

Public finances and the cycle:

Treasury Economic Working Paper No.5

November 2008



HM TREASURY

Public finances and the cycle

Stephen Farrington, John McDonagh, Catherine Colebrook and Andrew Gurney
HM Treasury

Abstract

Under the Code for fiscal stability, the Government is required to publish estimates of fiscal aggregates adjusted for the effects of the economic cycle. This paper updates previous HM Treasury estimates of the effects of the economic cycle on the public finances. It finds little change from previous analysis published in 2003, concluding that HM Treasury's existing cyclical-adjustment coefficients should remain unchanged.

The remainder of the paper explores other methodological issues related to cyclical-adjustment. Alternative approaches to cyclical-adjustment used by institutions such as the OECD, IMF and ECB are also found to produce similar results to HM Treasury's estimates. In recent years a number of institutions have examined the effect of asset prices on measures of the structural balance. Using a straightforward method for calculating the long-run average values of house and equity prices, the paper attempts to quantify these effects. In line with the practice of other institutions, it is not suggested that this analysis be used to adjust systematically HM Treasury's current methodology, as the uncertainties involved mean we cannot be confident that any adjustments would produce better policy. But the analysis in the paper presents one possible approach to conducting periodically some additional sensitivity analysis of the public finance projections.

JEL reference: E62, E32,

Keywords: Fiscal policy, cycles

This paper updates previous HM Treasury estimates of the effects of the economic cycle on the public finances. All other opinions expressed in this paper are those of the authors and do not necessarily reflect those of HM Treasury or other affiliated institutions. The authors are grateful for input and comments from colleagues at HM Treasury. The usual disclaimer applies.

Executive summary

Under the *Code for fiscal stability*, the Government is required to publish estimates of fiscal aggregates adjusted for the effects of the economic cycle. In all public finance forecasts produced since the 1998 Pre-Budget Report, the Government has published cyclically-adjusted forecasts of the current budget balance and public sector net borrowing (PSNB) to illustrate the impact of the economic cycle on key fiscal aggregates. This helps to promote transparency in the operation of fiscal policy and enhance the quality of policy decisions.

Cyclically-adjusted fiscal aggregates play an important role in assessing the sustainability of the public finances, since they provide a measure of the underlying, or structural, fiscal position. They are an estimate of the level of the deficit that can be expected to apply on average over the course of an economic cycle, in the absence of any discretionary changes to the existing fiscal stance.

Chapter 2 of the paper updates previous HM Treasury estimates of the effects of the economic cycle on receipts and spending. It finds little change in the responsiveness of the public finances to the economic cycle, implying that the existing cyclical-adjustment coefficients should remain unchanged from the 2003 analysis.

HM Treasury's ready reckoners for calculating cyclically-adjusted estimates of key fiscal indicators therefore remain as set out below:

Cyclically-adjusted net borrowing = net borrowing + 0.50 * output gap in the current fiscal year + 0.20 * output gap in previous fiscal year

Cyclically-adjusted current budget = current budget – 0.50 * output gap in the current fiscal year – 0.20 * output gap in previous fiscal year

Overall a 1 per cent increase in output relative to trend after two years is estimated to reduce the ratio of public sector net borrowing to GDP by just under $\frac{3}{4}$ percentage point, while increasing the ratio of surplus on the current budget to GDP ratio by just under $\frac{3}{4}$ percentage point.

Chapters 3 and 4 of the paper explore other methodological issues that relate to understanding the underlying fiscal position. Although the importance of considering the cyclically-adjusted, or underlying, fiscal position is widely recognised, in practice, there is a divergence of views on how cyclical-adjustment should be calculated. A number of different approaches have been developed which try to separate the cyclical and structural components of fiscal aggregates.

Chapter 3 looks at alternative approaches to cyclical-adjustment used by institutions such as the OECD, IMF and ECB. Other approaches are designed to capture different elements of the cyclical-adjustment process. They should therefore be seen as complementary to HM Treasury's approach.

Despite these different approaches, there is general agreement on the size of cyclical-adjustment parameters. These alternative methods produce very similar results to HM Treasury's estimates. The analysis therefore confirms the Government's top-down approach to cyclical-adjustment is relatively straightforward, robust, transparent and consistent.

The estimates of the cyclical-adjustment coefficients make use of historical data to estimate the average effect of changes in the output gap on the public finances. This means that events which impact on the public finances over a different horizon to the economic cycle, such as large and non-recurrent, or "one-off", fiscal operations, or significant movements in commodity or asset prices, could affect the accuracy of cyclically-adjusted fiscal balances as a measure of the underlying position of the public finances.

It is possible that the cyclical-adjustment process does not fully capture the impact of asset price movements on the public finances. Using a simple mechanical method for calculating the long-run average of house and equity prices, Chapter 4 of the paper explores the scale of the potential impact on measures of the structural balance. However, the results of the analysis undertaken reinforce the initial assertion that it is highly challenging to assess accurately these potential adjustments.

The top-down and bottom-up approaches tested suggest that, if both house and equity prices were estimated to be 10 per cent above their long-run average values, we might expect a boost to cyclically-adjusted tax receipts of between a 0.1 and 0.4 per cent of GDP. Consistent with others' findings, the difficulties inherent in estimating asset price effects, and the possibility that they could impact on tax receipts in an unpredictable way, suggest that the estimated adjustments should be interpreted cautiously.

In particular, application of the results to the structural balance in real time would require a judgement regarding the extent to which divergences of asset prices from past averages might persist. Therefore in line with the practice of other institutions, it is not suggested that this analysis be used to adjust systematically HM Treasury's current methodology, as the uncertainties involved mean we cannot be confident that any adjustments would produce better policy. But the analysis in this paper presents one possible approach to conducting periodically some additional sensitivity analysis of the public finance projections.

1

Introduction

Background

1.1 The economic cycle has important short-term effects on the public finances through the operation of the automatic stabilisers. These effects need to be taken into account when assessing the “structural” position of the public finances. The structural fiscal balance can be thought of as the level of the deficit that can be expected to apply on average over the course of an economic cycle, in the absence of any discretionary changes to the existing fiscal stance. Cyclically-adjusted fiscal aggregates therefore play an important role in HM Treasury’s assessment of the sustainability of the fiscal position.

1.2 Under the *Code for fiscal stability*, the Government is required to publish estimates of fiscal aggregates adjusted for the effects of the economic cycle. In all public finance forecasts since the 1998 Pre-Budget Report, the Government has published cyclically-adjusted forecasts of both the current budget balance and public sector net borrowing (PSNB) to illustrate the impact of the economic cycle on key fiscal aggregates. This helps to promote transparency in the operation of fiscal policy and enhance the quality of policy decisions.

1.3 The impact of the economic cycle on the public finances is liable to change over time for several reasons. New data may change the view of economic activity relative to trend. Policy changes may affect how quickly different effects feed through to fiscal aggregates. And the use of different techniques for estimating the effects of the economic cycle may also lead to different views.

1.4 This paper is HM Treasury’s latest assessment of the relationship between the public finances and the economic cycle. It forms an important part of HM Treasury’s ongoing analysis of fiscal policy. It follows the previous analysis set out in Box 1.A.

Outline of the paper

1.5 The paper is set out as follows. Chapter 2 explains the approach the Government takes to adjusting fiscal aggregates for the effects of the economic cycle. It updates the cyclical-adjustment coefficients previously published in the 2003 *End of year fiscal report*, based on latest published data, including the Blue Book 2008 National Accounts data. It uses the same consistent and transparent methodology set out in the previous analysis.

1.6 Chapter 3 explains how alternative methodologies differ to HM Treasury’s approach. Drawing on the approaches used by institutions such as the OECD and ECB, it helps to provide an assessment of the robustness of HM Treasury’s top-down approach to cyclically-adjusting fiscal aggregates.

1.7 Even after fiscal aggregates are adjusted for the effects of the economic cycle, there remains volatility in cyclically-adjusted receipts. Temporary shocks to fiscal aggregates, such as movements in asset prices, can feed through to changes in the structural balance even though they do not represent discretionary or permanent fiscal measures. Chapter 4 attempts to quantify the adjustments that could be made to the structural balance in light of asset price movements.

Box 1.A: HM Treasury analysis of public finances and the cycle¹

Fiscal Developments and the role of the cycle (1991). This Treasury Bulletin first set out HM Treasury's assessment of the effects of the economic cycle on fiscal aggregates.

Public Finances and the cycle (1995). This paper set out in detail the methodology used for deriving coefficients for cyclical-adjustment. These coefficients are used in the "ready reckoners" to cyclically-adjust fiscal aggregates presented at each Budget and PBR.

Lessons from the last economic cycle (1997). This paper set out the key lessons from the conduct of macroeconomic policy during the economic cycle that ended in 1996-97. It set out several recommendations including the need to adjust fiscal aggregates for the economic cycle and building in a margin for uncertainty, and the need to be open and transparent.

Code for fiscal stability (1998). The *Code* sets out the framework that guides the conduct of fiscal policy. It set out that the Government is required to publish a specific range of information from its economic and fiscal projections, which includes assessment of the cyclically-adjusted fiscal position.

Analysing fiscal policy (1999). This paper set out the Government's objectives for fiscal policy and the institutional framework to deliver them. It set out the important effects the economic cycle has on the public finances through the operation of the automatic stabilisers.

Public finances and the cycle (1999). This paper formed part of HM Treasury's ongoing assessment of the effects of the economic cycle on the public finances. It updated the HM Treasury analysis from 1995 to estimate the cyclical-adjustment coefficients and took a more detailed look at HM Treasury's estimates of potential output and the output gap.

End of year fiscal report (2003). Annex A of the report updated the 1999 analysis with the latest available data.

Fiscal Stabilisation and EMU (2003) This discussion paper, published alongside the Treasury's Assessment of the five economic tests, explored a number of policy options to make discretionary policy more effective for stabilisation purposes and strengthen the automatic stabilisers in the context of EMU membership.

¹ All papers are available from www.hm-treasury.gov.uk.

2

Updated cyclical-adjustment coefficients

This chapter updates previous HM Treasury estimates of the effects of the economic cycle on receipts and spending. It finds little change in the responsiveness of the public finances to the economic cycle, implying that the existing cyclical-adjustment coefficients should remain unchanged from the 2003 analysis.

HM Treasury's ready reckoners for calculating cyclically-adjusted estimates of key fiscal indicators are:

Cyclically-adjusted net borrowing = net borrowing + 0.50 * output gap in the current fiscal year + 0.20 * output gap in previous fiscal year

Cyclically-adjusted current budget = current budget – 0.50 * output gap in the current fiscal year – 0.20 * output gap in previous fiscal year

Overall a 1 per cent increase in output relative to trend after two years is estimated to reduce the ratio of public sector net borrowing to GDP by just under $\frac{3}{4}$ percentage point¹ while increasing the ratio of surplus on the current budget to GDP ratio by just under $\frac{3}{4}$ percentage point.

2.1 Under the *Code for fiscal stability*, the Government is required to publish estimates of fiscal aggregates adjusted for the effects of the economic cycle. In all public finance forecasts produced since the 1998 Pre-Budget Report, the Government has published cyclically-adjusted forecasts of the current budget balance and public sector net borrowing (PSNB) to illustrate the impact of the economic cycle on key fiscal aggregates.

The automatic stabilisers

2.2 The fiscal aggregates tend to fluctuate with the economic cycle, primarily as a result of the automatic stabilisers. These are the features of the public finances that automatically dampen the impact of shocks on output. When economic activity is strong, other things being equal, receipts from tax bases such as income and corporation tax will tend to be higher while spending on social security will be lower.

2.3 These effects will also tend to be reinforced by other mechanisms that operate to smooth the economic cycle. Movements in the balance of trade and the terms of trade both act to automatically stabilise the economy. In an upswing, the demand for imports will tend to rise, which for a given level of exports, will reduce net exports and constrain GDP growth. In a downturn, the same process, working in the opposite direction, will increase net exports and support GDP growth.

