National Audit Office

REPORT BY THE
COMPTROLLER AND
AUDITOR GENERAL

HC 83
SESSION 2009–2010

9 DECEMBER 2009

Audit of Assumptions for the 2009 Pre-Budget Report

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Audit of Assumptions for the 2009 Pre-Budget Report

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Amyas Morse
Comptroller and Auditor General

National Audit Office

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This report can be found on the National Audit Office website at www.nao.org.uk/prebudget09

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Statement of responsibilities

1 Sections 156 and 157 of the Finance Act 1998 provide for me to examine and report on conventions and assumptions underlying the Treasury's fiscal projections that are submitted to me by the Treasury for examination.

2 For this Report, the Chancellor of the Exchequer has asked me to carry out the three-year rolling review of the equity price assumption and of the consistency of price indices used to project the public finances with the Consumer Prices Index. My predecessor examined both assumptions for the 2006 Pre-Budget Report[1].

3 The general Rolling Review remit is to ensure that the key audited assumptions underpinning projections of the public finances remain valid, the Comptroller and Auditor General shall examine each audited assumption three years after its most recent audit:

- to review whether the assumption has resulted in reasonable and cautious projections of the elements of the public finances projections it relates to since it was first audited; and
- to check that it remains a reasonable and cautious assumption to use in future projections of the public finances.

4 The Treasury has advised me that none of the other assumptions examined in previous Reports has been changed. As before, the Treasury remains responsible for making projections of future public expenditure and revenue on the basis of the audited and other assumptions.

1 *Audit of Assumptions for the 2006 Pre-Budget Report*, HC 125, Session 2006-2007.

Basis of report and opinion

5 I have considered the available evidence gathered for this audit from relevant papers and discussions with officials in the Treasury, and for the equity price assumption, also from external experts and organisations listed in the Appendix.

Report

The assumption for projecting equity prices

6 The Treasury's projection of equity prices directly affects projections of receipts from stamp duty on shares, corporation tax on capital gains from life insurers and, with a lag, inheritance tax and capital gains tax, and so affects projections of the public finances. All other things being equal (including exactly correct forecasts of equity turnover and realisation rates), overestimating equity prices will lead to an overestimation of government revenues, and vice versa.

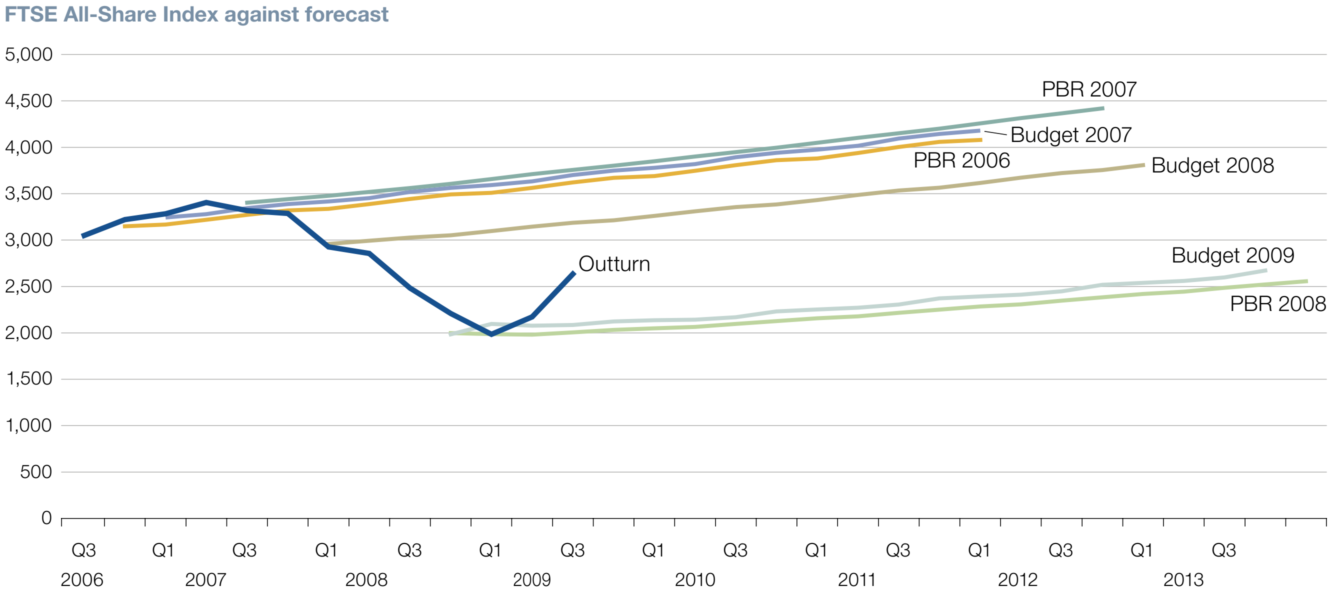
7 The audited assumption is that equity prices (represented by the FTSE All-Share Index) will grow in line with money GDP (Gross Domestic Product). This is broadly consistent with economic theory; equities represent claims on future corporate profits, and so it is reasonable to expect that, in the longer term, equity prices grow in line with the profitability of businesses. As the share of company profits in GDP has tended to be stable over the medium and longer term[2], the Treasury assumes that nominal equity prices will grow from its current level[3] at the same rate as money GDP.

