National Audit Office

Audit of Assumptions for the Pre-Budget Report November 1997

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John Bourn
Comptroller and Auditor General

National Audit Office
21 November 1997

The Comptroller and Auditor General is the head of the National Audit Office employing some 750 staff. He, and the National Audit Office, are totally independent of Government. He certifies the accounts of all Government departments and a wide range of other public sector bodies; and he has statutory authority to report to Parliament on the economy, efficiency and effectiveness with which departments and other bodies have used their resources.

Audit of Assumptions for the Pre-Budget Report November 1997

Report by the Comptroller and Auditor General to the House of Commons

Statement of Responsibilities

1 In June of this year I reported the results of my audit of five of the assumptions and conventions adopted to forecast the fiscal prospects for the July 1997 Budget. My report to the House of Commons was published in the Government's White Paper Cm 3693. The Chancellor of the Exchequer has indicated that he proposes not to change those assumptions for the purposes of the Pre-Budget Report. He has however asked me to offer an independent opinion on four further assumptions. These are that:

- equity prices move in line with projections for money GDP;
- oil prices are close to current levels in nominal dollar terms over the coming year, and remain flat in real terms thereafter;
- given current uncertainties about the prospects for VAT receipts, explored in the recent report by the Working Group on VAT Receipts, there will be a slight fall in the underlying ratio of VAT receipts to consumers' expenditure;
- the projections for the main price indices used to uprate social security benefits and plan public expenditure are consistent with the forecasts and assumptions for the RPI excluding mortgage interest payments, which is the definition used for the inflation target.

The assumptions apply over the five year period up to 2002-2003.

2 The remit which I have received from the Treasury is in the following terms:

> "To further assist the Government in preparing its forecasts of the public finances by reviewing the assumptions adopted for equity and oil prices, the projection for VAT receipts in relation to consumer spending, and the

consistency of the main price indices used for planning and projecting public expenditure with the RPI excluding mortgage interest payments, the index used to define the inflation target".

As before, I note that the Treasury is responsible for making projections of future public sector expenditure and revenue on the basis of these assumptions. I have not been asked to assess the way in which the forecasts are derived from the assumptions.

Basis of Report

3 As in the case of the July Budget, I have reviewed the evidence which I judged to be relevant to each of the above assumptions, so as to reach an opinion on whether they were reasonable and, where appropriate, consistent with related assumptions. I have not assessed them as predictions of the likely outcome at any specific time, but rather as a view of the broad trend over a period of years.

4 In carrying out the examination, the National Audit Office has inspected relevant papers and consulted officials as appropriate in the Treasury, the Office for National Statistics, Customs and Excise, the Department of the Environment, Transport, and the Regions, and the Department of Trade and Industry. In respect of Value Added Tax, the National Audit Office has also drawn on its experience of auditing receipts of revenue under Section 2 of the Exchequer and Audit Departments Act 1921.