¹ The same applies to the ratio of public sector net cash requirement (PSNCR), as financial transactions are not expected to be cyclical, and to the Maastricht definition of deficit.

2.4 Movements in the terms of trade have similar effects. In an upswing, inflation tends to rise. This will push up the price of exports, for a given exchange rate, worsen the terms of trade and reduce net exports. In a downturn, inflation tends to fall, improving the terms of trade and increasing net exports.²

2.5 However, in practice, the automatic stabilisers are normally thought of as features of the tax and benefit system.

HM Treasury's cyclical-adjustment methodology

2.6 A HM Treasury Occasional Paper published in 1995, *Public finances and the cycle*, set out the methodology for deriving coefficients for cyclical-adjustment. These coefficients are used as 'ready reckoners' to adjust nominal fiscal aggregates (expressed as ratios to GDP) to produce cyclically-adjusted variables.

2.7 Cyclically-adjusted fiscal measures play an important role in assessing the sustainability of the public finances, since they provide a measure of the structural fiscal position. They are an estimate of the level of the deficit that can be expected to apply on average over the course of an economic cycle, in the absence of any discretionary change to existing fiscal policy.

2.8 Updated estimates of the cyclical sensitivity of the public finances were published by HM Treasury in 1995, 1999 and 2003. This chapter forms part of HM Treasury's ongoing analysis of the effects of the cycle on the public finances.

2.9 HM Treasury's methodology to assess the impact of public finances on the cycle is relatively simple and transparent. Spending and receipts expressed as ratios to GDP over the past 30 years are regressed against estimates of contemporaneous and lagged output gaps. The coefficients indicate the responsiveness of the public finances to the average economic cycle.

2.10 The use of historical data means that the estimates reflect the average effect of changes in the output gap on the public finances over previous cycles. This means that, to the extent that one particular economic cycle differs from the average, temporary changes in the public finances may not be fully ascribed to the economic cycle. In addition, events which impact on the public finances over a different horizon to the economic cycle, such as significant movements in commodity or asset prices, will not be captured by this methodology. These issues are explored in more detail in Chapter 4.

Updated 2008 results

2.11 The ready reckoners are used to calculate the cyclically-adjusted estimates of key fiscal indicators (as per cent of GDP) that are presented at each Budget and PBR. As in the previous analysis the overall ready reckoner is derived from combining ready reckoners for both Total managed expenditure (TME) and public sector current receipts (PSCR).

2.12 The updated estimates presented in this chapter take into account the 2008 Blue Book National Accounts data. The new sample period for most equations starts in 1972-73 and is extended to 2007-08. The revision to the start date of the sample (which for most equations was previously 1966-67) reflects the fact that many of the survey indicators used by HM Treasury and other institutions to identify on-trend points in the cycle are only available from the 1970s onwards.³

² Turner (2006) considers the case for adjusting measures of the cyclically-adjusted fiscal balance for exceptional movements in the terms of trade for those countries where production of commodities is a substantial share of output (e.g. Australia).

³ The aggregate receipts equation starts in 1976-77 in order to ensure a consistent series for econometric analysis.

2.13 This update also makes a number of minor methodological improvements to previous analysis. The regressions now correct for autocorrelation where apparent. A potential simultaneous relationship between spending and receipts, and the output gap, is tested for, but was not found to be significant enough to warrant further analysis.⁴ This is consistent with other recent analysis (Darby & Melitz (2008)).

Relationship between spending and the economic cycle

2.14 Total Managed Expenditure (TME) is the sum of Annually Managed Expenditure (AME) and Departmental Expenditure Limits (DEL). As a ratio to GDP, it is sensitive to the cycle principally through a ‘denominator effect’, whereby the ratio of TME to GDP essentially drives the contemporaneous effect of the cycle on the public finances. This is because it is assumed that there is no significant change in public spending in cash terms. Currently the ratio of TME to GDP is around 40 per cent, which implies that a one per cent increase in output relative to trend would reduce the share of TME as a percentage of GDP by 0.4 percentage points in the first year. The arithmetic of this effect is set out in Box 2.A.

Box 2.A: Assessing cyclical-variation in TME and GDP changes

HM Treasury’s analysis looks at the impact of the economic cycle on fiscal aggregates as ratios to GDP. The cyclical-adjustment coefficient can therefore be interpreted as the effect that a one per cent change in the output gap has on the fiscal aggregate to GDP ratio. Arithmetically the change in the TME to GDP ratio is approximated by:

Change in (TME/GDP) \approx [per cent change in TME – per cent change in GDP] * [TME/GDP]

TME as a proportion of GDP is around 40 per cent and so a 1 per cent fall (rise) in GDP will lead to approximately a 0.4 percentage point rise (fall) in the ratio if the cycle has little initial impact on TME. This can be considered a pure “denominator effect”.

2.15 Since 1972-73, TME as a proportion of GDP has varied between 37 and 50 per cent of GDP (Chart 2.A). As expected, the share of TME to GDP rose in the recessions of the mid 1970s, early 1980s and early 1990s, and fell in the recoveries. However, fluctuations in the ratio reflect structural as well as cyclical influences, notably the decline in the underlying trend level of spending between the early 1980s and mid-1990s.

⁴ Autocorrelation violates the Ordinary Least Squares (OLS) assumption that error terms are uncorrelated. While this does not bias the coefficient estimates, the standard errors tend to be underestimated and t-statistics overestimated. The analysis takes autocorrelation into account using the Prais-Winsten correction. A problem can also arise using OLS when there is a two-way relationship between dependent and independent variables. This was tested for, using an Instrumental Variables (IV) technique based on world output gap and world interest rates, but found no evidence that this biased the results.

Chart 2.A: Total managed expenditure



Source: HM Treasury

2008 TME equation

2.16 Table 2.A shows the regression results for TME replicated from previous HM Treasury analysis⁵. Note the time trend starting 1966⁶ included in previous analysis has now been removed to reflect the later start to the sample period in the updated 2008 analysis. The updated equation is now showing that a one per cent rise in GDP relative to trend reduces the TME to GDP ratio by just over 0.2 percentage points compared to 0.3 percentage points in the 2003 estimate.⁷

2.17 As in the 2003 analysis, the coefficient on the current year's output gap in the TME equation suggests the predominance of a "denominator effect". From the discussion above, a coefficient of less than 0.4 in absolute terms could point to some pro-cyclical spending, as it would offset to some degree the "denominator effect".

Table 2.A: Total Managed Expenditure (TME) per cent of GDP

TME	Constant	TME (-1)	TME (-2)	Output Gap	Trend 66	Trend 75	Dummy 2002	R ²	Standard error	Durbin's h-statistic
2003 EYFR	22.64 (6.08)	0.86 (5.32)	-0.43 (-3.47)	-0.32 (-3.27)	0.49 (3.44)	-0.67 (-3.95)	-	0.92	1.05	-
2008	30.11 (9.03)	0.79 (6.33)	-0.41 (-4.26)	-0.34 (-4.72)	-	-0.22 (-7.93)	1.02 (1.82)	0.97	0.76	2.45

⁵ The standard Durbin Watson test statistic is used to test the null hypothesis of no autocorrelation. When the regression includes lagged dependent variables, the Durbin-Watson statistic is not valid as a test for autocorrelation. The Durbin Watson statistic tends to be biased towards 2. In this case, Durbin's h test should be considered.

⁶ As in the previous analyses the 1975 time trend is based on a visual inspection of the data.

⁷ The changes from the 2003 analysis due to the extended sample period were confirmed by recursive estimates for the TME, Corporation tax and VAT equations.

Accounting for TME growth since 2002

2.18 The process for stripping out discretionary changes is fundamentally different for spending, given the number of measures and the uncertainties involved. The effects of discretionary changes cannot generally be removed for TME as they can in receipts.

2.19 Since 2002-3 there has been an increase in the underlying level of spending, including the introduction of new tax credits (Box 2.C). The updated 2008 sample now includes observations from the period when new tax credits have been introduced. Not accounting for such a major policy change could produce a distorted relationship between the economic cycle and TME.

2.20 There is however, not yet enough data to derive reliable quantitative estimates of the relationship between tax credits and the economic cycle. Different tax credits may also have different and complex links to the cycle, so it is difficult to assess quantitatively their impact. Spending on tax credits is now around 1.5 per cent of GDP (Box 2.B). The inclusion of the dummy variable for increased spending since 2002 provides an estimate of the increase in structural revenues over this period. Inclusion of the dummy variable reduces the coefficient on lagged TME as well as boosting the coefficient on the output gap.

2.21 If the dummy variable is excluded then the increase in the structural level of spending since 2002 can only be captured by the coefficient on lagged spending, but as changes in the actual ratio are also correlated with the economic cycle, this has the effect of reducing the estimated impact of the economic cycle.

2.22 As the effects of discretionary changes cannot be removed from TME, the coefficient on the contemporaneous output gap in the TME equation is assumed to be 0.4 in recognition of the denominator effect discussed above.

Cyclically-driven spending

2.23 As HM Treasury set out in 1995⁸, there are two spending items that are likely to display sensitivity to the cycle. These are cyclical social security and debt interest payments. The analysis in this section assesses the importance of these two elements.

2.24 The assessment of what can be considered “cyclical social security” (CSS) spending has changed since the 2003 analysis following the introduction of tax credits and other reforms to the tax and benefit system. The historical measure of cyclical social security used in the 1999 and 2003 analysis included Income Support and Job Seekers allowance⁹. This is shown as “CSS1” in Table 2.B. It continues to display a small, but statistically significant variation in response to changes in the output gap.

Table 2.B: Cyclical social security (per cent of GDP)

Cyclical social security	Constant	Output Gap	R ²	Standard error	Durbin Watson
2003 EYFR	1.55 (20.75)	-0.08 (-3.16)	0.30	0.35	-
2008 CSS1	1.18 (4.75)	-0.07 (-2.98)	0.28	0.34	1.74
2008 CSS2	0.92 (4.44)	-0.002 (-0.084)	0.02	0.02	1.79

⁸ *Public finances and the cycle*, HM Treasury.

⁹ The historical measure of Cyclical social security is no longer published. It can be constructed from data published at www.dwp.gov.uk.

2.25 A more accurate measure of cyclical social security comprises Unemployment Benefit, Jobseeker's Allowance (contribution based), Jobseeker's Allowance (income-based), Income Support paid to the unemployed, Housing Benefit and Council Tax Benefit (and predecessor benefits) paid to unemployed. The main exclusions are Income Support for the working age sick and disabled and Income Support for lone parents. This new measure is significantly lower as a per cent of GDP than previous estimates.

2.26 The coefficient on the new measure of cyclical social security (defined as "CSS2" in Table 2.B) is much reduced and no longer statistically significant. This may reflect the gradual migration to tax credits of elements previously classed as income support to the employed, as set out in Box 2.B.

Box 2.B: New Tax Credits

New tax credits introduced in 2003 have introduced an additional spending component to Annually Managed Expenditure (AME). The recent growth of these New Tax Credits is shown below. Growth in Child Tax Credits has been the main driver of increased tax credits.

£bn	2003-04	2004-05	2005-06	2006-07	2007-08
Working Tax Credit	4.5	5.2	4.8	4.8	4.7
- of which Childcare Tax Credit	0.6	0.7	0.9	1.3	1.4
Child Tax Credit	8.8	10.7	12.6	13.9	15.3
Total tax credits	13.3	15.9	17.3	18.7	20.0

Increased spending on tax credits has been predominantly a structural rather than a cyclical phenomenon, and is a plausible explanation for the positive coefficient on the post-2002 dummy variable in the regression for Totally Managed Expenditure (Table 2.A).

Debt interest payments

2.27 The effect of the economic cycle on debt interest payments is complex and is discussed in detail in the 1995 *Public finances and the cycle* paper. In brief, fiscal deficits tend to be lower when output is above trend leading to reduced new debt issuance. However interest rates tend to rise, and this may imply that maturing debt is more costly to refinance. The updated regression in Table 2.C replicates previous estimates of the relationship.

