to be much more than offset by its inflationary effect when the threshold point is passed.'[2]

Under these circumstances sterling might well depreciate further, domestic prices would rise more rapidly and therefore result in even larger pay increases. 'It is easy to imagine the inflation rate increasing to 20 per cent or more should an interactive process of this kind really get going.'[3]

Despite the fears that were current in January 1974 of a prolonged energy shortage, an analysis of energy requirements in the medium term indicated that productive potential should not be constrained by energy supply but instead, as in the past, by labour supply and productivity.

The rise in the price of oil and its deflationary impact on aggregate demand at once altered the fiscal stance recommended by the CEPG, corresponding to the much larger balance-of-payments deficits entailed by the oil crisis. An important strategic issue was the rate at which the balance-of-payments deficit should be reduced over the four years to 1977. 'The correct strategy, though this is a matter of judgement, is probably to adjust slowly; this would be expensive in terms of our foreign assets and there would be for a long time a risk of further devaluation should the adjustment process falter. On the other hand, the fiscal measures necessary to secure a rapid adjustment would almost certainly generate very high unemployment, at least for a temporary period.'[4]

The analysis of the inflationary implications of the threshold mechanism proved to be very accurate, for the rate of inflation accelerated during the year, particularly after the threshold was triggered in April, and was not far under 20 per cent up on a year earlier by the end of the year. The review gave a clear analysis both of the risks of slow adjustment of the balance of payments, and of the costs of a rapid adjustment through low growth of domestic demand which would generate very high unemployment.

(iv) *February* 1975

The first of the CEPG's annual reviews to be published as a printed volume contained some developments to the medium-term model. The most important addition was an explicit model of inflation, whose characteristic was to view inflation as the process by which the average level of gross real earnings achieved at pay settlements is reconciled with the availability of resources for real consumption, through erosion of the real value of settlements. The impact of the North Sea on economic activity was analysed by treating it as a separate economy. A set of 'national income' and balance-of-payments accounts for the North Sea was produced with projections to 1978.

The strategic problems were once again concerned with adopting a balance-of-payments objective, and with setting fiscal and trade policy to achieve the external target and to sustain domestic activity and employment. It was argued, with due appreciation of the risks, that the balance-of-payments deficit be reduced slowly. 'If sterling is to remain negotiable the balance of payments deficit, now running at £3·8 billion per annum, will probably have to be reduced by at least £1·5 billion to no more than £2·5 billion (at 1974 values) by 1978. A policy to achieve only this amount of adjustment involves considerable risks and it may be prudent – indeed we may be forced – to

[1] London and Cambridge Economic Bulletin, *The Times*, 22 January 1974.

[2] Ibid.

[3] Ibid.

[4] Ibid.

undertake a much larger one.'[1] The risks of this policy were obvious. 'If the current account showed no perceptible improvement or if domestic inflation accelerated, sterling would quickly look vunerable and a reduction in the inflow of oil funds and a withdrawal of speculative support would be precipitated. To keep the market for sterling open, the UK would be forced to seek assistance from Central Banks and the IMF. The condition for their support would be acceptance of a programme of fiscal and monetary restriction aimed at rapid and substantial reduction in the current account deficit.'[2]

The Group argued, wrongly in the event, that the fiscal stance corresponding to a strategy of slow reduction in the balance-of-payments deficit would have to be strongly deflationary. In the absence of policies to promote net export growth, this fiscal stance would ultimately generate very high unemployment. It was argued that, in addition to the depreciation of sterling required merely to maintain relative cost competitiveness with other countries, a further devaluation of 20-25% would be necessary in the first half of 1975 to achieve sufficient net export demand. But the consequences for domestic inflation implied by devaluation on this scale were extremely grave. 'Accordingly there seems now to be no way of obtaining simultaneously an improvement in the current balance and keeping unemployment below one million other than by introducing some form of import restriction.'[3]

Provided a large-scale devaluation were avoided, the Group was optimistic on the prospects for inflation, which was expected to peak during the first half of 1975 at a rate of about 20% compared with a year earlier, and thereafter fall away to 15-17% by the close of the year. In fact, the peak rate of over 26% did not come until the third quarter of 1975, and the rate was still well over 20% by the end of the year. This error occurred because there was an inconsistency between the fiscal stance required – a reduction in the public sector deficit, implying higher indirect taxes, reduced subsidies, increases in local authority rates and nationalised industry prices – and the fiscal assumptions implicit in the inflation forecast. This defect was remedied the following year, with the development of a fiscal model which ensured consistency between fiscal policy and prices.