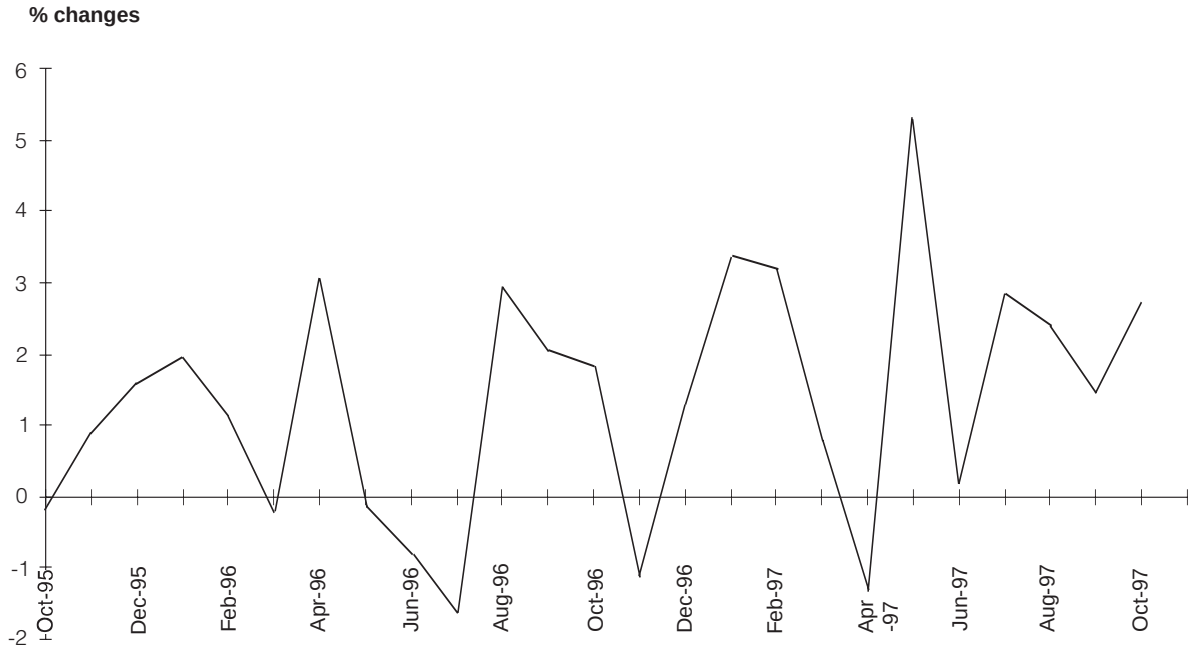
Report

Equity prices

5 Equity prices affect the public finances through their impact on receipts of capital gains tax, stamp duty, and inheritance tax, and are generally the biggest though not the only determinant of these revenues. In 1996-97, revenue from these three sources amounted to £5.2 billion. Assuming no change in turnover, the Inland Revenue estimates that the direct effects of a sustained 10 per cent increase in equity prices would be to raise revenues by about £750 million in a full year. For the purposes of the fiscal projections, the Treasury proposes to adopt the assumption that equity prices grow at the same rate as gross domestic product (GDP) in money terms.

6 Equity prices can move quite differently from money GDP in the short term. For example, over the past two years, equity prices measured by the Financial Times all-share index have risen by 35 per cent, while money GDP has increased by 12 per cent. In addition, there has been considerable fluctuation in the monthly growth rates of equity prices within this period, as shown in Figure 1.

Figure 1: Monthly percentage changes in the FT all-share index October 1995-October 1997



7 Predicting short term movements is problematic, since equity markets are likely to be efficient in incorporating all available information into prices. While there is a great deal of information on companies and markets which could provide a basis for a forecast of equity prices, this information is available to participants in the equity market, and these views should therefore be reflected in the existing market price. Short term changes in equity prices are therefore the result of the arrival of unexpected information, which by its nature cannot be forecast. There is a considerable body of academic evidence which supports the view that short term movements in equity prices are unpredictable and that the best estimate of short term equity prices is therefore their current level.

8 Longer term forecasts of equity prices are also made by commentators, focusing in particular on whether markets are over or under valued in comparison to fundamentals such as current company profitability. The predictive power of such assessments taken as a whole is limited. For example, views that markets are overvalued have been put forward while markets have nevertheless continued to rise for long periods.

9 An alternative approach for projecting equity prices depends on the economic theory of asset prices. Assets used by businesses generate a stream of profits and as a result the value of such assets, and hence equity prices, depends on the expected value of current and future profits. On this basis, a reasonable assumption to make is that future equity prices will grow in line with future profits.

10 Clearly a number of assumptions could be made about the rate of growth of future profits, but over long periods of time the share of profits in gross domestic product has tended to remain stable, and this implies that profits grow at the same rate as money GDP. On this basis, it could be assumed that equity prices will grow in line with money GDP, and for the purposes of making fiscal projections it is not unreasonable to make such an assumption provided the share of profits in money GDP does not alter markedly. It remains the case that there will be unpredictable short term movements in equity prices, however, and so the assumption is unlikely to be valid at all times over the Treasury forecast period.