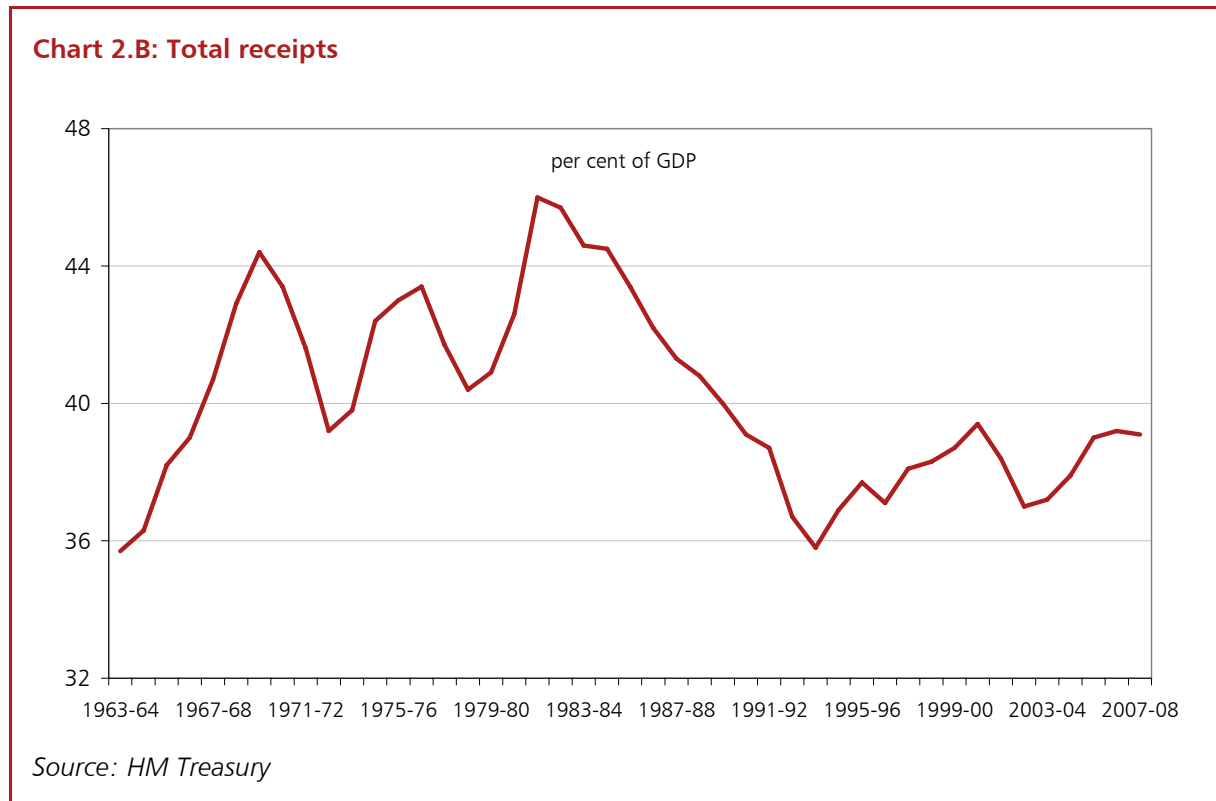
2.28 Central government debt interest payments as a per cent of GDP are regressed on lagged values and the output gap. Both the magnitude and the statistical significance of the coefficient on the output gap have declined slightly in the updated 2008 analysis. The dominant effect in these regressions comes from the coefficients on the existing level of the ratio of debt interest payments to GDP. The low statistical significance and small magnitude of the coefficient on the output gap implies that the influence of the cycle on debt interest payments is negligible.

Table 2.C: Central Government Debt Interest Payments (per cent of GDP)

Debt interest	Constant	Debt (-1)	Debt (-2)	Output Gap	Trend 66	Trend 77	R ²	Standard error	Durbin's h-statistic
2003 EYFR	0.48 (1.51)	1.00 (5.66)	-0.17 (-0.98)	-0.03 (-1.44)	0.05 (1.55)	-0.07 (-1.94)	0.93	0.24	-
2008	10.60 (1.98)	1.53 (9.85)	-0.67 (-4.44)	-0.02 (-0.79)		-0.79 (-1.83)	0.89	0.31	2.12

Relationship between receipts and the economic cycle

2.29 Since 1972-73, receipts as a proportion of GDP have varied between 36 and 46 per cent of GDP (Chart 2.B). The effects of the economic cycle are less apparent than for spending, although there was a sharp decline in the receipts ratio during the recession in the early 1990s.



2.30 Movements in tax receipts will typically include the effect of the economic cycle as well as discretionary policy decisions. In theory, cyclical-adjustment coefficients should measure the effect of the former and not the latter. The Government sets out an assessment of discretionary tax changes at each Budget. The 2008 sample uses publicly available receipts data that have been adjusted for the effects of discretionary policy measures by creating constant tax regimes with 1989-90 as the base year (Chart 2.C).

Chart 2.C: Constant tax regime series



Source: HM Treasury

2.31 This constant tax regime series is lower than the unadjusted receipts series as in the 2003 analysis. The measure of “aggregate receipts” comprises six tax bases, which theory suggests could be related the economic cycle: income tax, corporation tax, excise motor tax, other excise taxes and VAT.

2.32 Costings for the other tax bases such as National Insurance Contributions (NICs), local authority taxes and other non-tax receipts (mainly interest, dividends, trading surpluses and rent) are not available on a consistent historical basis, and have consequently been excluded from the adjusted “aggregate” series. In addition, the effects on the public finances of North Sea revenues have been removed by using non-oil corporation tax receipts¹⁰. The issue of adjustments for “one-off” effects is discussed in Box 2.C.

¹⁰ All series are available in the Public Finances Databank, which is a compilation of published data covering the main aspects of the Government Finances including receipts, expenditure, borrowing and debt. It can be accessed at www.hm-treasury.gov.uk.

Box 2.C: Accounting for one-off measures when assessing the structural fiscal balances

Large 'one-off' fiscal operations can affect the calculation of cyclically-adjusted fiscal balances even though they have no, or very little, implication for the fiscal stance. Typical examples include government sales of mobile phone licenses, lump-sum payments to the government in exchange for the transfer of employees' pension obligations debt assumptions and tax amnesties.

International institutions account for these effects in different ways. The European Commission (2006) relies on a disaggregated approach in which one-off adjustments are identified on a case-by-case basis in each individual country. This approach is therefore able to directly strip-out these effects from the structural balance measure, but there are practical implementation challenges in ensuring consistency in cross-country comparisons.

The recently updated OECD methodology (Joulmard (2008)) is designed to deliver a more systematic treatment of one-off adjustments, and is based on the deviation of government net capital transfers from a trend measure, rather than the identification of individual measures. This method has the advantage that it is relatively easy to compute and has low informational requirements.

In recognition of these effects, the Government's assessment of receipts, most notably the auctioning of third generation mobile telephone licenses, has been adjusted to reflect their one-off nature.

Cyclicity of aggregate tax receipts

2.33 As set out in Table 2.D the new results for the aggregate receipts equation show a slightly lower coefficient on the lagged output gap of under 0.2. This coefficient remains statistically significant. These results are consistent with the 2003 finding that there is a significant lagged effect of the economic cycle on receipts.

Table 2.D: Aggregate tax receipts (per cent of GDP)

Aggregate receipts	Constant	Output gap	Output gap (-1)	Trend GDP	R ²	Standard error	Durbin Watson
2003 EYFR	113.10 (5.82)	-	0.23 (2.56)	10.30 (7.05)	0.93	0.68	-
2008	19.87 (0.59)	-	0.18 (2.89)	0.08 (-0.03)	0.91	0.42	1.93

Cyclicity of individual taxes

2.34 Further insight into the cyclicity of tax receipts can be obtained by repeating the analysis for each of the tax categories (Tables 2.E to 2.I). These tables show that:

- non-oil corporation tax and VAT receipts both show a small positive contemporaneous response to the economic cycle;
- income tax receipts and motor excise tax both show a negative contemporaneous response to the economic cycle;
- income tax and non-oil corporation tax exhibit positive responses with a 1 year lag;
- non-oil corporation tax displays the largest responsiveness to the cycle, with a coefficient of 0.1 on both the contemporaneous and lagged output gaps; and

- the cyclical responsiveness of excise taxes is both statistically weak and small. The negative coefficient on motor excise taxes is probably another example of the denominator effect described in Box 2.A.

2.35 In each case the results are very close to those obtained in the 2003 *End of year fiscal report*, and hence provide an assurance that the cyclical-adjustment coefficients are robust to changes in the estimation period. In the corporation tax equation the coefficient on the current output gap has increased and the coefficient on lagged output is a little lower than found in 2003. This is consistent with the assumption in the 2003 analysis that the introduction of quarterly instalment payments of corporation tax payments for large companies has increased the timeliness of receipts to changes in economic activity. However, the effect is small, and not statistically significant.

2.36 The negative coefficient on the contemporaneous output gap in the income tax equation might appear counter-intuitive. We might expect income tax to be pro-cyclical, meaning that income tax as a share of GDP increases in line with the economic cycle. One possible explanation is that this reflects a combination of the denominator effect described in Box 2.A and the fact that a proportion of income tax liability is assessed in the following financial year. This coefficient is both statistically significant and robust to changes in the estimation period.

Table 2.E: Income tax receipts (per cent of GDP)

Income Tax	Constant	Output gap	Output gap (-1)	Trend GDP	R ²	Standard error	Durbin Watson
2003 EYFR	-102.82 (-12.86)	-0.18 (-2.56)	0.23 (3.23)	8.42 (14.01)	0.89	0.65	-
2008	-70.00 (-7.48)	-0.14 (-2.70)	0.18 (2.92)	5.95 (8.47)	0.93	0.62	1.60

Table 2.F: Non oil-corporation tax receipts (per cent of GDP)

Corporation	Constant	Output gap	Output gap (-1)	Trend GDP	R ²	Standard error	Durbin Watson
2003 EYFR	-22.19 (-6.28)	0.06 (2.07)	0.12 (3.83)	1.89 (7.13)	0.84	0.29	-
2008	18.51 (1.05)	0.08 (1.96)	0.10 (3.88)	-1.14 (-0.88)	0.78	0.34	2.21

Table 2.G: Excise motor tax receipts (per cent of GDP)

Excise Motor	Constant	Output gap	Output gap (-1)	Trend GDP	R ²	Standard error	Durbin Watson
2003 EYFR	64.12 (15.02)	-0.02 (-2.11)	-	-4.58 (-14.59)	0.90	0.13	-
2008	31.09 (2.53)	-0.04 (-0.30)	-	-2.18 (-2.43)	0.91	0.16	2.52

Table 2.H: Other excise tax receipts (per cent of GDP)

Excise other	Constant	Output gap	Output gap (-1)	Trend GDP	R ²	Standard error	Durbin Watson
2003 EYFR	79.30 (16.87)	-	-	-5.74 (-16.22)	0.89	0.41	-
2008	65.15 (19.33)	-	-	-4.67 (-18.71)	0.97	0.37	1.99

Table 2.I: VAT receipts (per cent of GDP)

VAT	Constant	Output gap	Output gap (-1)	Trend GDP	R ²	Standard error	Durbin Watson
2003 EYFR	5.57 (103.74)	0.02 (0.88)	-	-	0.03	0.28	-
2008	4.62 (3.83)	0.05 (3.34)	-	-	0.83	0.34	1.90

2.37 Table 2.J summarises the updated 2008 regression analysis. A 1 percentage point increase in the output gap is estimated to reduce the spending to GDP ratio by between 0.3 and 0.5 percentage points in the first year, and to increase the ratio of taxes to GDP by between 0.2 and 0.3 percentage points in the second year.