8 **Figure 1** overleaf shows outturn equity prices over the rolling review period since the 2006 Pre-Budget Report, and the various projections made. Up to around the end of 2007, the projections were close to outturn. Between then and early 2009, the projections overestimated equity prices by an increasing amount as equity prices fell. This reflects the impact of the unexpected severe disturbances in UK and overseas financial markets. As a result, the projections of equity prices led to overestimates of the associated tax revenues. The projections made for the 2008 Pre-Budget Report and for Budget 2009 have on the other hand underestimated the recovery in the stock market to date. As a result, the related tax revenues were underestimated for these two forecasts.

2 See *Audit of Assumptions for Budget 2007*, HC 393, Session 2006-2007. Shares in GDP are subject to shorter term fluctuations and stability of the shares in GDP applies more in the medium and longer term.
3 Current levels are defined as the closing price on a date shortly before publication of the Budget or Pre-Budget Report. The date and level are set out in the relevant Budget or Pre-Budget Report.

Figure 1
Equity price outturns and projections for each Budget and Pre-Budget Report

Budget and Pre-Budget Report projections of equity prices against outturns



Source: HM Treasury

NOTE
The outturn data is quarterly. The projections start from the closing price on a date shortly before publication of the Budget or Pre-Budget Report.

9 It is not straightforward to assess the impact of the errors in projecting equity prices on the fiscal projections, because the relationship between equity prices and tax revenues is uncertain, and depends on more than the level of equity prices alone. For example, stamp duty on shares will also depend on equity turnover, while capital gains tax receipts depend on the timing of share sales. The Treasury's ready reckoner suggests that a one per cent change in equity prices could change associated tax receipts by approximately £100 million when all effects have worked through over time.

10 The Treasury's more detailed estimates of the impact of equity price forecast errors on tax revenue for each rolling review projection are shown in **Figure 2**. The largest over-estimates of tax revenue, in 2008-09, arise from equity price projections made before a fall in the FTSE All-Share Index. There were some offsetting under-estimates of tax revenue, but taking the rolling review period as a whole, the equity price assumption did not perform well. Money GDP increased by 5.8 per cent while the FTSE All-Share Index fell by a little over a quarter. The assumption was therefore not cautious to this extent, though the estimated revenue impacts were small in relation to total public sector current receipts of over £500 billion in 2008-09.

Figure 2

The Treasury's estimates of the effects on tax revenues of errors in the equity price forecasts, £ billion

Projections made for	2006-07	2007-08	2008-09
PBR 2006	0.0	-0.2	+2.1
Budget 2007		0.0	+2.4
PBR 2007		+0.1	+2.6
Budget 2008			+1.0
PBR 2008			+0.1

Source: HM Treasury estimates

NOTES

1 Over-estimates (+) of tax revenues and under-estimates (-), comparing forecast and actual total tax revenues related to equity prices.