In retrospect the slow adjustment of the balance of payments which was advocated proved too optimistic and too risky. The hope that the UK could attract the funds necessary to finance a series of large deficits, principally from the re-cycling of OPEC revenues, was not fulfilled. The lax balance-of-payments target implied a larger projected growth of personal consumption than was actually possible.

During 1975 there was neither a devaluation on the scale required, nor protection of domestic markets, nor any other means introduced to provide a sufficient growth of net exports in order to improve the balance of payments and raise domestic activity; consequently, as the CEPG had predicted, unemployment did rise above one million by the end of the year.

(v) *March* 1976

The analysis contained in the second *Economic Policy Review* was based on a completely revised econometric model, with an explicit framework of targets and instruments such that the values of any set of exogenous variables could be determined for each projected year, to ensure that an equal number of endogenous variables would attain target values in that year. Substantial improvements were also made to the model's accounting framework, in order to facilitate the analysis of behavioural properties of the model.

As mentioned earlier, the development of economic ideas had always previously exceeded the pace at which they could be given a formal specification in the model; the new 1976 model was the opportunity to catch up. In particular, the 'New Cambridge' properties of private sector net acquisition of financial assets were first included in the model in 1976. Many improvements were made to the modelling of inflation,[4] which made possible for the first time a full quantitative treatment of the macroeconomic effects of devaluation, including inflation feedbacks and changes in the distribution of disposable income.

The *Review's* interpretation of Britain's post-war economic performance was based on the argument that 'the entire nexus of inter-related problems stems from loss of export and home markets to foreign competitors, which has meant insufficient export earnings to finance the level of imports which would be purchased at full employment. Since growth of domestic demand and output had to be low enough, on average, to avoid excessive balance-of-payments deficits, unemployment has risen from one cycle to the next.'[5]

Measures were now urgently required to promote the growth of output and a return towards full employment, but emphatically not by means of fiscal expansion of domestic demand.

'Over the whole of the last five years, ever since the CEPG has been in existence, we have consistently, emphatically and publicly opposed the kind of fiscal laxity which in 1954/5, 1958/9, 1963/4 and – the most exaggerated manifestation of all – in 1972/3, generated consumption-led expansions which encountered inevitable and insuperable constraints leading, in turn, to reversals of policy at the cost, not only of recession, but of progressive structural distortion of the economy.'[6]

An analysis of the current situation was made by reference to the real national income of the economy and the claims on this real income. It was concluded that since 1970 the growth of claims on national income had far exceeded the growth of national income, and that the resulting gap[7] had been financed from unsustainable sources – from the balance-of-payments deficit and negative stockbuilding, an unprecedentedly high private savings ratio, itself largely a consequence of inflation, and stock appreciation. The major strategic issue was now to reduce the excess of claims over resources; this reduction would be a prior claim on any growth in the real national income in coming years. Given the size of prior claims on resources, if

[1] *Economic Policy Review*, No. 1, February 1975.
[2] Ibid.
[3] Ibid.

[4] A full account of the specification of the 1976 model and its accounting system can be found in *Technical Manual on the CEPG Model* by M. J. Fetherston, DAE, April 1976, and *Economic Policy Review*, No. 2, March 1976.
[5] *Economic Policy Review*, No. 2, March 1976.
[6] op. cit.
[7] In last year's *Policy Review*, this was termed the 'inflationary gap', which caused some confusion with the Keynesian concept.

the growth of national income were slow, the balance of additional real income for wage and salary earners over the whole period to 1980 would be very small and possibly negative. Some favourable factors – notably North Sea oil and the anticipation of faster export growth – could promote more rapid growth of real income, but this would not be enough to prevent a fall in real wages during 1976 and 1977. Neither was it likely to be rapid enough to bring down unemployment, because of the government's decision to halt increases in public service employment, at a time when for demographic reasons labour supply was expanding more rapidly than in the past. The other major strategic question was still the importance of promoting net export-led growth of national income. The *Review* reinforced the previous year's conclusion that, although both devaluation and protection could provide the necessary growth to bring unemployment down below one million by 1979, the former would entail lower real wages and make far more difficult the future control of inflation.

The immediate prospects were likely to be favourable; output would rise as world trade recovered and stockbuilding began, and inflation would slow down over the year with the acceptance of £6 wage settlements.