2.38 This analysis also allows an estimate of the effects of fiscal drag¹¹ (the tendency for tax receipts as a percentage of GDP to increase over time). The trend GDP coefficient in the income tax equation¹² in Table 2.E, which can be thought of as a proxy for fiscal drag, is positive and statistically significant. It is consistent with HM Treasury's previous estimate of fiscal drag of around 0.1 per cent of GDP a year from income tax, set out at Budget 2004.

2008 Ready reckoners

Table 2.J: Summary of regression coefficients

Fiscal aggregate	Table	Output Gap	Lagged Output Gap
Total Managed Expenditure	2A	-0.28 to -0.4	
Cyclical Social Security	2B	0.00 to -0.07	
Government Debt Interest	2C	-0.02	
Aggregate tax receipts	2D		0.18
Disaggregated tax receipts			
Income tax	2E	-0.14	0.18
Non-oil corporation tax	2F	0.08	0.10
Excise motor tax	2G	-0.04	
VAT	2I	0.05	
Total using aggregate tax receipts equation (1)		0.3 to 0.49	0.18
Total using disaggregated tax receipt equations (1)		0.25 to 0.44	0.28

Note: Coefficients from the expenditure equations are multiplied by minus 1 when calculating the total impact on fiscal balances.

2.39 The individual receipts equations also support the assumption made in 2003 around increased sensitivity of receipts to the cycle from changes to corporation tax regime and the increased importance of the financial sector.

¹¹ The concept of fiscal drag is discussed in more detail in *Analysing fiscal policy* 1999.

¹² The rationale for using a trend GDP coefficient to proxy fiscal drag was set out in the 2003 *End of year fiscal report*.

2.40 These estimates validate the existing ready reckoners used to cyclically-adjust fiscal aggregates, which assume that a 1 percentage point increase in the output gap will lead to an improvement (bigger surplus or smaller deficit) of 0.5 percentage points in the fiscal aggregates in the concurrent year and a further 0.2 percentage point improvement in the next year. The analysis set out in this chapter implies there is no need to change the existing ready reckoners, which are set out in Table 2.K.

Table 2.K: Summary of proposed 2008 ready reckoners (per cent of GDP)

Cyclically-adjusted fiscal aggregate	Fiscal Aggregate	Output Gap	Lagged Output Gap
Cyclically-adjusted TME	TME	+0.4	+0.1
Cyclically-adjusted receipts	PSCR	- 0.1	-0.1
Cyclically-adjusted net borrowing	Net borrowing	+0.5	+0.2
Cyclically-adjusted current budget	Current budget	-0.5	-0.2

3

Alternative approaches to cyclical-adjustment

Summary

This chapter looks at alternative approaches to cyclical-adjustment used by institutions such as the OECD, IMF and ECB. It concludes that these alternative cyclical-adjustment approaches produce similar results to HM Treasury estimates set out in Chapter 2.

Despite different approaches, there is general agreement on the size of budgetary sensitivity parameters. In practice estimates of the output gap are more contentious. Other approaches are also designed to capture different elements of the cyclical-adjustment process. They should therefore be seen as complementary to HM Treasury's approach.

The analysis sets out that HM Treasury's top-down approach to cyclical-adjustment is relatively straightforward, robust, transparent and consistent.

3.1 The importance of considering the cyclically-adjusted, or structural, fiscal position is widely recognised. However, in practice there is a divergence of views on how cyclically-adjustment should be calculated and a number of different approaches have been developed which try to separate the cyclical and structural components of fiscal aggregates. These alternative approaches provide a useful cross-check on the robustness of HM Treasury's top-down cyclical-adjustment methodology. This chapter evaluates those approaches.

3.2 The various methods can be characterised as following two broad approaches. The first approach can be characterised as "bottom-up". Common to this approach is the building up of an aggregate effect of the economic cycle on the public finances, by looking in more detail at its effect on the individual categories of revenue and expenditure. These individual elasticities are then aggregated to produce an overall elasticity for fiscal aggregates, by taking account of the relative contribution of each tax and spending base to the overall fiscal position.

3.3 The second approach, which can be thought of as "top-down", directly adjusts the overall fiscal aggregates for the estimated effects of the cycle and treats the residual as structural. The HM Treasury method outlined in Chapter 2 is an example of a "top-down" approach.

3.4 Although the degree of aggregation in the two approaches is different, both methodologies generally proceed in two steps:

- First, an estimate of the cyclical position of the economy is required. This involves estimation of the underlying potential output of the economy and the associated output gap; and
- Secondly, estimates of the cyclical sensitivity of tax and expenditure items are derived (i.e. tax and expenditure elasticities), using either econometric techniques or an analysis of fiscal institutions.

Evaluating the output gap

3.5 The Treasury's approach to assessing the economic cycle is based on identifying on-trend points and estimating the trend growth rate over the past by assuming it is constant between on-trend points (Box 3.A). However, the Treasury's method for estimating the output gap is only one of several methods that could be used. Other methods include the use of statistical filtering techniques, or methods based on more explicit production function approaches.

3.6 Statistical filtering techniques are a common method used to derive estimates of the output gap because they are relatively simple to apply and easily replicated. The most commonly used statistical filtering techniques are the Hodrick-Prescott (HP) filter and "band-pass" filters, including the Baxter-King (BK) and Christiano-Fitzgerald (CF) filters.¹

3.7 While statistical filters are simple to apply and easy to update, in practice they are subject to a number of drawbacks. Statistical filters:

- take no account of information from data series other than output in identifying the trend and cyclical components of growth;
- are unable to detect structural breaks in trends, but rather spread the effect of any break over periods both before and after the break, which may generate misleading estimates of the output gap;
- are unreliable at estimating the output gap at the end of the sample, as they are unduly influenced by the latest data points; and
- often require arbitrary parameters to be assigned to the cycle and trend parameters, which will in turn depend upon *a priori* judgements on the decomposition of output into cyclical and trend components.

3.8 The main benefit of using a production function approach is that it provides a transparent framework to account for growth in terms of the contributions of factor inputs and total factor productivity. However, judgements need to be made on the functional form and estimation of the parameters of the production function. Moreover, within production function approaches, the use of statistical filtering techniques to estimate trend levels of potential employment and productivity means that the output gap assessment is dependent on a judgement about the degree to which the filter should smooth the data. In addition, statistical filters can be unduly sensitive to the last data points and introduce a pro-cyclical bias.

3.9 Compared with production function approaches, HM Treasury's on-trend point approach is less susceptible to picking up spurious cyclical components, as it measures a constant potential growth rate over a period of time (along with its determinants). Box 3.A summarises the Treasury's approach to assessing the economic cycle.

¹ These approaches are discussed in detail in *Evidence on the UK economic cycle*, available from the Treasury website: www.hm-treasury.gov.uk.

Box 3.A: HM Treasury's approach to assessing the economic cycle

Business cycles are fluctuations in economic activity that abstract from both trend and very short-term irregular movements. Cyclical fluctuations are characterised by successive and distinct up and down phases, and are driven by demand or supply-side shocks that are propagated through the economy and eventually damped as market price and quantity adjustments run their course. Identification of business cycles is integral to the Treasury's methodology for estimating the UK economy's rate of trend growth.

HM Treasury's approach to assessing the economic cycle is based on identifying on-trend points and estimating the trend growth rate over the past by assuming it is constant between on-trend points. When the economy is on trend, its factors of production are employed at 'normal' rates of utilisation. On-trend points are therefore identified by looking at a wide range of cyclical indicators of factor utilisation in the economy. These indicators consist mainly of data from private-sector business surveys and the Office for National Statistics. Projections of trend growth looking forward are then built up from analysis of the components – labour productivity (output per hour), average hours worked, the employment rate and the adult population.^{2,3} The output gap is then estimated as the deviation of actual output from trend output.

The advantage of HM Treasury's approach to dating on-trend points compared with many other approaches is that it tends to give greater stability to estimates of past trend output growth. This is because the approach is based on analysis of a much wider range of indicators and is less susceptible to data revisions. A further advantage of disaggregated economic-based approaches, such as HM Treasury's, is that they can explicitly allow for particular factors affecting trend output in the latest cycle and beyond.

Moreover, when identifying complete past cycles, latest on-trend points and the starting point of the latest cycle, the Treasury's approach brings a much wider range of indicators to bear on the assessment than the production function approach and especially statistical filters.

Cyclical sensitivity of taxes and spending

3.10 A variety of methods is available for calculating the sensitivity of taxes and expenditure to the economic cycle. They can be grouped into three main approaches.

3.11 The first method is to run regressions of fiscal aggregates against a measure of the output gap. The effects of discretionary changes in the fiscal stance are accounted for by including them as explanatory variables in the regression or by adjusting the data directly for their effects. This is the HM Treasury approach set out in detail in Chapter 2. The explicit adjustment for the effects of policy changes (on the receipts side) and "one-off" measures (discussed in Box 2.C) is a key advantage of this approach. It also benefits from being relatively straightforward to calculate and generally robust to changes to the sample period.

² Previous discussion of the Treasury's trend growth and cycle-dating approaches is set out in the following Treasury publications: *Fiscal Policy: Public Finances and the Cycle* (HMT, 1999), *Trend Growth: Prospects and Implications for Policy* (HMT, 1999), *Trend Growth: Recent Developments and Prospects* (HMT, 2002) and *Evidence on the UK economic cycle* (HMT, 2005).

³ Latest estimates of trend output growth and its decomposition are set out in Table A2 of the 2008 Pre-Budget Report.

3.12 The second approach, which has been adopted by the OECD (Van den Noord (2000)) and IMF (Hagemann (1999)), has three parts. The first step is to estimate the elasticities of tax bases and expenditure items with respect to the cycle. In the second step the elasticities of receipts and expenditure with respect to the tax bases are determined. This usually involves an element of judgement: for example, this elasticity may be set to unity where it is reasonable to assume proportionality. Finally, the two elasticities are combined into a single measure of budgetary sensitivity to the cycle. The OECD approach is discussed in detail below.

3.13 The assumption of unit elasticities of tax proceeds to tax bases sidesteps the need to adjust the data for discretionary fiscal changes and changes to the tax code. This is the main advantage of the OECD approach, which helps to facilitate a consistent international comparison across countries. Against this, the approach seems to be quite sensitive to sample size, and in the OECD, analysis estimates for several countries came up with unexpected signs on the coefficients, requiring some ad-hoc adjustments to be made to continue with the estimation method.

3.14 The third approach derives the required tax and expenditure elasticities by running standard simulations on a macro-econometric model. These simulations typically show the calibrated response of receipts and expenditure to a one per cent increase in output relative to its trend level. This method is able to distinguish between different types of shocks, which may have very different implications for the response of receipts and expenditure, rather than assuming the existence of an 'average' cycle. However, another consequence of using a model-based approach is that the results are necessarily dependent on the assumptions underpinning the model.

3.15 The remaining sections of this chapter discuss in more detail the specific features of the OECD and IMF approaches. It also goes on to consider an example of the model simulation approach using a structural vector autoregression (SVAR) model.

Alternative approaches to cyclical-adjustment 1: the OECD

3.16 The OECD's approach to cyclical-adjustment was most recently set out in Girouard & Andre (2006) (previous analysis includes Giorno et al (1995) and Van den Noord (2000)). It is an example of a more "bottom-up" approach to cyclical-adjustment, which involves building up to an aggregate value for the effect of the economic cycle on the public finances, by first looking at the effect of the economic cycle on the individual categories of revenue and expenditure.

3.17 The analysis proceeds in a number of steps. In the first stage income tax, social security tax, corporate tax, and indirect tax are identified as the key source of tax receipts related to the cycle. On the expenditure side, the OECD assumes that unemployment-related expenditure is the main element of spending driven by the economic cycle.