2 Outturn estimates for 2009-10 not available for Budget 2009 or earlier forecasts.

11 Taking the period 1996 to 2006 as a whole, reviewed three years ago[4], equity prices increased by 65 per cent compared with an increase in money GDP of 68 per cent. It is now clear from **Figure 3** overleaf that the period since the mid 1990s has been characterised by considerable volatility in the relationship between equity prices and money GDP. In looking forward at the case for the continued use of the equity price assumption, the economic environment could mean that the relationship between equity prices and money GDP remains as unsettled as it was over the current rolling review period.

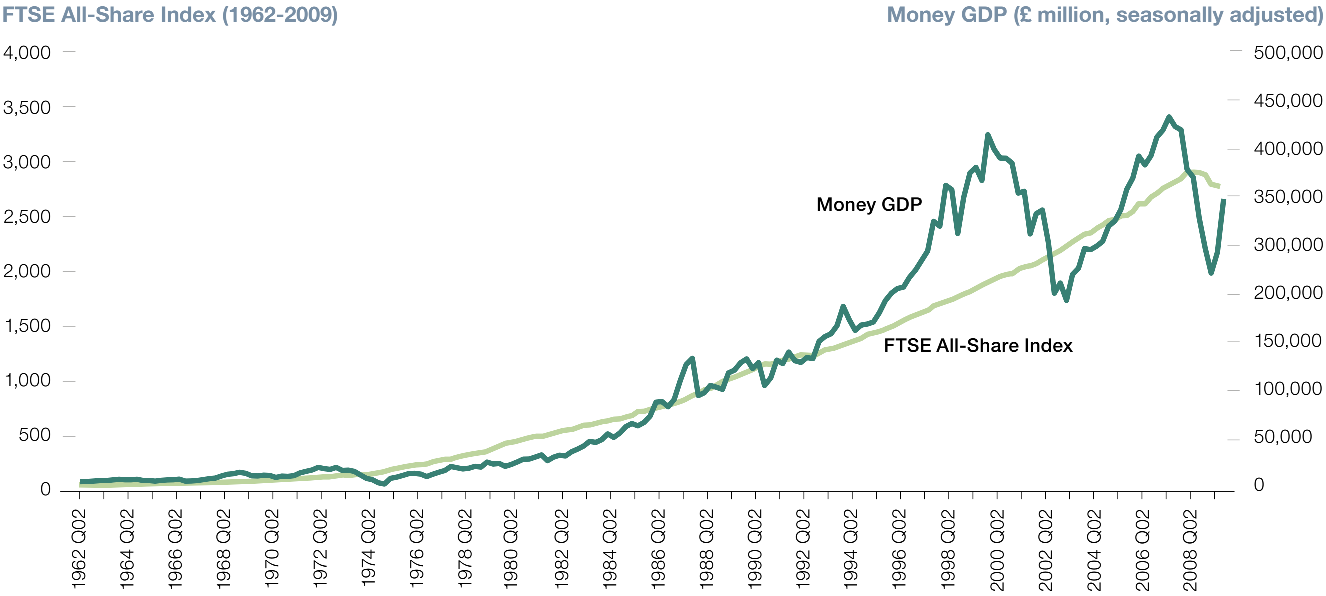
12 I consulted other organisations about whether the Treasury methodology for projecting equity prices remains reasonable, and whether there might be alternative and better approaches. The general view confirmed that the Treasury's approach based on expected movements in money GDP is a straightforward and transparent one, which has its basis in economic theory. The same or a very similar approach is used by a number of relevant organisations including the Bank of England, the National Institute for Economic and Social Research, Oxford Economics and the ITEM Club.

13 Whichever approach is used, those I consulted stressed the large uncertainties in using any method to predict equity prices. There are alternative approaches but consultees as a whole did not point to any obviously better methodology. There is therefore no case at present for the Treasury to adopt an alternative assumption.

14 For the future, one unknown is whether, as assumed by the Treasury, the share of profits in GDP will be constant over its forecast period. If not, equity prices could grow at more or less than the rate of growth of money GDP. With the economy away from trend, a number of effects on the shares of profits in GDP are possible. The Treasury expects them to be too small numerically and relative to other possible sources of forecast differences to warrant making any adjustments to the assumption.

