Seasonal adjustment of money and its counterparts

This article describes some of the more significant methodological changes made this year in estimating seasonal adjustments for the money supply and its counterparts; and illustrates their effect on the underlying trend.

Introduction

The seasonal adjustments estimated by the Bank for the monetary aggregates and their counterparts were described in an article in the June 1978 *Bulletin.* As that article explained, the adjustments to money are not simply based on a moving average of its past behaviour; instead, they are linked to those for the central government borrowing requirement (CGBR), in order to reflect fully the seasonal pattern of government revenue and expenditure in the most recent period. These seasonal adjustments are updated annually[1] in the light of the latest available information, and on occasion, as this year, the revisions both to the CGBR and to sterling M_3 in some individual months can be extensive. Broadly, the effect on sterling M_3 in 1980 is to switch about $1\frac{1}{2}$% of its growth from the second half of the year into the first half.

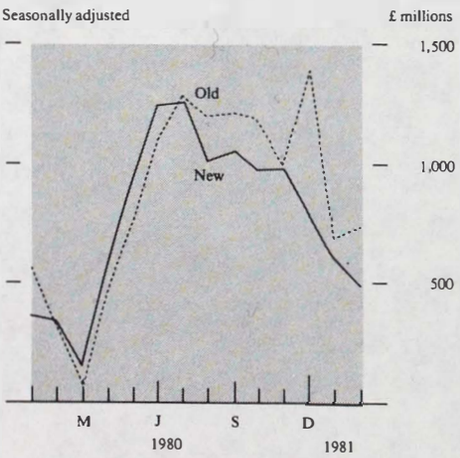
The central government borrowing requirement

The most important revisions made this year relate to the estimated effect of the varying date of the banking figures (make-up date) on the flow of Inland Revenue receipts during the banking month, the pattern of value added tax (VAT) receipts within the quarter, and the swings in government supply expenditure, a series whose seasonality has apparently been shifting in recent years. The Inland Revenue revisions result from an improved method for estimating the seasonal pattern of the difference between two series: total taxes received by the central government during a banking month, and an analysis over different time periods of taxes received by local collectors. The new pattern of VAT derives from the increased penalty for late payment introduced in the 1980 Budget and the encouragement of payment by direct debit: the bulk of manufacturers' payments now comes through before the banks' mid-month reporting date, instead of spreading on either side of it.

Supply expenditure is strongly seasonal, with a peak in April (which includes the end of the financial year), but the average size of the irregular component (after seasonal adjustment) remains high at about $7\frac{1}{2}$% of monthly expenditure. This makes any estimate of the seasonal pattern subject to a large margin of error, and liable to change substantially merely from the inclusion of another twelve months' figures (as happened this year).

Chart A
Central government borrowing requirement

Three-month moving average (banking months)



Petroleum revenue tax

Petroleum revenue tax (PRT) is now payable on 1 March and 1 September (before 1980 it was due in May and November). It is growing rapidly and its contribution to the monthly seasonality of the CGBR is now (1981) of comparable magnitude to that of corporation tax. Hitherto the impact of PRT on the financial system has been assumed to be the same as that of all other transactions making up the CGBR. This implied that about two thirds of the seasonal pattern of PRT would be reflected in bank deposits and one third in sterling bank lending. It is now believed, however, that little or no sterling lending has been involved; but, since autumn 1980, there has been significant investment by oil companies in certificates of tax deposit (CTDs), which are subsequently used (wholly or partly) to pay PRT.

Those oil companies which pay PRT earn large amounts of income from abroad, and this raises the question whether external transactions are developing a seasonal pattern related to the growth of this tax. It is known that the companies have arranged substantial forward purchases of sterling to mature during the month before the tax is due. But the monetary impact of these transactions depends on the way in which their UK bankers cover them in the market, and it has not yet been possible to identify any

(1) The latest revisions are incorporated in Table 11 of the statistical annex.

regular seasonal pattern related to PRT in the banks' very large volume of foreign exchange operations.

In view of the present and prospective size of PRT payments, and the distorting effect of the old treatment on the adjustment of the monetary aggregates, it was decided this year that the seasonal adjustment of PRT and its counterparts would become a separate exercise. Given the absence of sterling borrowing and the lack of evidence for a seasonal pattern in external transactions, it is now being assumed that the impact of PRT is confined to sterling time deposits and CTDs. This implies that there is a steady build-up of the oil companies' sterling assets during the five months preceding the payment month.