It is too early yet to judge whether the medium-term dilemmas will be as acute as indicated by the CEPG. Economic developments since March 1976 do not appear to reveal any serious errors in the conditional forecasts; the balance-of-payments forecast (given in Table 10.2 above) for 1976 was close to the outcome, as also was the forecast of inflation. The slow growth of domestic output that has taken place – about 1% higher than 1975 – reinforces the conclusion made last year that a slow recovery would almost certainly imply falling real wages over last year and this year, with evident danger of an outburst of highly inflationary wage settlements. Despite the gloomy nature of the policy dilemmas, which developments this year give no reason to change, the *Review* concluded on an optimistic note: 'If any viable arrangement can be reached which removes the balance-of-payments obstacle to future growth of demand, the British economy should now be capable of a period of very fast growth (by the standard of past performance) at a sustained rate of 5% a year or more for many years to come. This would provide the opportunity for a transformation of industry and the economy in which the critical structural problems existing today could be resolved.'[1]

APPENDIX

This Appendix describes the method used to obtain updated conditional predictions of individual variables using the equations of past versions of CEPG's model. Results are presented for the terms of trade and for components of final expenditure. Summary Tables 10.2 and 10.3 in Part 1 of this chapter were derived from these results.

Data were obtained for the dependent and explanatory variables over the period of the forecast, using the same definitions as were applicable at the time of publication of the exercise. The data were in general different from the figures used in the *Reviews* because of revisions and change of base from 1963 prices to 1970 prices. Before making any adjustment to the dependent variables by means of the behavioural relationships of the model, all the data used at the time of a previous exercise were rebased to be equal to the out-turn data in 1970 and in general defined as index numbers to base 1970.

The general form of all behavioural relationships in the models may be specified as:

$$y=g(x_1, x_2, \ldots\ldots\ldots x_k, z; p)+u \tag{A.1}$$

where y is the dependent variable; g is a function of values of explanatory variables x_i and structural factors, z; and u is an error term. The x_i are variables such as world trade, relative costs etc., about which different assumptions can be made to obtain alternative forecasts of y, whereas the structural factors, z, are invariant with respect to changes of assumption and alter only with time. The structural factors may be regarded as part of 'the model' and include such variables as trends, 'par' series etc. Let $\bar{x}_i$ be the values of explanatory variables assumed at the time and let $\bar{y}$ be the forecast value of the dependent variable, based on these assumptions, presented in a past annual exercise.

Let $\hat{x}_i$ be a revised set of assumptions (for example, the *ex post* outcome) and let $\hat{y}$ be the revised conditional forecast implied by the original model.

Defining $\triangle y=\hat{y}-\bar{y}$ and $\triangle x=\hat{x}-\bar{x}$ then

$$\triangle y \simeq \sum_{i}^{k} \frac{\partial g}{\partial x_i} \cdot \triangle x_i \tag{A.2}$$

When the function g is linear, the adjustment reduces to

$$\hat{y}=y+\sum_{i}^{k} p_i(\hat{x}_i-x_i) \tag{A.3}$$

where p_i are structural parameters of the function g.

In this Appendix we are concerned with the case where $\hat{x}_i$ represents the *ex post* outcome and $\hat{y}$ represents the prediction whose accuracy we wish to examine. If y is the actual outcome for the dependent variable, the *ex post* error of the forecast is defined as

$$e=y-\hat{y} \tag{A.4}$$

Since nearly all the functions g are linear or log-linear in their explanatory variables x_i, conditional forecasts can generally be calculated using equation (A.3) in additive or proportional form respectively. The resulting forecasts have been rebased as index numbers.

Tables 10.A1(i) and 10.A1(ii) present the original projections of current and capital expenditure on goods and services by the public sector, based on successive Public Expenditure White Papers and a

[1] *Economic Policy Review*, No. 2.

Table 10·A1(i) Public authorities' current expenditure on goods and services (index 1970=100)

	1971	1972	1973	1974	1975	1976
Blue Book, 1965-75	102·7	106·9	111·4	113·5	118·8	121.5e
CEPG estimate[a]	102·6	106·2	108·9	110·9	116·1	120·2
Economic Policy Review, No. 2,[a] March 1976	103·2	106·3	108·4	111·6	118·9	121·1
Economic Policy Review, No. 1, Feb. 1975	103·0	107·1	111·1	113·2	116·5	119·8
Prospects for Economic Management 1973-77, Jan. 1974	103·7	107·6	110·6	113·1	116·4	119·5
Prospects for Economic Management 1972-76, Jan. 1973	103·5	106·3	110·8	113·2	116·2	119·1
Problems in Management of the Economy 1971-75, Feb. 1972	102·1	103·8	106·7	109·2	112·0	....

e: CEPG estimate.
[a] measured inclusive of the 'relative price effect'.
Figures to the right of the stepped line are conditional predictions.
Figures to the left of the line represent estimates of the actual outcome in previous years based on information available at the time of the forecast.
Predictions in this table and in table 10.A1(ii) were derived from Public Expenditure White Papers.