4 Paragraph 17, *Audit of Assumptions for the Pre-Budget Report 2006*, HC 125, Session 2006-2007.

Figure 3
Growth in Money GDP and FTSE All-Share Index over time



Source: HM Treasury

15 With greater variability in equity prices now than in more stable economic conditions, there is a good case for increased use of sensitivity analysis, to obtain a higher level of assurance, in particular that an equity price projection is not over-optimistic. Among the possibilities are methods which as a check, place the forward looking equity price projection within a distribution of equity price changes, constructed from current and historical market data, or which otherwise create a probability distribution around a point forecast.

The consistency of price indices used in forecasting public finances and the Consumer Prices Index (CPI)

16 The price indices used to forecast significant elements of government expenditure are the Retail Prices Index (RPI), the Rossi Index and the price deflator for GDP. The RPI affects non-income related benefits, tax allowances and thresholds, interest payments on index linked gilts and specific duties. The Rossi Index is used to uprate income related benefits, while the GDP deflator has a small indirect effect on housing benefits.

17 The CPI, RPI and the Rossi index are different measures of consumer prices, but have common elements. They have differences of calculation in terms of the statistical formula used and weights applied, as well as the components included or excluded. The GDP deflator has a much broader scope than the other price indices and measures the overall level of prices for goods and services in the domestic economy. Nevertheless, movements in the GDP deflator are largely influenced by the consumer expenditure deflator, since consumption currently accounts for some 65 per cent of money GDP. The GDP deflator therefore shares common influences with the CPI, RPI and Rossi index, **Figure 4** overleaf.

18 In order to be coherent, the government's fiscal projections need to be based on a set of price indices that are internally consistent, so that the numerical differences between the various indices can be explained by the definitional and other factors. Since December 2003, the Treasury has defined the Monetary Policy Committee's inflation target in terms of the CPI, rather than the RPI. The convention that I audit is therefore that the RPI, Rossi index and the GDP deflator are consistent with each other and with the CPI. This convention was last examined for the 2006 Pre-Budget Report[5].

19 The Treasury builds consistency into its projections of the price indices by projecting the CPI and the housing components included in the RPI but not the CPI. The projections for the RPI and the Rossi index are then built up allowing for the differences in coverage and statistical formulation. In making its projection of the CPI, the Treasury forecast is based on the premise that the Monetary Policy Committee of the Bank of England will take the necessary policy actions to ensure that the outlook for inflation is in line with the two per cent target. The Treasury applied the process described for each Budget and Pre-Budget Report in the rolling review period.

20 The forecast for the GDP deflator is built up from the forecast for each of the components of the deflator: the consumer expenditure deflator, investment deflator, export and import price deflators, and the government consumption deflator. Given the high weight of consumer expenditure in GDP, consistency is achieved if growth in the consumer expenditure deflator moves broadly in line with CPI. Over the rolling review period, the Treasury's projections of the consumer expenditure deflator and CPI were broadly in line. Any expected differences between the forecast paths of the GDP deflator and CPI were due to differences in coverage and calculation, with the GDP deflator having wider coverage and therefore being subject to different influences to the CPI.

5 *Audit of Assumptions for the 2006 Pre-Budget Report*, HC125, session 2006-07, paragraphs 19-26.

Figure 4
Similarities and differences in the calculation and coverage of the price indices