3.18 This is an important difference to the Treasury approach, which assumes that a much wider proportion of public expenditure, namely TME, forms part of the automatic stabilisers. The inclusion of TME reflects the fact that a proportion of public spending is fixed in nominal terms. Movements in real activity will therefore cause TME to rise relative to GDP through the denominator effects described in Box 2.A.

3.19 After identifying the appropriate revenue and expenditure categories, the elasticity of each is built up in two stages. First, the elasticities of tax receipts or expenditure with respect to their relevant tax bases have to be determined. In the case of receipts, most taxes are levied *ad valorem*, with the tax rate set as a certain per cent of the tax base. This means that the tax rates in most countries are usually independent of the size of the tax base. So in most cases it is possible to assume proportionality between receipts and the relevant base (i.e. unit elasticity).

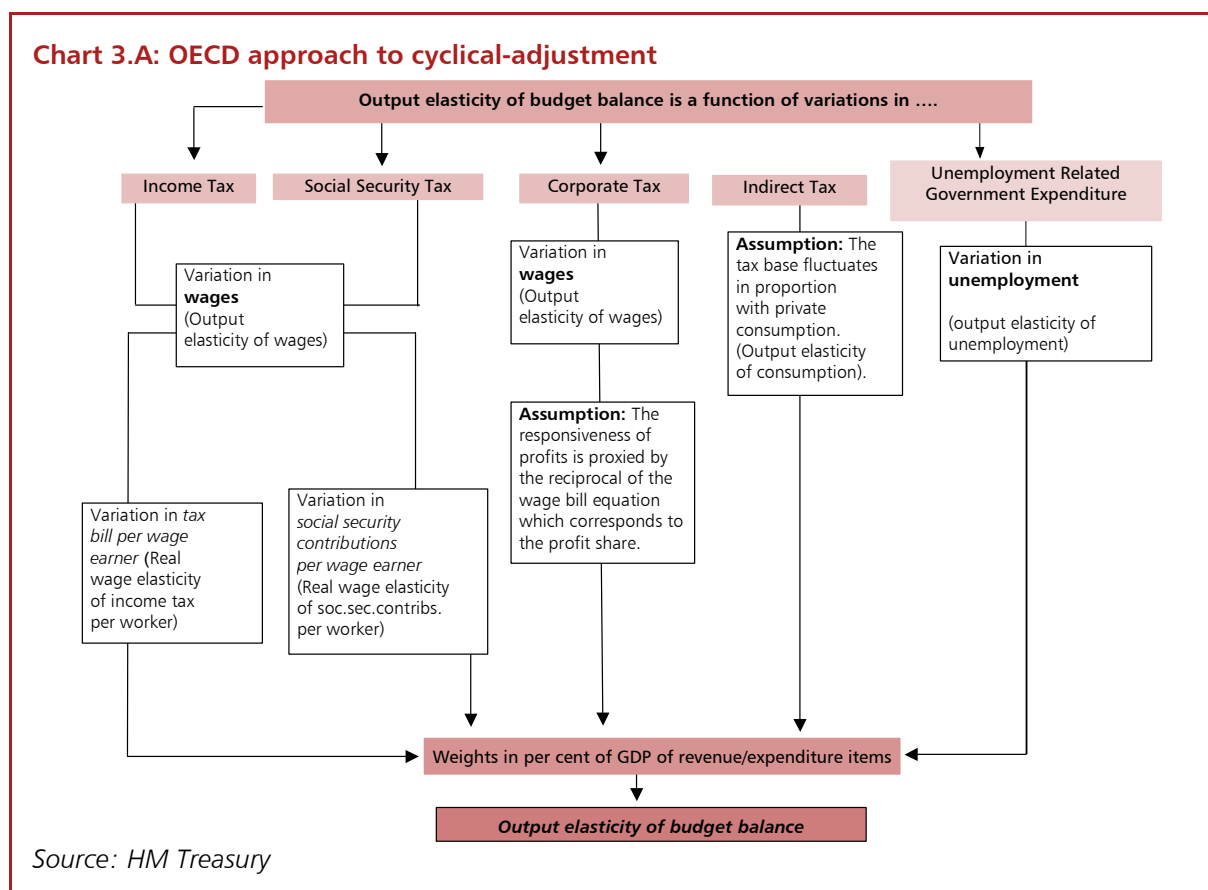
If this assumption cannot be applied due to progressivity of the tax or some other factor, information from the tax code is used to derive an elasticity.

3.20 In the second stage, regression analysis is used to estimate the elasticities of the relevant tax bases and unemployment with respect to the output gap. The two elasticities are then combined to give an elasticity of receipts and expenditure to the output gap.

3.21 Take the income tax category as an example. First, the economic cycle affects income taxes through the quantity response it produces in employment: as an economy moves into an upswing firms may look to increase production by employing more workers. This then produces a second response in prices: as labour demand increases, real wages may rise. Finally, as wages shift, the effective tax rate faced by individuals will change as people move between income tax brackets. Therefore to produce an estimate of the output elasticity of income tax, these three responses are first calculated, and then used to produce an output elasticity of income tax. Similar processes of estimation are applied to the other categories.

3.22 In the penultimate step, before aggregating these five elasticities to produce an overall elasticity of the budget balance to output, it is necessary to take account of the relative contribution of each of the categories to the budget balance. This is done by multiplying the output elasticity of each category by its share in GDP; after which the elasticities can be added together to produce the overall output elasticity of the budget balance.

3.23 Chart 3.A is a schematic representation of the OECD approach. It sets out the key assumptions made on the individual drivers of tax and the spending bases driven by the cycle.



3.24 The results of the OECD's bottom-up analysis for the UK point to an overall elasticity of the budget balance to output of 0.45. This is slightly smaller than the Treasury's top-down estimate that a 1 per cent increase in output relative to trend will lower the ratio of net borrowing to GDP by 0.5 per cent in year 1 and 0.2 per cent in year 2.

3.25 The European Commission has recently adapted its cyclical-adjustment methodology to the OECD approach (European Commission 2002). The Commission now uses budgetary sensitivity parameters based on the tax and expenditure elasticities calculated by the OECD. In addition, the Commission has changed the way it calculates potential output (and the output gap) from a statistical filter (Hodrick-Prescott) to a production function approach.

3.26 In line with many other methods, the OECD approach focuses exclusively on the aggregate output gap and may not fully capture composition effects arising from changes in the structure of demand on government revenue and expenditure. Allowing for this effect is the key feature of the approach adopted by the ECB, which is discussed in the next section.

Alternative approaches to cyclical-adjustment 2: the ECB

3.27 Budget positions are potentially sensitive to changes in the composition of aggregate demand. Domestic demand-led growth is usually more 'tax-rich' than export-led growth. Similarly, the relative growth of factor shares is important as wages are relatively highly taxed compared with profits. The composition effect can be particularly important in the short-term, where individual tax bases might be in different phases of the cycle or exhibit fluctuations of different magnitude from the aggregate.

3.28 In theory these effects could be taken in to account by adjusting tax revenues for deviations of tax bases from their long-term structure. Consequently the measurement of the composition effect requires the existence of a benchmark composition of aggregate demand. But, unlike potential output, there is no equivalent structural reference for the equilibrium structure of aggregate demand. (European Commission 2004)

3.29 The ECB approach, set out in Bouthevillain *et al* (2001), is based on a disaggregated method for the calculation of the cyclical component of the budget balance. Tax revenues are broken down into four tax categories: indirect taxes, personal income taxes, corporate income taxes and social security contributions and attributed to their corresponding tax bases e.g., household consumption, gross operating surplus and wages.

3.30 To estimate the baseline path of each macroeconomic variable, a statistical filter (the Hodrick-Prescott filter) is then applied to annual data extended with country-specific projections. The choice of the specific features of the filter is based on the desire to capture almost entirely in the estimated cyclical component cycles of up to eight years.

3.31 Finally, the ECB excludes those components of revenue that also appear among the expenditure terms that are not cyclically-adjusted, in order to treat revenue and expenditure items consistently. Other corrections involve, when data are available, the exclusion of tax categories that are not significantly affected by the cycle.

3.32 Overall, the results are again similar to both the OECD and HM Treasury's approach to cyclical-adjustment and the composition effects are typically not found to be large.⁴ The ECB's estimated cyclical-adjustment coefficient for the UK is 0.65. This is very similar to the top-down coefficient used by HMT of 0.7 over two years.

Assessing cyclical variation in the public finances: a structural VAR approach

3.33 There are a number of potential drawbacks to the two-step method outlined above. The first is the possible over-estimation of the sensitivity of the automatic stabilisers, mainly because the procedure does not take into account the mutual impact of the fiscal position and

⁴ See, for example, European Commission (2002).

domestic demand. The second is the need to identify the output gap, which is not a directly observable variable.

3.34 Both of these concerns are addressed by using a structural vector autoregression (SVAR) model to analyse movements in the fiscal aggregates. A SVAR model can be thought of as a combination of a pure time series method⁵ and the more theoretical approach employed by HM Treasury focussing on links with the economic cycle. Although such models do not readily allow for the separation of the cyclical and structural elements of the fiscal aggregates they do provide an assessment of their sensitivity to economic fluctuations.

3.35 A common application of the SVAR approach is an attempt to identify prudent budgetary margins for countries to stay within some imposed deficit or debt ceilings (see Dalsgaard and Serres (1999)). The answer will depend on the size of economic shocks, and the sensitivity of fiscal policy to those shocks, thereby encompassing both the response of the automatic stabilisers and any additional discretionary response.

3.36 There are a number of advantages to this approach. First, estimates of the output gap are not required. Secondly, the simulated shock analysis means that it can consider a wider range of possible outcomes than just looking at historical data can reveal. Finally, an SVAR model can also take into account any feedback between fiscal policy and the economic cycle (see Bouthevillain and Quinet, 1999; Kearney *et al.*, 2000).

3.37 A SVAR model is derived in several stages. The first step involves specifying a theoretical model that explicitly incorporates the government's budget balance and its interactions with the rest of the economy. This stage involves specifying the variables, identifying restrictions, and exogenous shocks that should be captured by the empirical model. The aim is to decompose the fluctuations in the deficit-to-GDP ratio into different sources of structural disturbances (i.e. that can be given an economic interpretation). One of these disturbances can be interpreted as a change in discretionary fiscal policy.

3.38 The model is then estimated to determine the effects of exogenous shocks on the budget balance and other endogenous variables. By examining the magnitude of past shocks, and their effect on the budget balance, the model can be used to estimate the level of the *ex ante* budget balance necessary to achieve a specified budget balance at some future time horizon with a given level of probability. Using this approach, Dalsgaard and Serres (1999) find a greater sensitivity of the UK fiscal deficit in response to shocks than in most other EU countries.

3.39 However, the results with this model are not directly comparable with the other methods discussed in this chapter. This is because the elasticities that are derived from the SVAR model include not only the impact of automatic stabilisers, but also that of discretionary fiscal policy to the extent that it reacts in a predictable fashion to economic disturbances.

3.40 A SVAR method can also be unreliable in the presence of structural change in the economy which will cause the model to be misspecified. Other disadvantages of this method are that the identifying procedure is subjective; meaning that the estimates are sensitive to small changes in the identifying restrictions and the accuracy of the estimates largely depends on the restrictions' identifying power.

3.41 For policymakers, the biggest difficulty with the structural VAR method is that it is not simple to update when new information becomes available, making it difficult to monitor a cyclically-adjusted indicator based on a structural VAR approach on a regular basis. It also does not readily facilitate the decomposition of the overall budget balance into its cyclical and structural components.

⁵ A time series approach does not exploit theoretical relationships but simply looks at a variable as a function of past shocks.

Conclusions

3.42 Although there a number of different approaches to cyclical-adjustment, the results, at least for the UK, are broadly similar. Despite theoretical differences, there is general agreement on the size of budgetary sensitivity parameters. In practice estimates of the output gap are more contentious. Other approaches are designed to capture different elements of the cyclical-adjustment process. They should therefore be seen as complementary to the Treasury's approach.