Table 10·A1(ii) Public authorities' capital expenditure on goods and services (index 1970=100)

	1971	1972	1973	1974	1975	1976
Blue Book 1965-75	99·4	96·2	98·7	101·0	102·1	100·1e
CEPG estimate[a]	98·6	96·3	108·9	114·3	114·0	112·9
Economic Policy Review No. 2,[a] March 1976	101·2	94·9	106·4	110·3	112·8	109·0
Economic Policy Review, No. 1, Feb. 1975	98·8	95·2	95·5	97·6	98·8	97·0
Prospects for Economic Management 1973-77, Jan. 1974	99·8	96·1	97·3	92·2	92·1	92·4
Prospects for Economic Management 1972-76, Jan. 1973	102·9	105·8	112·9	117·0	118·2	119·7
Problems in the Management of the Economy 1971-75, Feb. 1972	102·2	110·7	114.3	115·0	117·1	....

e: CEPG estimate.
[a] measured inclusive of the 'relative price effect'.
See note to table 10.A1(i).

comparison with the out-turn. The early public expenditure plans involved a growth of capital expenditure to 1976 at an average of 3·7% p.a., whereas there was in fact virtually no increase in capital expenditure over the whole period. On the other hand the actual growth of current expenditure has been consistently faster than forecast.

Tables 10A.2(i) to 10.A2(iii) present the trade forecasts. The import forecasts reveal no persistent tendency to overpredict and in the last three *Reviews* have been relatively accurate. The terms-of-trade forecasts have also been relatively accurate since January 1974 – the forecast for 1976 in three cases being within 1½% of the outcome. The export forecasts have been more variable. The underlying trend growth of exports was too low in the January 1973 *Review* and too high in the January 1974 *Review*. In both cases, and also with the February 1975 *Review*, the predicted recovery of exports between 1975 and 1976 was too large.

Finally Table 10.A3 presents forecasts of private investment. These are less accurate than for other components of expenditure, underestimating the rise in investment in 1973 and the fall in 1976.

Table 10·A2(i) Volume of exports of goods and services (index 1970=100)

	1971	1972	1973	1974	1975	1976
Blue Book 1965-75	107·2	109·5	122·4	131·2	126·1	134·6e
Prospects for Economic Management 1972-76, Jan. 1973			114·4	122·2	117·5	128·1
Prospects for Economic Management 1973-77, Jan. 1974				133·0	131·7	143·0
Economic Policy Review, No. 1, Feb. 1975					126·5	135·6
Economic Policy Review, No. 2, March 1976						133·6

e: CEPG estimate.

Table 10·A2(ii) Volume of imports of goods and services (index 1970=100)

	1971	1972	1973	1974	1975	1976
Blue Book 1965-75	104·8	116·9	132·4	133·1	124.6	132·1
Problems in the Management of the Economy 1971-75, Feb. 1972		113·5	125·9	130·0	131·4	....
Prospects for Economic Management 1972-76, Jan. 1973			129·6	134·7	133·5	145·4
Prospects for Economic Management 1973-77, Jan. 1974				131·5	127·1	134·1
Economic Policy Review, No. 1, Feb. 1975					122·9	130·6
Economic Policy Review, No. 2, March 1976						132·0

Table 10·A2(iii) The terms of trade for goods and services (index 1970=100)

	1971	1972	1973	1974	1975	1976
Blue Book 1965-75	101·0	102·9	94·6	81·6	87·6	90·0e
Problems in Management of the Economy 1971-75, Feb. 1972		103·3	100·6	96·5	96·6	....
Prospects for Economic Management 1972-76, Jan. 1973			94·9	97·1	100·0	100·5
Prospects for Economic Management 1973-77, Jan. 1974				85·5	86·6	90·6
Economic Policy Review, No. 1, Feb. 1975					85·2	91·4
Economic Policy Review, No. 2, March 1976						90·8

e: CEPG estimate.

Table 10·A3 Private fixed investment (index 1970=100)

	1971	1972	1973	1974	1975	1976
Blue Book 1965-75	104·7	110·1	116·5	111·1	108·0	101·0e
CEPG estimate[a]					110·4	102.2
Problems in the Management of the Economy 1971-75, Feb. 1972		99·5	111·6	107·4	101·3	....
Prospects for Economic Management 1972-76, Jan. 1973			109·2	120·6	115·5	112·2
Prospects for Economic Management 1973-77, Jan. 1974				121·4	114·8	111·2
Economic Policy Review, No. 1, Feb. 1975					105·8	106·5
Economic Policy Review, No. 2,[a] March 1976						107·1

[a] Measured inclusive of the 'relative price effect'.
e: CEPG estimate.