	CPI	RPI	ROSSI	Consumer expenditure deflator within the GDP deflator
Coverage	Includes all UK households.	Excludes the top four percent of households by income. Excludes pensioners who derive at least three quarters of their income from state benefits.		Covers both national and domestic concepts of expenditure.
	Includes spending of UK resident and non-UK resident households within the UK.			Excludes expenditure of foreign residents while in the UK (these come into the accounts as exports). Includes UK resident expenditure overseas.
	Excludes mortgage interest payments, council tax and housing depreciation costs, and UK resident expenditure abroad.	Includes mortgage interest payments, council tax, and housing depreciation costs.	Excludes mortgage interest payments, council tax, and housing depreciation costs.	Includes financial intermediation services and some imputed expenditures excluded from the CPI.
	Includes actual rent.	Includes actual rent.	Excludes rent.	Includes imputed rents.
Calculation	Direct measure of inflation: prices are averaged within expenditure categories using the geometric mean.	Direct measure of inflation: prices are averaged within expenditure categories using the arithmetic mean.		Indirect measure of inflation: implied price deflator, from comparisons between current price and constant price measures.
	Annually chain-linked index.	Annually chain-linked index.		Constant price estimates are derived through deflation using a combination of RPI and household deflators, although some direct volume measures are employed. The resultant implied deflator is then determined by dividing the aggregate current price estimate by the aggregate constant price estimate.
	A 'base weighted' index based on a historic basket of purchases: what this basket would cost now compared with the past.	A 'base weighted' index based on a historic basket of purchases: what this basket would cost now compared with the past.		A 'current weight' index based on the current basket of purchases, comparing its cost now with what it would have cost in the base period.
Weights	Index weights are based on shares in nominal expenditure.	Index weights are based on shares in nominal expenditure in the Expenditure and Food Survey.		Index weights are based on shares in real expenditure.
	Weights use expenditure data from a base year.	Weights use expenditure data from a base year.		Weights use expenditure data from the current year.

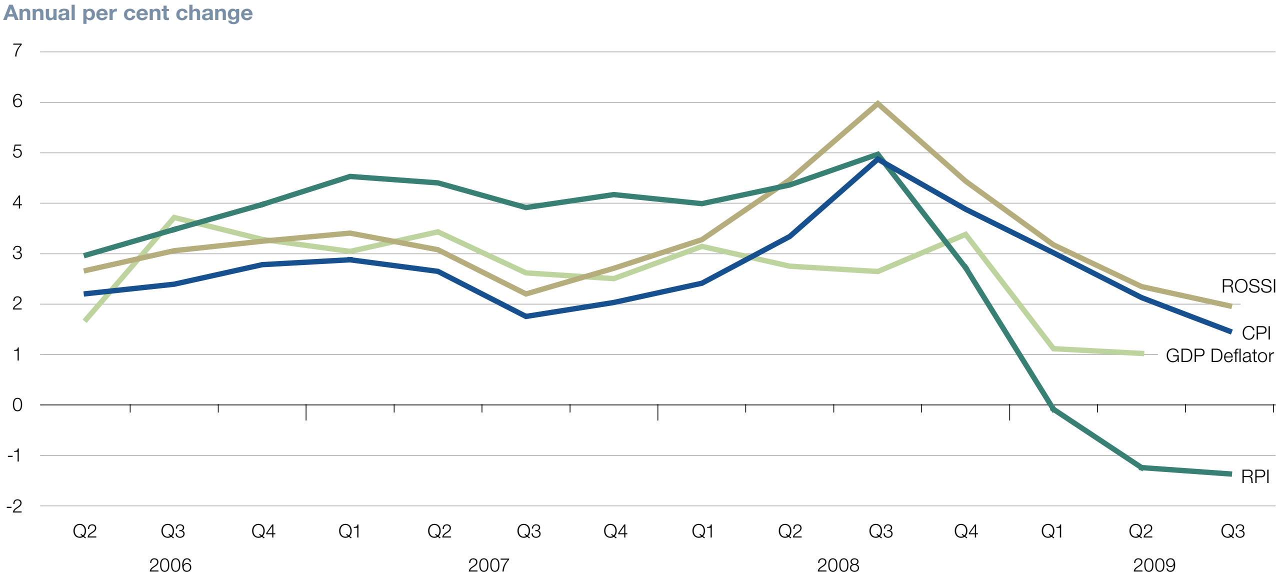
Source: Office for National Statistics

21 Looking back over the rolling review period, **Figure 5** shows the paths of the different indices. Divergences between the indices are explained by the definitional and other structural differences such as weights, and by differences in the movements of components included in one index, but not another. For example, the divergence between the path of RPI and CPI largely reflects the movement of housing components that are included in the RPI but not the CPI, **Figure 6** overleaf. The difference between the path for the GDP deflator and CPI in 2008 was greater than usual.