11 The link between equity prices and money GDP growth can be examined by looking at movements in these two time series. Figure 2 shows data for the Financial Times stock exchange all-share index since 1963, the date at which the index was first constructed. Over this period there were many short term fluctuations in equity prices, and the relationship with the rate of growth of money GDP, also shown in Figure 2, was not exact. In the longer term, however, an assumption of a relationship between equity prices and money GDP growth is broadly supported by the data, though there were periods when the relationship held less strongly, particularly in the 1970s.

12 The degree to which the assumed relationship fits past data can be gauged more accurately by examining forecast errors. To test this, the Treasury was asked to make retrospective forecasts for equity prices for successive five year intervals between 1963 and the present, comprising a forecast for equity prices in 1968 based on money GDP growth from 1963 to 1968, a forecast for equity prices in 1969 based on GDP growth 1964 to 1969, and so on to the present. The errors in the forecast level of equity prices expressed as a percentage of the actual FT all-share index are shown in Figure 3.

Figure 2: Money GDP (£million) and FTSE all-share index

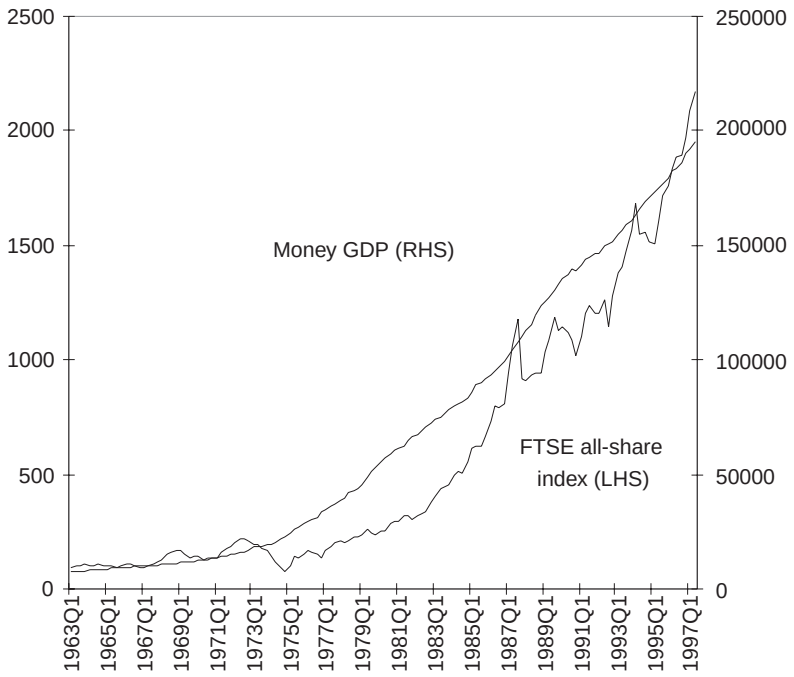
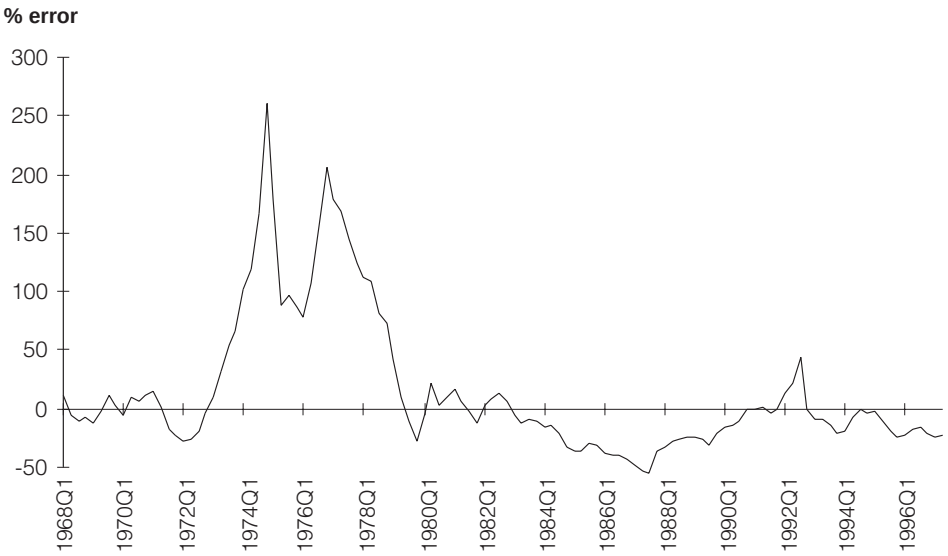