3.43 The Treasury's top-down approach has a number of advantages. It is transparent and easy to produce with relatively low data requirements – requiring only an estimate of the output gap to be calculated. The estimates are also generally more robust over time.

4

Adjusting for asset price effects

Summary

Unusually large and persistent swings in asset prices across industrialised economies over the recent past, along with evidence of a decoupling of asset price movements from the business cycle, have prompted the ECB and IMF among others to focus on the effect that temporary asset price movements may have on structural fiscal aggregates.

Using a simple mechanical method for calculating the long-run average values of house and equity prices, this chapter explores the scale of the potential impact on measures of the structural balance. However, the results of the analysis undertaken reinforce the initial assertion that it is highly challenging to assess accurately these potential adjustments.

Consistent with others' findings, the difficulties inherent in estimating asset price effects, and the possibility that they could impact on tax receipts in an unpredictable way, suggest that the estimated adjustments should be interpreted cautiously.

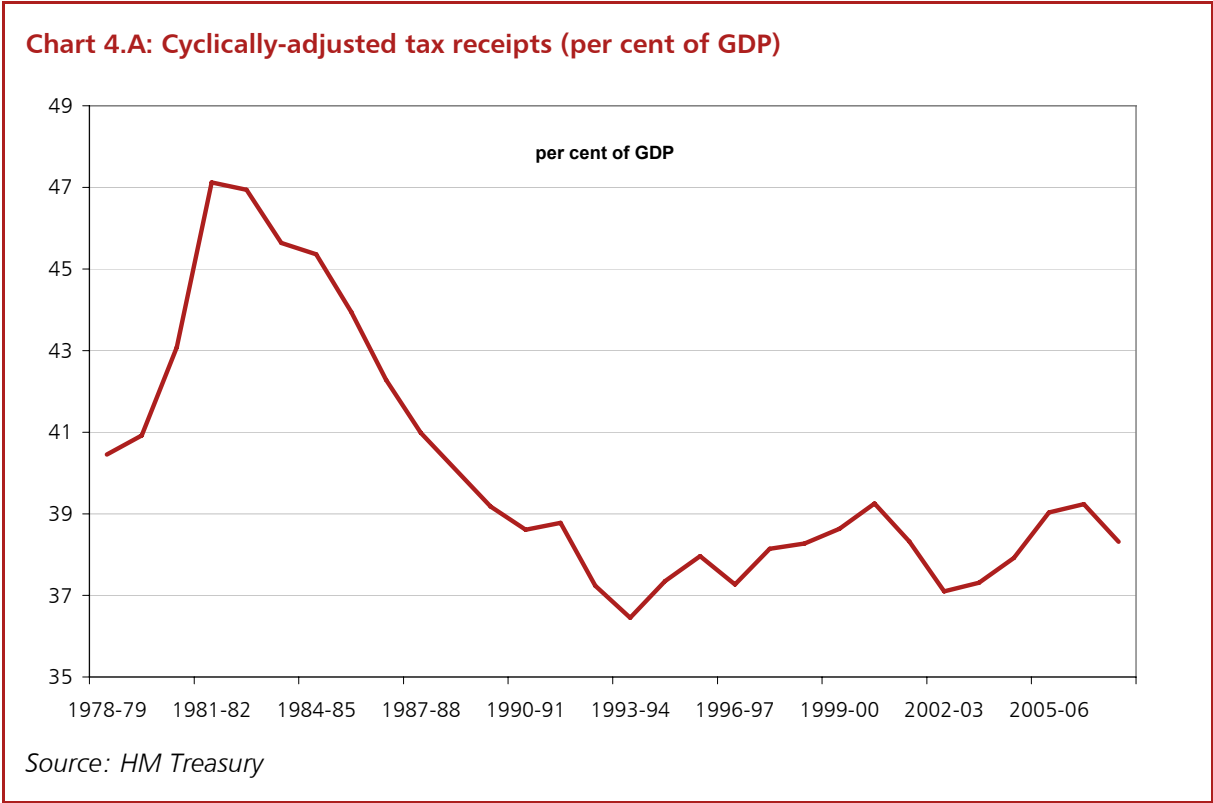
In particular, application of the results to the structural balance in real time would require a judgement regarding the extent to which divergences of asset prices from past averages might persist. Therefore in line with the practice of other institutions, it is not suggested that this analysis be used to systematically adjust HM Treasury's current methodology, as the uncertainties involved mean we cannot be confident that any adjustments would produce better policy. But the analysis in this chapter presents one possible approach to conducting periodically some additional sensitivity analysis of the public finance projections.

4.1 The estimates of the cyclical-adjustment coefficients in Chapter 2 make use of historical data to estimate the average effect of changes in the output gap on the public finances. However this means that the estimates reflect the average effect of changes in the output gap on the public finances over previous cycles. So, to the extent that one particular economic cycle differs from the average, temporary changes in the public finances may not be fully ascribed to the economic cycle.

4.2 This means that events which impact on the fiscal balance over a different horizon to the economic cycle, such as large and non-recurrent, or "one-off", fiscal operations, or significant movements in commodity or asset prices, could affect the accuracy of cyclically-adjusted fiscal balances as a measure of the underlying position of the public finances.

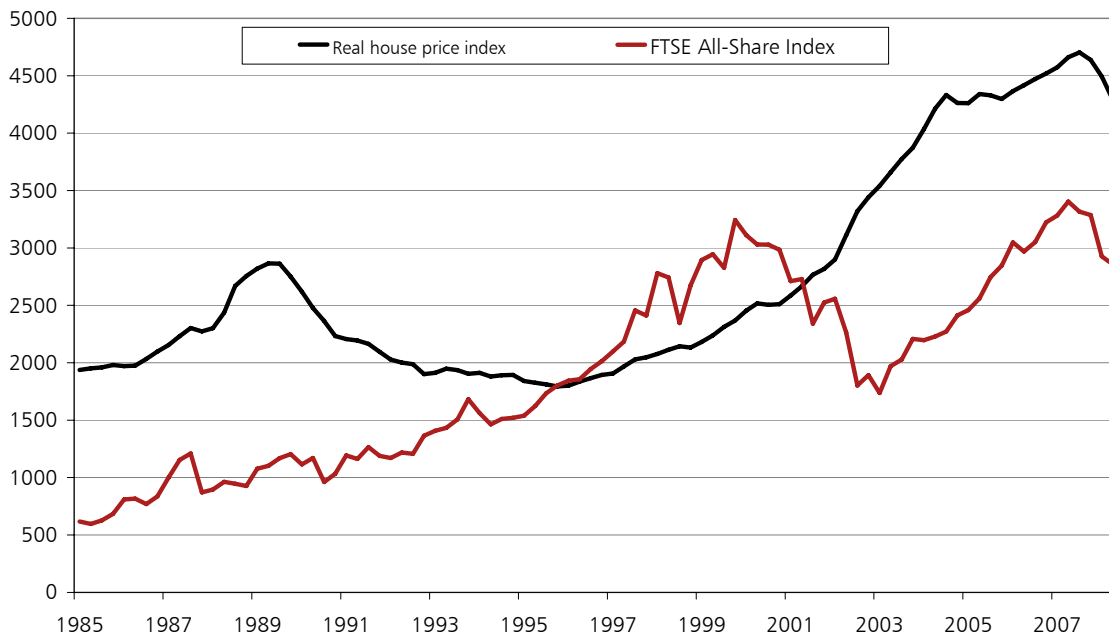
4.3 The correlation between asset prices and fiscal aggregates appears to have increased across industrialised economies over the past 30 years (IMF (2004)). At the same time, house price swings in particular have become more pronounced, and are increasingly out of step with the business cycle (OECD (2005)). For these reasons there has been growing interest in the effect of asset price movements on tax receipts – particularly when such movements are not fully aligned to the cycle.

4.4 Chart 4.A shows the profile of cyclically-adjusted tax receipts since 1978. It is clear that even after stripping out the effects of the cycle, the estimated structural receipts series fluctuates considerably.



4.5 Chart 4.B shows the movements in equity and house prices since 1985. Some of these movements will be the result of structural factors, such as financial innovation, demographic change and growth in real incomes. The impact on tax receipts of such movements will also be structural.

Chart 4.B: House and equity prices



Source: Nominal house prices: Nationwide House Price Index (1952=100); real house prices: House Prices / RPI; equity prices: Office for National Statistics

4.6 Although in theory it would be desirable to strip out non-structural movements in asset prices, in practice, isolating and removing asset price effects from cyclically-adjusted receipts is a complex and difficult process. In recent working papers¹, the OECD and ECB have experimented with different approaches, but there remains no consensus around the optimum method either for deriving an “equilibrium” asset price, or for arriving at the true underlying fiscal balance. Consequently, these institutions have yet to incorporate the results of the working paper analyses into their existing methodologies, which were reviewed in Chapter 2.

4.7 In particular, the ECB working paper (Eschenbach & Schuknecht (2002)) concludes that, although it is useful to test for the effect of asset prices on fiscal variables, the fact that equilibrium asset prices are unknown, and that regression analysis using past data “may not always reflect the most recent tax regime and/or behaviour of consumers/tax payers” prevents firm conclusions from being made on the basis of econometric analysis.

4.8 The proposition that an asset price can deviate from its “equilibrium” is itself controversial. There are theoretical reasons why equity prices in particular should not exhibit sustained deviations from their fundamental values. The argument is that if equity prices were perceived to be “overvalued” (or “undervalued”) then market participants would have an incentive to sell (or buy) until the perceived misalignment were eliminated. Hence, observed asset prices should reflect market views of the underlying value of the asset, and the notion of an asset price gap is a misleading construct.

¹ OECD (2008); OECD (2004); OECD (2006), ECB (2007).

4.9 An opposing view is that market participants trade on the basis of limited information about longer-term asset values, and that this can give rise, in certain circumstances, to sustained, although ultimately temporary, departures from longer-term trends. From the point of the view of the public finances, revenues attributable to the longer-term component of asset prices can be considered to be structural, while revenues attributable to the deviation of prices from their underlying trend are likely to prove temporary.

4.10 Of course, correcting cyclically-adjusted tax revenues for the effects of asset price deviations from trend, or “gaps”, only makes sense if the concept of an “asset price gap” is considered reasonable. The following analysis derives measures of asset price gaps, and takes these at face value. But it should be borne in mind that this is a strong assumption, with implications for how an asset-price-gap adjustment might be applied in practice. An alternative way of interpreting the gap series is as a proxy indicator of the probability that asset prices are temporarily high or low. In other words, the more that asset prices deviate from the estimated anchor, the more likely it is that they will revert back towards their longer-term average.

4.11 This chapter reviews a number of alternative approaches to estimating the impact of equity and house prices on the structural balance. It goes on to estimate the potential adjustments to cyclically-adjusted tax receipts that could be made in light of these deviations from longer-term trends. Finally, the chapter will conclude that, in view of the significant uncertainties surrounding the analysis, mechanical adjustments to take account of asset price effects should not be made to the fiscal aggregates as a matter of course.

International evidence

4.12 During the late 1990s and early 2000s, a number of EU countries benefited from significant boosts to tax revenues as a result of strong asset prices: Spain’s cyclically-adjusted budget balance, for example, improved by 0.6 per cent of GDP per annum on average between 1999 and 2005².

4.13 Concerned that rapid asset price growth could be causing member states to over-estimate their underlying fiscal strength, an ECB working paper (Morris & Schuknecht (2007)) conducted some preliminary empirical analysis of the impact of asset prices on fiscal balances. Its findings suggested significant and positive asset price effects for direct taxes on corporations, households, indirect taxes, and taxes on financial transactions for all countries examined:

“[Our] results support the view that asset price movements are a major factor behind unexplained changes in the cyclically-adjusted balance, which, if not accounted for, can lead to erroneous conclusions regarding underlying fiscal developments”.