22 **Figure 7** overleaf shows the Treasury's 2009 Pre-Budget Report forecasts for the CPI, GDP deflator, RPI and Rossi indices. The approach taken for the Pre-Budget Report forecast is in line with the approach adopted in the rolling review period. The Treasury forecasts that the annual rate of CPI inflation will rise sharply in the near term and then fall through 2010 and in 2011 before returning back to the 2 per cent target during 2012.

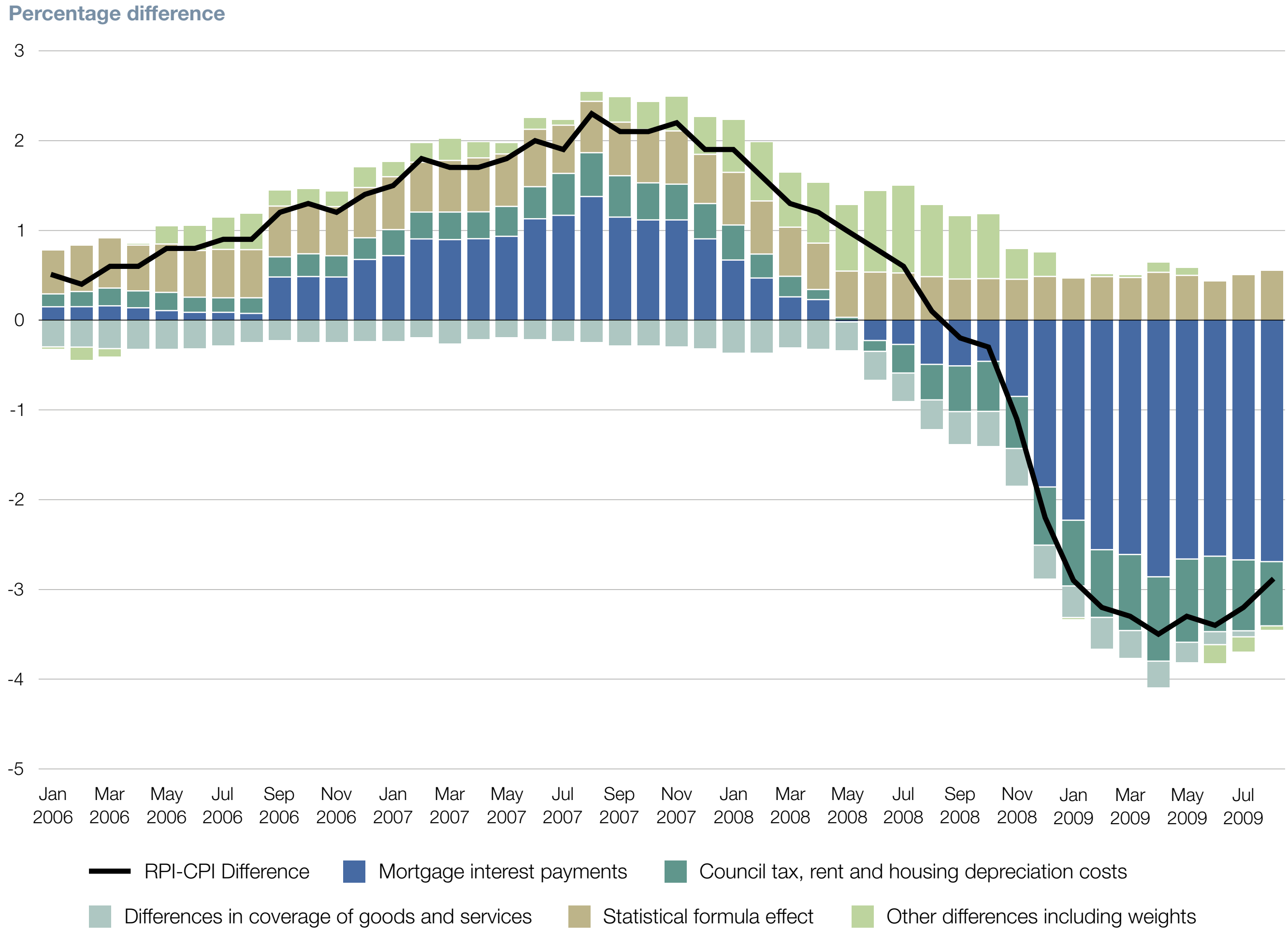
Figure 5

CPI, RPI, Rossi and GDP deflator inflation rates 2006-2009



Source: Office for National Statistics

Figure 6
Reconciliation of CPI and RPI figures – contributions to the differences between the indices