Figure 3: Equity price forecast error as per cent of the actual FTSE all-share index



13 Figure 3 indicates, as evident from Figure 2, that the relationship between equity prices and GDP growth broke down in the 1970s. However, for much of the rest of the period examined, while the relationship is by no means an exact one and some percentage errors are sizeable, it has broad validity.

14 In conclusion, unexpected events or information will inevitably result in fluctuations in equity prices. The relationship between equity price growth and money GDP is therefore likely to be imprecise, and possibly quite significantly so. But there are reasonable grounds in economic theory and the data on equity price movements over a long time period to support the use of such a relationship as a rule of thumb for forecasting purposes.

Oil prices

15 Projections of oil prices are used by the Treasury mainly for forecasting tax revenues from the oil industry. North Sea revenues are forecast to contribute £3.5 billion to public finances in the current financial year. The Inland Revenue estimates that a continuing 5 per cent increase in oil prices would increase these revenues by around £200 million in the first year and £300 million in each year subsequently.

16 Forecasting short term oil price movements is difficult because short term movements in the supply of and demand for oil result from unforeseeable events. Short term supply can be disrupted by events such as a major accident or political problems in oil producing regions, and short term demand movements are dependent on unpredictable factors such as weather. The impact of these factors on short term prices can be considerable. For example, oil prices increased sharply in the aftermath of the Iraqi invasion of Kuwait in 1990.

17 Oil prices have also been affected by an increasing amount of speculative trading by non-oil industry firms, which can alter prices without a change in oil industry fundamentals. The outturn figures in Table 1 show the volatility of oil prices since the beginning of 1996. Prices rose around 28 per cent during 1996 and have fallen by around 14 per cent in the first three quarters of 1997.

18 As a result, the Treasury believes that a reasonable assumption for oil prices in the short term is that they remain close to recent levels. Thereafter, the Treasury assumption is that oil prices remain flat in real rather than nominal terms in order to allow for general world inflation.

19 For the medium to longer term, it is possible to take more account of the underlying trends in supply and demand. The Department of Trade and Industry's assessment is that factors such as improved technology in discovery and extraction mean that there is a plentiful supply of world oil. They also believe that world demand is likely to continue to grow at a fairly steady rate. On the basis that growth in demand can be accommodated by increases in supply, the real price of oil would remain flat.

20 In producing specific forecasts, the Department makes assessments of the supply of oil by geographical area to build up a country by country and then regional supply estimate. It also examines likely demand trends using forecasts of economic growth from the Treasury, taking account of projections made by the Organisation for Economic Cooperation and Development and the International Monetary Fund. The Department of Trade and Industry produces a forecast for oil prices measured using a representative market price as a benchmark. These forecasts are then discussed with the Treasury, other government departments which use projections of the oil market, and the Bank of England. The final agreed projections take account of all the information available to government.

21 The current assumption for oil prices is that the nominal price will grow slightly, rising from $18.4 to $18.6 a barrel until 2000, subject to a range of plus or minus $3 due to the uncertain nature of the market. The Treasury expects that the price of world manufactures, which is used to deflate nominal oil prices to real terms, will also grow relatively slowly; so the assumption implies a level path for real oil prices.