4.14 Overall, the analysis suggested that the underlying fiscal position of the countries examined would be increased by around half a per cent of GDP by a 10 per cent increase in equity and real estate prices. This average masks large variations between countries: receipts in Belgium and Spain, for example, were thought to be boosted by in excess of 0.7 per cent of GDP by a 10 per cent rise in prices, while the boost to France’s fiscal position was estimated to be much smaller, at 0.3 per cent.³

² Source: European Commission.

³ The authors do not report the equivalent aggregate effect for the United Kingdom.

4.15 The authors stressed that asset price effects varied in terms of their magnitude; which assets have significant effects on which revenue category; and their duration and immediacy. Further, the methodology did not attempt to distinguish between price movements in line with fundamentals and temporary fluctuations. The results are therefore only indicative, but nevertheless suggest that consideration of asset price movements may account for unexplained improvements in estimates of the structural fiscal balance.

4.16 An IMF working paper (Jaeger & Schuknecht (2004)) has also examined the effect of asset prices on the fiscal aggregates. Looking at the experiences of 16 developed countries between 1970 and 2002, the paper concluded that large asset price cycles are associated with much stronger fiscal effects than during “normal” times.

4.17 An OECD working paper (Girouard & Price (2004)) examined this issue using a HP filter to separate “structural revenue” from that attributable to the asset price cycle. The authors applied a filter to Capital Gains Tax revenues in order to determine the overall impact on the budget balance of including an additional adjustment for fluctuations in asset prices. For the UK, they found that adjusting Capital Gains Tax revenues would have reduced the overall balance relative to cyclical-adjustment alone between 1999 and 2001, but that the magnitude of the adjustment was small.

4.18 The authors also looked at the correlation between stock market values and transaction taxes, and found that for the UK Stamp Duty revenues followed movements in the FTSE 100 with approximately a 1 to 2-year lag. However, movements in transaction taxes were thought to generate only small effects on fiscal balances, as they represent a small share of GDP. For example, UK Stamp Duty receipts were 1 per cent of GDP in 2006-07, and the unweighted OECD average was around $\frac{3}{4}$ per cent.

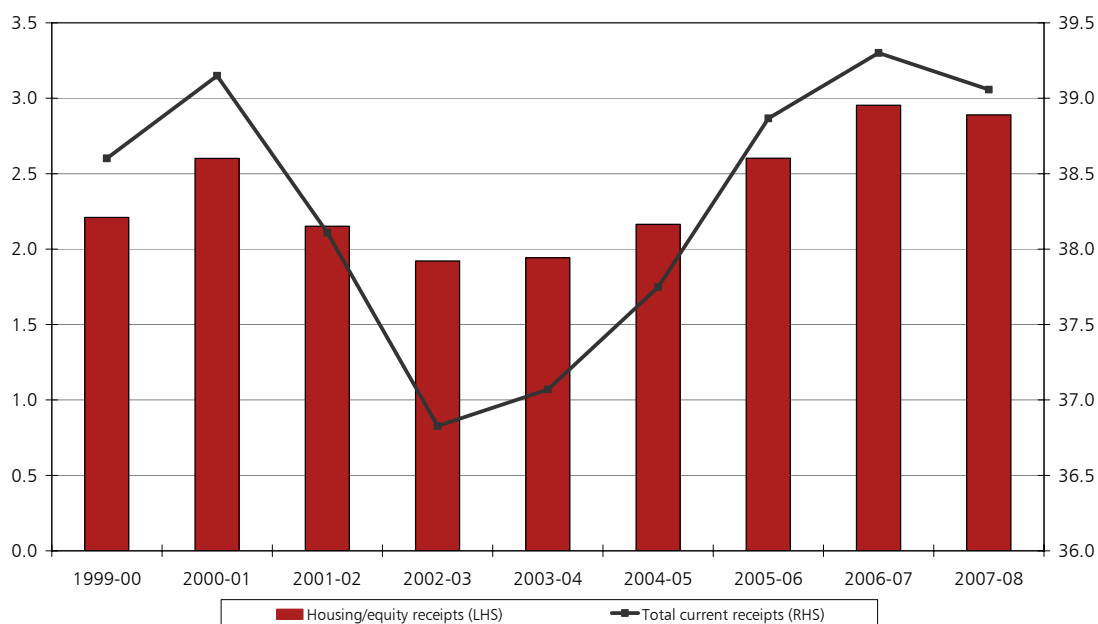
4.19 The following section carries out a similar analysis of the effects of asset prices on the public finances for the UK.

Asset price movements and the UK public finances

4.20 In the UK, the key taxes likely to be affected by asset price fluctuations are Stamp Duty, Capital Gains Tax and Inheritance Tax. Value Added Tax, Corporation Tax, Income Taxes and National Insurance Contributions are also likely to be indirectly affected. Between 2000-01 and 2002-03, receipts strongly linked to house and equity prices⁴ declined from 2.6 per cent to 1.9 per cent of GDP, largely as a result of equity price falls. Strong growth in both stock and house prices then caused related receipts to rebound, reaching 2.9 per cent of GDP in 2007-08.

⁴ Financial sector corporation tax, income tax from financial sector bonuses, Capital Gains Tax, Inheritance Tax and Stamp Duties.

Chart 4.C: Profile of asset price-related tax receipts (per cent of GDP)



Source: HM Treasury

4.21 Given that there appears to be evidence that asset prices have an impact on the UK public finances, and that these impacts are not fully captured by existing cyclical-adjustment methodologies, the question becomes how to strip out the ‘non-structural’ distortions from estimates of the structural balance. For this purpose it is necessary to define an estimate of the structural or fundamentals-based asset price.

Estimating asset price “gaps”

4.22 As noted above, the concept of an “equilibrium” from which asset prices can deviate is controversial. However, if the notion that house and equity prices will tend to revert towards their long-run trends were accepted, then this would imply that asset price “gaps” could be calculated as deviations between their observed and trend values. These “gaps” would constitute estimates of the temporary component of each asset price, and their effects on tax receipts should, if possible, be excluded from any estimate of the underlying fiscal position.

4.23 The methodology used to calculate asset price gap series is purely mechanical. It does not attempt to estimate an “equilibrium” price. Instead, it uses the observed median⁵ values of the ratio of real house prices to real disposable income per capita, and of the ratio of share prices to nominal GDP, as measures of the extent to which asset prices deviate from their average, as opposed to trend, values.

Approach 1: Quantifying the aggregate effects

4.24 Even if the concept of an asset price equilibrium were uncontroversial, and it were assumed that the series derived above were appropriate equilibrium measures, it could be the case that asset price movements impact on tax receipts in an asymmetric, or even stochastic, way⁶. This would mean that a mechanical, symmetric adjustment to fiscal balances in light of asset price

⁵ Calculated over the available sample period.

⁶ OECD (2005) includes a good discussion of the criticisms that could be levelled at an econometric approach to quantifying fiscal effects.

movements would risk creating larger inaccuracies than were originally present in the cyclically-adjusted series.

4.25 One way to test whether a predictable relationship exists between asset prices and public finances is to look at the relationship between cyclically-adjusted tax receipts and the asset price “gap” series derived above. If asset prices moved in step with the output gap, then the standard cyclical-adjustment process should already capture fully their impact on public finances, in which case regressing cyclically-adjusted tax receipts on the asset price gap series should yield a statistically insignificant relationship.

4.26 The following empirical relationship was tested using data from 1984-5 to 2006-7 for cyclically-adjusted receipts and asset price gaps:

$$CATR_t = \alpha_1 CATR_{t-1} + \alpha_2 SGap_t + \alpha_3 HGap_t$$

Where $CATR$ is cyclically-adjusted tax receipts, $SGap$ is the stock price gap, and $HGap$ is the house price gap⁷. A lagged receipts term was included in order to control for movements in the structural balance during the estimation period.

4.27 As we might expect, the regression found that asset price deviations from trend contribute positively to cyclically-adjusted receipts, although the statistical significance of the results was sensitive to the choice of sample period. Table 4A shows that the later the sample period begins, the stronger is the estimated effect of asset prices on receipts, and the weaker is the influence of the previous year’s cyclically-adjusted receipts.

Table 4.A: Regression estimates of asset price effects

Dependent variable: $CATR_t$						
	1984-5 to 2006-7	1985-6 to 2006-7	1986-7 to 2006-7	1987-8 to 2006-7	1988-9 to 2006-7	1989-90 to 2006-7
$CATR_{t-1}$	0.727***	0.624***	0.535***	0.474***	0.386**	0.388*
$HGap_t$	1.182	1.605**	1.835**	1.899**	1.928**	1.930**
$SGap_t$	1.840*	2.355**	2.518**	2.512**	2.642***	2.642**

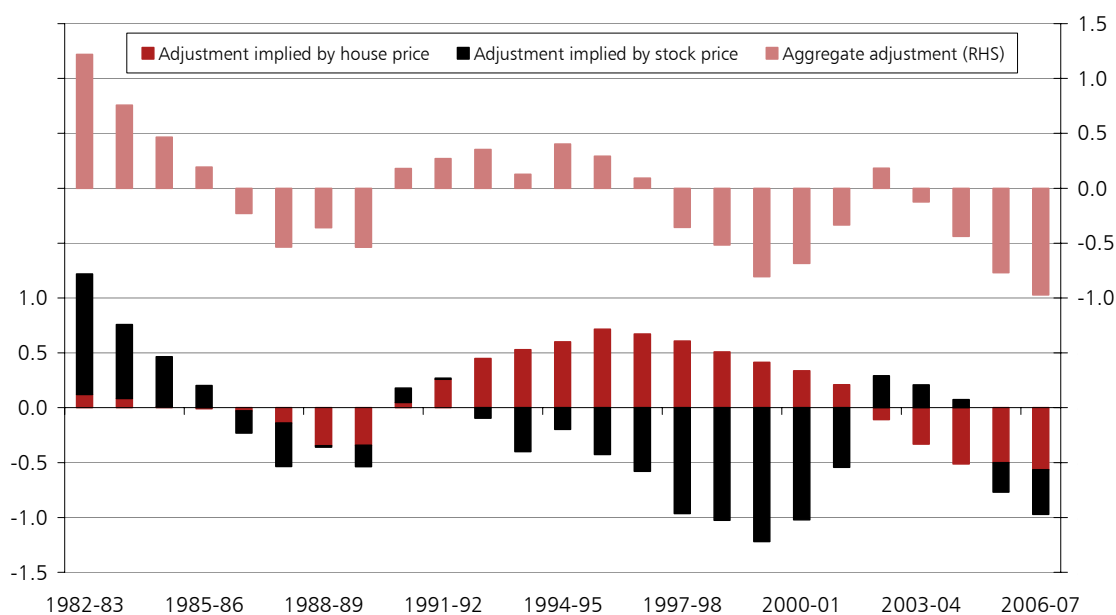
* Significant at 10 per cent level; ** Significant at 5 per cent level; *** Significant at 1 per cent level
Source: HM Treasury

4.28 The results of this analysis are not definitive. Hence, judgement is required regarding the coefficients to apply in adjusting fiscal balances for asset price gaps. Assuming $\alpha_2 = 2.5$ and $\alpha_3 = 1.9$ (the median of the results tabulated below), a 10 per cent over-valuation of both equity and house prices would boost cyclically-adjusted tax receipts by around 0.44 per cent of GDP. This is broadly comparable with the ECB findings discussed earlier.

4.29 Chart 4.D plots the adjustments that would need to be made to cyclically-adjusted receipts in order to strip out asset price effects estimated above, and assuming that $\alpha_2 = 2.5$ and $\alpha_3 = 1.9$.

⁷ The gaps are as defined in the previous section.

Chart 4.D: Implied adjustments to cyclically-adjusted tax receipts



Source: HM Treasury

Approach 2: Quantifying the effects by tax type

4.30 Large swings in asset prices, particularly house prices, impact on several specific tax bases. Volatile housing transactions volumes impact on Stamp Duty receipts. House prices impact on both inheritance and Capital Gains Tax receipts, and are likely to affect consumer behaviour, meaning an impact on indirect taxation. This section assesses the impact of asset prices on individual tax bases, and is a variant of the approach in the ECB working paper discussed earlier.