Source: Office for National Statistics

Figure 7
Treasury forecasts for price indices between 2009-14, annual per cent change

Year	CPI	RPI	Rossi	GDP Deflator
Q4 2009	2	½	3½	1½
Q4 2010	1¾	2½	2¼	2
Q4 2011	1½	3½	1¾	1½
Q4 2012	2	3½	2¼	2½
Q4 2013	2	3¼	2¼	2¾
Q4 2014	2	3	2½	2¾

Source: HM Treasury

23 Recently, the annual rate of RPI inflation has been negative, due to declines in house prices and the lagged feed-through from the fall in the Bank of England Base Rate to lower mortgage interest payments. These housing components are included in the RPI but not the CPI. In the near term RPI inflation is forecast to turn positive and rise more rapidly than CPI inflation with upward pressure from rising house prices and the large falls in the mortgage interest payments falling out of the year on year comparison. RPI inflation is projected to settle at around three per cent by the end of the forecast period. The annual rate of inflation in the Rossi index is expected to remain more than one percentage point above CPI in the near term, as the recent rise in second-hand car prices has a larger effect on the RPI and Rossi index, due to differences in calculation.[6] The gap between CPI and Rossi is expected to narrow during 2010 and the annual rate of inflation in the Rossi index is forecast to settle at two and a half per cent. The largest component of the GDP deflator, the consumer expenditure deflator, is forecast to move broadly in line with the CPI over the forecast period. The GDP deflator is forecast to weaken in 2010 and 2011 before rising to settle at two and three quarter per cent in 2013.

6 The index for new cars in the RPI is compiled in the same way as the used cars index: it uses the same sample and prices as the used cars index, but the weighting is different.

Conclusions and recommendation

The methodology for projecting equity prices

24 The Treasury's approach for modelling equity prices based on the growth of money GDP is simple, transparent and based in economic theory. The assumption did not perform well over the rolling review period as a whole, as it did not capture the major movements in UK equity prices following upheavals in the global financial system and stock markets. Overall, the assumption resulted in over-prediction of tax revenues associated with equity prices, though these were a small percentage of overall government receipts. To that extent the assumption was not cautious in the rolling review period.

25 For the future, there is no case for adopting an alternative methodology on the basis that there is no obviously superior methodology, though the assumption will continue to be inexact.

26 With the uncertainties manifested over the rolling review period and the possibility that the relationship between equity prices and money GDP will remain volatile, I recommend that the Treasury makes an assessment of formal methods to allow for the uncertainty in its equity price projections. The conclusions of this work may have relevance for other assumptions I audit.

The consistency of price indices

27 The Treasury ensured consistency between the CPI, RPI, Rossi index and the GDP deflator over the rolling review period by forecasting the various components of each index and then incorporating these forecasts as required by the definition of each index, making adjustments for differences in the statistical approach to calculating each index.

28 There are uncertainties in projecting the indices, even allowing for the definitional and other differences, as forecasts of the index components may be affected by factors currently unknown. It is not part of my remit to assess the likely accuracy of the price index projections made for the 2009 Pre-Budget Report, but the same approach as for the rolling review period has been used, and the projected series are consistent with each other on this basis.

Appendix

Individuals and organisations consulted on the Treasury's equity price projection methodology

We received information from the following:

- Peter Spencer, Chief Economist, ITEM CLUB;
- Bank of England;
- Barrie & Hibbert Ltd;
- Commerzbank;
- European Commission;
- National Institute for Economic and Social Research;
- ING;
- International Monetary Fund;
- Morgan Stanley;
- Oxford Economics; and
- Pension Protection Fund.

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