22 The margin of error of the assumption can be examined by looking at how well the Government's recent forecasts have compared with actual prices. Table 1 shows the results of a comparison of the July 1996 Summer Economic Forecast with outturn prices. This shows there were some large forecasting errors due to the volatility of the market, the largest of which is an underestimate of nearly 30 per cent in the fourth quarter of 1996. Future projections are therefore likely to be uncertain. The assumption is that the increase in prices during 1996 was temporary and that prices are now settling down to a lower level which is broadly likely to continue in the short term.

23 It is also possible to compare the latest government projections with those from other forecasting institutions, though some of these may not be strictly comparable, as they may not refer to the benchmark price estimated by the Government, or may have been estimated at a slightly different date. Across 32 independent estimates of oil prices in the Treasury publication 'Forecasts of the UK Economy', the highest projected oil price for 1998 is $21.30 a barrel and the

Table 1: July 1996 Government short term forecast compared with outturn prices

		Forecast	Outturn	Difference	% difference
1996	Quarter 1	18.57	18.6	-0.03	-0.2
	Quarter 2	19.14	19.7	-0.56	-2.8
	Quarter 3	17.16	21.1	-3.94	-18.7
	Quarter 4	16.90	23.8	-6.90	-29.0
1997	Quarter 1	16.50	21.4	-4.90	-22.9
	Quarter 2	16.50	18.3	-1.80	-9.8
	Quarter 3	16.50	18.7	-2.20	-11.8

Source: HM Treasury

lowest $16.10. The average independent estimate is $18.90 a barrel, and the median is $18.65. The most common estimate is $18.00. The Government's forecast for 1998 of $18.4 is thus within the range of the independent estimates, and close to the centre of the range. The sources of the independent estimates are listed at Annex A.

24 Taking the above evidence into account, an assumption that oil prices remain broadly flat in real terms is reasonable, though short-term oil prices may well diverge markedly from this level in response to unforeseen events.

The underlying ratio of Value Added Tax receipts to consumer spending

25 In forecasting net VAT receipts, which currently total some £50 billion a year, account is taken of forecasts of expenditure, the long term trend in the proportion of that expenditure liable to VAT, and the impact of changes in the VAT regime. Although some VAT receipts arise as a consequence of central government expenditure and unrecovered VAT on purchases by exempt businesses, the major source of VAT is from consumer spending. The relationship between underlying VAT receipts and consumer spending is therefore used as the key trend indicator in forecasting VAT yield.

26 The underlying ratio of VAT receipts to consumer spending is calculated using actual VAT receipts adjusted for the effects of changes in rates and coverage of the tax, so as to give a consistent ratio over time. VAT revenue forecasts are calculated initially from an estimate of the VAT base which has three main elements: the proportion of consumer spending liable to VAT; VAT absorbed in central government expenditure; and unrecovered VAT on purchases by the exempt sector (primarily financial services). The projections of the VAT base are principally

derived from the Treasury's forecasts of consumer and government spending together with the extrapolation of past trends in the relationships between these variables and the VAT base.

27 During the early 1990s, in the light of previous experience of the economic cycle, these forecasts incorporated predicted increases in the underlying ratio of VAT receipts to consumer spending. The resulting revenue forecasts proved overly optimistic, however, when measured against subsequent outturn. Following a particularly large shortfall of £5 billion between the November 1994 forecast and the outturn for 1995-96, the Treasury and Customs and Excise conducted a joint review of factors affecting the trend in VAT receipts and issued a report of their findings in September 1997[1].

28 The review concluded that the shortfall against forecasts had been largely due to overestimates of the underlying VAT yield at any given level of consumer spending, rather than the result of errors in forecasting the spending levels themselves. It identified the main reasons for the declining yield, though when roughly quantified these factors fell short of the total to be explained. It found difficulties in measuring the impact of the exempt sector on the VAT base, and concluded that VAT planning and avoidance were probably the most significant factors in depressing the yield during the period under investigation.