4.31 The results of the three best-fit regressions are reported below for individual tax bases. The regression equations were estimated over a number of sample periods to test for sensitivity to the period chosen. As no statistically significant relationship could be established between asset price gaps and Corporation Tax, these results are excluded.

Table 4.B: Regression results for Inheritance Tax (per cent of GDP)

Dependent variable: IHT_t								
	1982-3	1983-4	1984-5	1985-6	1986-7	1987-8	1988-9	1989-90
IHT_{t-1}	0.456**	0.513**	0.515**	0.570***	0.410**	0.367*	0.571***	0.532***
$HGap_t$	0.057**	0.056**	0.056**	0.057***	0.068***	0.070***	0.062***	0.067***
$SGap_t$	0.021	0.029	0.031	0.049***	0.051***	0.050***	0.048***	0.048***

* Significant at 10 per cent level; ** Significant at 5 per cent level; *** Significant at 1 per cent level

Table 4.C: Regression results for Stamp Duty (per cent of GDP)

Dependent variable: SD_t								
	1982-3	1983-4	1984-5	1985-6	1986-7	1987-8	1988-9	1989-90
SD_{t-1}	0.802***	0.788**	0.789***	0.817***	0.871***	0.875***	0.835***	0.650***
$HGap_t$	0.270*	0.319**	0.317**	0.300**	0.251*	0.246	0.308*	0.544***
$SGap_t$	0.390***	0.494***	0.487***	0.501***	0.480***	0.477***	0.488***	0.602***

* Significant at 10 per cent level; ** Significant at 5 per cent level; *** Significant at 1 per cent level

Table 4.D: Regression results for Capital Gains Tax (per cent of GDP)

Dependent variable: CGT_t								
	1982-3	1983-4	1984-5	1985-6	1986-7	1987-8	1988-9	1989-90
CGT_{t-1}	0.454**	0.416**	0.390*	0.366*	0.337*	0.323*	0.275**	0.125
$HGap_{t-1}$	0.187**	0.220**	0.247**	0.272**	0.290***	0.288***	0.252***	0.276***
$SGap_{t-1}$	0.133*	0.182**	0.229**	0.281**	0.318***	0.323***	0.291***	0.326***

* Significant at 10 per cent level; ** Significant at 5 per cent level; *** Significant at 1 per cent level

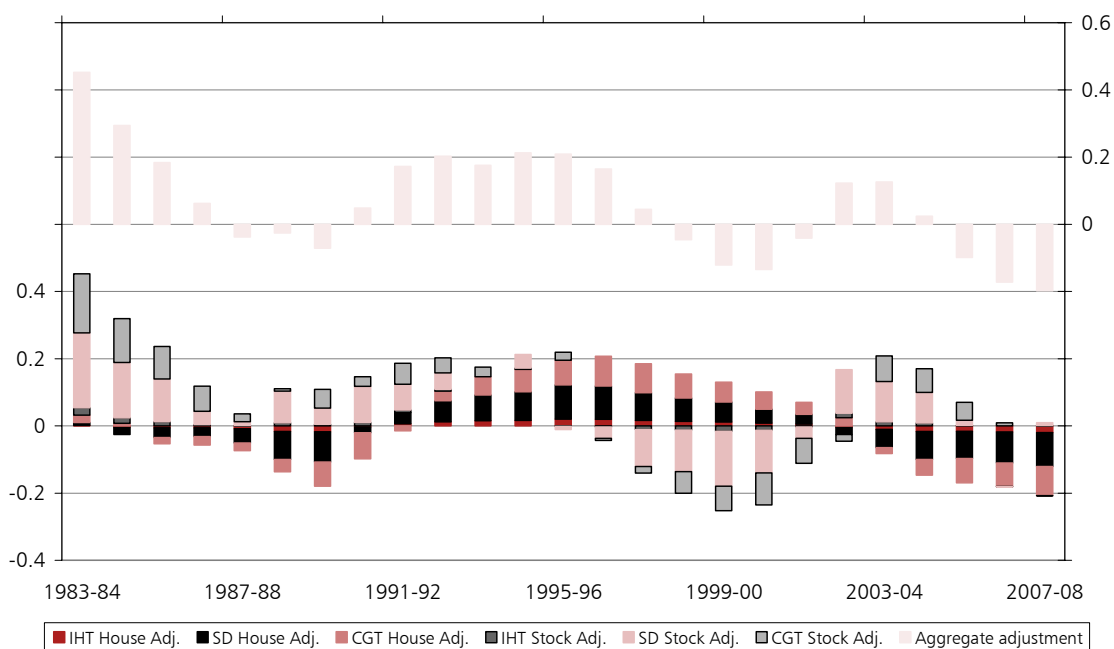
4.32 In the case of Stamp Duty and Inheritance Tax, current year asset price gaps contributed most strongly to receipts, while capital gains tax was most significantly impacted with a one-year lag. As was the case in the top-down results, using a shorter sample period strengthened the estimated impact of asset prices on tax receipts.

4.33 Interpreting these results, and taking the median value of the coefficient estimates implied by the various sample periods tested, a 10 per cent over-valuation in both house and stock prices relative to their long-run average in the current year boosts receipts of these three tax types by 0.14 per cent of GDP in the current and following year.

4.34 The bottom-up approach therefore produces a lower estimate of the impact of asset prices than the aggregate method, as might be expected. The bottom-up coefficients are more significant and less sensitive to the sample period chosen, suggesting that this is a more reliable method for estimating the impact of asset prices on specific tax bases, but given that it does not measure any indirect fiscal effects, the true aggregate impact is likely to lie somewhere between the estimates produced using the top-down and bottom-up methodologies.

4.35 The chart below shows the potential total adjustment (as a percentage of GDP) that could be made to tax receipts in order to try and remove the distortions caused by asset price deviations from long-run trend, based on the bottom-up estimates. In a number of years, a small aggregate effect masks large offsetting adjustments to individual taxes.

Chart 4.E: Adjustments to tax receipts implied by analysis on an individual tax basis



Source: HM Treasury

Conclusion

4.36 It is possible that the cyclical-adjustment process does not fully capture the impact of asset price movements on the public finances. Using a simple mechanical method for calculating the long-run average of house and equity prices, this chapter has explored the scale of the potential impact on measures of the structural balance. However, the results of the analysis undertaken reinforce the initial assertion that it is highly challenging to assess accurately these potential adjustments.

4.37 The top-down and bottom-up approaches tested suggest that, if both house and equity prices were estimated to be 10 per cent above their long-run average values, we might expect a boost to cyclically-adjusted tax receipts of between a 0.1 and 0.4 per cent of GDP. Consistent with others' findings, the difficulties inherent in estimating asset price effects, and the possibility that they could impact on tax receipts in an unpredictable way, suggest that the estimated adjustments should be interpreted cautiously.

4.38 In particular, application of the results to the structural balance in real time would require a judgement regarding the extent to which divergences of asset prices from past averages might persist. Therefore in line with the practice of other institutions, it is not suggested that this analysis be used to adjust systematically HM Treasury's current methodology, as the uncertainties involved mean we cannot be confident that any adjustments would produce better policy. But the analysis in this chapter presents one possible approach to conducting periodically some additional sensitivity analysis of the public finance projections.

Bibliography

- Bouthevillain, C. P. Cour-Thimann, G. van den Dool, P. Hernandez De Cos, G. Langenus, M. Mohr, S. Momogliano and M. Tujula (2001) "Cyclically-adjusted Budget Balances: An Alternative Approach", *ECB Working Paper Series, No. 77*, September, Frankfurt
- Buckle, A., Kim, K. & Tam, J. (2001). "A Structural VAR Approach to Estimating Budget Balance Targets", *New Zealand Treasury Working paper 2001/1*
- Dalgaard, Thomas and Alain de Serres (1999) "Estimating prudent budgetary margins for 11 EU countries: a simulated SVAR model approach", *OECD Economics Department Working Papers, No. 216*
- Darby, J. and Melitz, J., (2008) "Automatic stabilisers", *Economic Policy*, October 2008
- Eschenbach, F., L. Schuknecht (2002) "Asset prices and fiscal balances", *ECB Working Paper Series, No. 141*
- European Commission (2002) "Public Finances in EMU – 2002. European Economy Reports and Studies", Directorate General for Economic and Financial Affairs, Brussels, May 2002
- Giorno, C., Prichardson, D. Roseveare and P. Van den Noord (1995) "Potential output, output gaps and structural budget balances" *OECD Economic Studies*, No. 24, pp. 167-209
- Girouard, N. and R. Price (2004) "Asset Price Cycles, 'One-off' Factors and Structural Budget Balances", *OECD Economics Department Working Papers, No. 391*
- Hagemann, R. (1999) "The Structural Budget Balance. The IMF's Methodology" *IMF Working Paper No. 95*, July
- HM Treasury (1995) "Public Finances and the Cycle", The Stationery Office, London
- HM Treasury (1997) "Lessons from the Last Economic Cycle", The Stationery Office London
- HM Treasury (1998) "Code for fiscal stability", The Stationery Office, London
- HM Treasury (1999) "Analysing fiscal policy", The Stationery Office, London
- HM Treasury (1999) "Public finances and the cycle", The Stationery Office, London
- HM Treasury (2001) "Reforming Britain's Economic and Financial Policy", The Stationery Office, London
- HM Treasury (2002) "Trend Growth: Prospects and Implications for Policy", The Stationery Office, London
- HM Treasury (2003) "End of year fiscal report", The Stationery Office, London
- HM Treasury (2003) "Fiscal Stabilisation and EMU", The Stationery Office, London
- HM Treasury (2005) "Evidence on the UK economic cycle", The Stationery Office, London
- IMF (2003) "What goes up must come down?", Article IV Report on the UK
- IMF (2008) "House price dynamics in the United States", *IMF Working Paper WP/08/187*

IMF (2008) *World Economic Outlook*

Jaeger, A., L. Schuknecht (2004) "Boom-bust phases in asset prices and fiscal policy behaviour", *IMF Working Paper*, WP/04/54

Joumard, I., M. Minegishi, C. André, C. Nicq, R. Price (2008) "Accounting for one-off operations when assessing underlying fiscal positions", *OECD Economics Department Working Papers*, No. 642

Kearney, Ide, Daniel McCoy, David Duffy, Michael McMahon and Diarmaid Smyth (2000). "Assessing the stance of Irish fiscal policy." in *Budget Perspectives, Proceedings of a Conference. Economic and Social Research Institute*, Dublin, 19 September: 4- 40

Klyuev, V. (2008). "What goes up must come down? House price dynamics in the United States", *IMF Working Paper*, WP/08/187

Morris, R., & L. Schuknecht (2007) "Structural balances and revenue windfalls: the role of asset prices revisited", *ECB Working Paper Series*, No. 737

OECD (2005) "Recent house price developments: the role of fundamentals", *OECD Economic Outlook* 78

Turner, D. (2006) "Should Measures of Fiscal Stance be Adjusted for Terms of Trade Effects?", *OECD Economics Department Working Papers*, No. 519

Van den Noord, P. (2000) "The Size and Role of Automatic Fiscal Stabilizers in the 1990s and Beyond", *OECD Economics Department Working Papers*, No. 230, Paris

Van den Noord (2000) "The Size and Role of Automatic Stabilizers in the 1990s and Beyond", *OECD Working Paper* 230, January

Vladkova Hollar, I. R. (2003) "An Analysis of House Prices in the United Kingdom", *IMF Selected Issues Paper, Article IV Report on the UK*

Vladkova Hollar, I. R. (2005) "An Analysis of House Prices in the United Kingdom", *OECD Economic Outlook* 78

ISBN 978-1-84532-503-9



9 781845 325039 >