For forecasting, further assumptions are required about the rate of purchase of CTDs by the oil companies and the extent to which they will use them for PRT. On the next payment date (1 September) there will also be six months' supplementary petroleum duty (SPD) to pay, so the total to be smoothed by seasonal adjustment is much greater than the £1.3 billion paid in March 1981. Revisions to the adjustments are therefore almost inevitable when the amount and financing of each payment become known. The Government has announced that, after September, SPD will be paid monthly and has invited the industry to consider with the Inland Revenue how a broadly similar pattern of payments may be introduced for PRT. Meanwhile, the problems of statistical treatment of PRT, and of the proper interpretation of monetary developments, will remain and, indeed, become more acute, as the tax grows.

Bank lending

For sterling lending to the private sector, the main recent problem has been the persistence of three-monthly peaks—commonly known as 'spikes'—in the seasonally-adjusted series. The reason for these spikes is not known: it may have something to do with the higher rate of VAT and the acceleration in its payment, in which case it might be a permanent feature of the system. However, there is some evidence that the spikes are becoming smaller in the early months of 1981.

Two methods of seasonal adjustment were tried: the Bank's normal moving average procedure (referred to in the June 1978 *Bulletin* article) and a new method 'signal extraction' which requires a model to be fitted to the series.[1] With data to end-1980, the moving average method has begun to pick up the spikes, but only partially. In the new method the spikes can actually be modelled: they do not appear to be a permanent feature of the series, but a new source of variation which started in October 1979. Assuming that each spike is offset in the following two months, the average magnitude of the variations is estimated to be about 600, −300, −300 (£ million), disregarding the effect of the particularly large spike in July 1980 associated with the ending of the 'corset'.

No evidence was found of spikes in non-interest-bearing sight deposits, but they sometimes appear in time deposits or interest-bearing sight deposits. Thus, examination of the counterparts to bank lending (excluding the CGBR) yields no explanation of the spikes, and it is quite possible that they will, in due course, disappear. After reviewing all the evidence, and consulting statisticians in the London clearing banks, it was decided for this year at least to regard them as an erratic factor and not incorporate them into the seasonal adjustments. But, if the spikes persist, this decision will be reconsidered next year.

Bank deposits

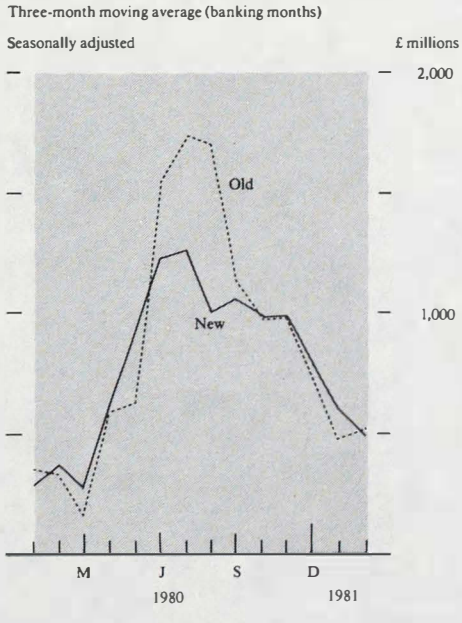
For private sector sterling time deposits, a prior adjustment is necessary to remove the separately estimated seasonal effect of PRT. The resulting series is extremely erratic and only marginally seasonal, but it continues to be seasonally adjusted.

For private sector sterling sight deposits, data are now available for the interest-bearing component over more than five years—the minimum period necessary for reliable seasonal adjustment. This is a very variable series and its treatment as non-seasonal is now confirmed by the data. Non-interest-bearing sight deposits have therefore been seasonally adjusted separately, which should improve the quality of the estimates.

Effects of the revisions

The revised seasonally adjusted CGBR is smoother than the previous one over the period 1976–80[2] and particularly over the past year. But the monthly series is still fairly erratic, so it is better to look at the corresponding

Chart B
Growth in sterling M_3



(1) J P Burman, 'Seasonal adjustment by signal extraction' *Journal of the Royal Statistical Society*, Series A, 1980, No. 3.
(2) Measured by the root mean square of the first differences of each series.

three-month moving averages (Chart A). This shows that the old series was tending to underestimate the CGBR in the first half of 1980, and to overestimate in the second half.

The new series for sterling M_3 is, however, a little less smooth than the old one. The reason for this is not easy to explain. Each of the counterparts of sterling M_3 which are seasonally adjusted—'other public sector contribution', sterling lending to the UK private sector, net external and foreign currency transactions, net non-deposit liabilities—is smoother than before. But these are not independent series and the variation in sterling M_3 is very much less than the sum of the variations in the component series. For example, variations in the CGBR are partially offset by those in bank lending: when the Government's borrowing requirement is large, the private sector needs to borrow less from the banks. It so happens that some of the offsets, notably this one, have become smaller in the new series; and so the greater smoothness in the counterparts is not reflected in sterling M_3. But the three-month moving average of this series is smoother in 1980—see Chart B—and clearly shows the faster growth in the first half of the year (and slower growth in the second half) exhibited by the CGBR.