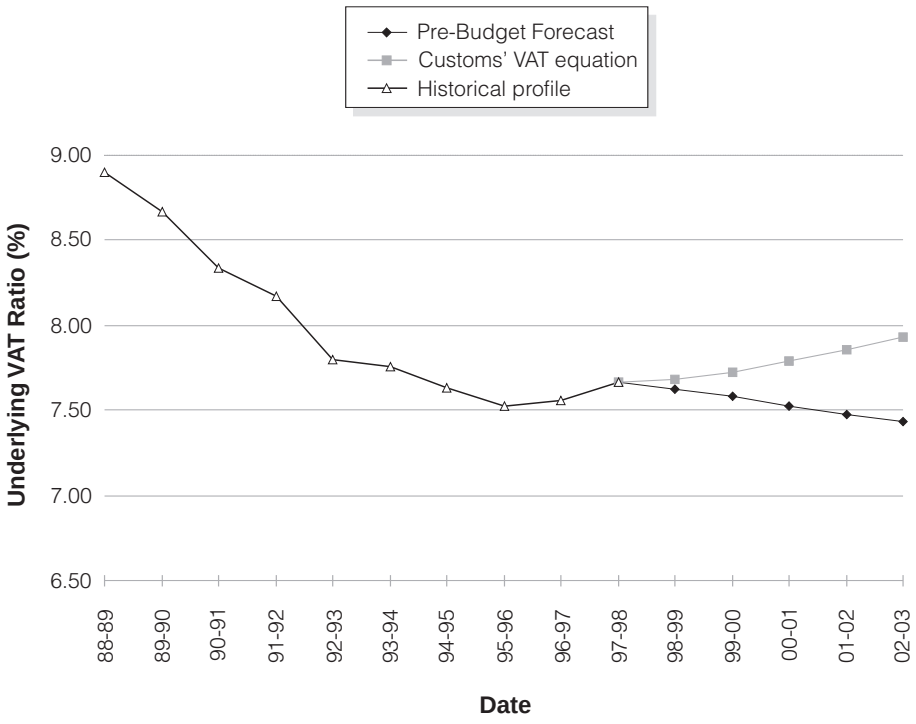
29 As a result of the emerging shortfall, Customs and Excise revised its forecasting equation with effect from November 1995. The current equation gives a good fit to the outturn for the years since 1988-89, showing a cumulative over-estimate of only £156 million up to 1996-97. The average annual divergence (plus or minus) from the recorded level of VAT receipts is £273 million, ranging between an over-estimate of £570 million for 1995-96 and an under estimate of £408 million for 1991-92. However, the equation has been re-estimated on several occasions in the past, and accurate reflection of past data does not necessarily imply that the equation will necessarily give similarly accurate predictions of the future.

30 The outturn for the years 1994-95 to 1996-97 shows a flattening of the previous sharp decline in the ratio of underlying VAT receipts to consumer spending. A forecast based on the current equation alone would show an improving trend, with an upward trend in the VAT base relative to consumer spending.

1 The VAT shortfall: Report of the Working Group on VAT Receipts and Forecasts, Treasury Occasional Paper No 9.

31 The Pre-Budget Report takes a cautious view, placing more emphasis on the earlier trend than the current slight upturn, and the resulting forecast for the period from 1998-99 to 2002-3 shows a declining trend in the underlying ratio of VAT receipts to consumer spending of approximately 0.05 percentage points per annum. The effect is to reduce forecast VAT receipts by £300 million in 1998-99, rising to £3.2 billion in 2002-03, compared to the levels predicted by Customs and Excise's forecasting equation (assuming an upward trend in the VAT base relative to consumer spending). This effect is shown graphically in Figure 4.

Figure 4: Comparison between Customs and Excise equation and the pre-Budget forecast



32 The assumed decline in the underlying ratio of VAT to consumers' expenditure is therefore less favourable than Customs' current equation would suggest. However the causes of the past decline have not been fully quantified, nor is it clear how quickly Customs and Excise will continue to make headway against avoidance and VAT planning. It would therefore be premature to assume a rising ratio at this stage, and some allowance for the possibility of further decline is reasonable.

Price indices

33 The Government has instructed the Monetary Policy Committee to achieve a target of 2.5 per cent inflation, and the forecast projects that this is met by the end of 1999. The target is set in terms of the Retail Prices Index excluding mortgage interest payments (RPIX). Assumptions for three other price indices are required in order to forecast significant elements of government revenue and expenditure. These are:

- the Retail Prices Index (RPI) itself;
- the index which is used to uprate income support and other income-related benefits, known as the Rossi index, and which differs from the RPI by excluding not only mortgage interest payments, but also council tax, rent, and depreciation, on the grounds that recipients of income-related benefits are separately assisted with their housing costs;
- the price deflator of Gross Domestic Product (GDP deflator), representing the ratio of GDP in money and in real terms.

The areas of expenditure affected by each of these three indices, and the approximate financial impact of a 1 per cent rise, are shown in Table 2. The net effect on tax revenues is estimated by the Treasury to be broadly neutral.

Table 2: Effects of a 1 per cent rise in price indices on Government expenditure

Index	Areas affected	Annual impact of 1 per cent rise
RPI	Non-income related benefits, (including pensions), and interest payments on index-linked gilts	£500 million additional expenditure on social security payments £700 million additional expenditure on interest payments on index-linked gilts
Rossi	Income related benefits	£300 million additional expenditure
GDP deflator	Housing benefits[1]	£128 million additional expenditure

Source: HM Treasury

1. Allowance is also made for real increases in private sector rents.

34 The RPI and its derivatives (RPIX and the income-related benefits index) are constructed from a representative "basket" of goods which relate essentially to consumers' expenditure. The GDP deflator, however, is designed to reflect the prices of all domestically produced goods and services.

35 The assumed path for each of these indices is shown in Table 3. The Government's inflation target of 2.5 per cent, in terms of the RPIX, is a key policy objective. I have not sought to assess the validity of that objective, or the probability of achieving it by the end of 1999. My review has been directed to the consistency of the assumptions for the other three indices with the projected path of RPIX and with each other.

Table 3: Assumptions for price indices used in the fiscal projections

				Percentage change on a year earlier			
Period		**RPI**	**RPIX**	**Income related benefit index**	**Period**	**RPIX**	**GDP Deflator**
1997	September	3.6 (actual)	2.7 (actual)	2.4 (actual)	**1997/98**	2.8	2.7
1998	September	3.6	2.9	2.5	**1998/99**	3.0	2.8
1999	September	2.3	2.7	2.4	**1999/00**	2.6	2.6
2000	September	2.3	2.5	2.2	**2000/01**	2.5	2.5
2001	September	2.6	2.5	2.2	**2001/02**	2.5	2.5
2002	September	2.6	2.5	2.2	**2002/03**	2.5	2.5

Source: HM Treasury

36 Unlike the RPIX, the **RPI** includes mortgage interest payments. These are mainly affected by the average amount of outstanding capital on mortgages, mortgage interest rates, and rates of tax relief available on mortgage interest payments. The first of these is related to house prices; but the effect of changes on the index and therefore on expenditure is relatively small. At current interest rates, the impact of a 1 per cent increase in the average value of mortgages is to raise the RPI by about 0.05 per cent, and expenditure by £25 million. The average size of mortgage is projected to grow by 4.5 per cent a year through the period, and $^{1}/_{4}$ percentage point higher than house prices, which are assumed to grow in line with earnings in the medium term.

37 Mortgage interest rates are the main variable in forecasting mortgage interest payments, and are assumed to vary in line with changes in the three month inter-bank rate. The latter is assumed to reflect expectations in financial markets. I reviewed this convention in my report on the assumptions for the July Budget, and found it to be a reasonable approach. On mortgage tax relief, the Government announced that the rate of relief on the first £30,000 of eligible loans would drop from 15 per cent to 10 per cent from 6 April 1998. I have confirmed

that this drop is reflected in the assumed difference between the RPIX and the RPI, and it has the effect of raising the RPI by 0.2 per cent and increasing expenditure by £100 million a year from then onwards.

38 **The income-related benefit index** differs from the RPIX by excluding not only mortgage interest payments, but also other housing costs comprising council tax, rents, and depreciation. It is assumed that local authority rents rise in line with the GDP deflator, while private rents move broadly in line with money GDP, and therefore increase in real terms. Similar assumptions are adopted for the rent rises underlying projections of housing benefit (Table 3). Depreciation, as the capital element of house maintenance, is assumed to reflect the movement of house prices. Council tax levels are difficult to forecast, but are projected by the Treasury to take account of the prospective future level of local authority expenditure. Thus the other housing costs excluded from the income-related benefits index are projected to rise faster than the RPIX, at a rate of around 4.5 per cent overall. The effect of excluding them is therefore to depress the growth in the index below that of RPIX, as shown in Table 3.

39 The **GDP deflator** can be separated into four elements, reflecting the components of Gross Domestic Product, which respectively measure inflation in goods and services:

- purchased by consumers - the consumption deflator;
- purchased by central and local government (excluding transfer payments such as social security benefits) - the government deflator;
- used in fixed capital formation and stockbuilding - the investment deflator;
- imported and exported - the net export deflator, or terms of trade effect, reflecting relative movement in import and export prices.

40 Consumers' expenditure has the largest weight in GDP, and the consumption deflator is therefore the most significant element in the GDP deflator. It has been assumed to follow approximately the same path as RPIX, which measures a broad range of consumer prices and so can normally be expected to move in step with the consumption deflator. The government deflator is initially assumed to rise rather faster, reflecting the assumption underlying the national accounts that there are no efficiency gains for large parts of the public sector.

41 The assumed paths of the investment deflator and the net export deflator both reflect the recent appreciation of sterling, in broadly offsetting ways. On the one hand investment prices are expected to show subdued growth, because historically a higher proportion of capital goods are imported than is the case for private consumption of goods and services. On the other hand import price inflation will tend to fall temporarily below export price inflation, since imports are generally invoiced in foreign currency, while exporters may not adjust their sterling prices immediately; so a temporary net upward effect on the GDP deflator is to be expected.

42 In summary, the main differences in the scope of the four indices which I have been asked to consider relate to housing costs and the non-consumption elements of the GDP deflator. Having reviewed the Treasury's assessment of the prospects for price movements in these areas, I conclude that there is reasonable consistency between the assumed trends in the indices, subject to the inevitable uncertainty of projecting relative price movements.

Conclusion

43 In my opinion the four additional assumptions which the Chancellor has asked me to review can be reconciled with the available evidence, as broadly consistent with past relationships and with each other.

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21 November 1997

Annex A

Organisations providing oil price forecasts

Forecasts of oil prices for 1998 (paragraph 23)

Abn Amro Hoare Govett
Barclays Bank
Business Strategies Ltd
Cambridge Econometrics
Chase Manhattan
Confederation of British Industry
Credit Lyonnais
Data Resources Inc. Europe
Deutsche Morgan Grenfell
Dresdner Kleinwort Benson
Economic Perspectives
Economist Intelligence Unit
European Commission
Goldman Sachs
HSBC Economics and Strategy
International Monetary Fund
ITEM Club
James Capel
Lehman Brothers
Lombard Street Research Ltd.
National Institute for Economic and Social Research
Natwest Group
Natwest Markets
Norwich Union Investment Management
Organisation for Economic Cooperation and Development
Oxford Economic Forecasting
Salomon Brothers
Schroders
Societe Generale
Union Bank of Switzerland
Wharton Economic Forecasting
Williams de Broe

These organisations are drawn from the Treasury publication “Forecasts for the UK Economy”, October 1997.