

Seasonal adjustment of UK monetary aggregates: direct versus indirect approach

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Introduction

At the start of 2004, the Bank of England changed its method of seasonal adjustment of monetary data to X-12-ARIMA.¹ One of the modelling choices to be made concerned the direct or indirect adjustment of monetary aggregates. This note briefly explains the theoretical considerations for direct and indirect adjustment before discussing how this issue was approached in the Bank. It ends with an example of series for which the issue of direct versus indirect adjustment was important.

When to use direct or indirect adjustment

Many time series of monetary data are constructed as the sum (or aggregate) of several component series. Estimates of the seasonal effects in such aggregate series may differ, depending on the level of aggregation at which seasonal adjustment methods are applied. It is important to analyse the level of aggregation at which component series are seasonally adjusted because, if the series used are too disaggregated, the degree of noise/irregular movement can be much larger than, and possibly overshadow, the seasonal factors in the series.

An acceptable seasonal adjustment of a series implies that: the series does not display any residual seasonality, and the series is stable. Stability of a series implies that the series is not heavily revised when the seasonal adjustment model is reapplied as new data observations are added. An added complication in the adjustment of aggregate data is that some component series may not show any signs of seasonality at all. In those cases, one needs to assess whether the unadjusted series can be added sensibly to other seasonally adjusted components to give the total series.

If seasonal adjustment is applied directly to an aggregate series, the resulting aggregate does not necessarily equal the sum of its seasonally adjusted components. Direct adjustment tends to perform better when all component series display similar seasonal patterns (and when aggregation leads to some noise cancellation between the component series). Indirect adjustment occurs when the component series of an aggregate are each individually examined for seasonal effects; the seasonally adjusted aggregate series is then calculated simply by summing these seasonally adjusted component series. Indirect adjustment generally performs better when the component series have different seasonal patterns or when the proportion of the total that a component accounts for fluctuates over time.

Additivity in seasonally adjusted data sets can be preserved either by using indirect adjustment throughout, or by constraining the adjusted components to sum to a total that has been adjusted directly. A residual arises when the adjusted components are left unconstrained and the total is adjusted directly. It is the Bank's practice to publish such residuals as separate series.²

The Bank's approach to direct versus indirect adjustment

With respect to the monetary statistics, it is likely that the different sectors (the household sector, private non-financial companies (PNFCs) and other financial companies (OFCs)) display different seasonal characteristics. So as a starting point, adjusting for seasonal effects for these three sectors may best be done indirectly. Conversely, banks and building societies may be subject to similar seasonal patterns in their business, so the sum of their data can be adjusted directly.

Since the three sectors mentioned above behave differently, the next step is to determine the lowest level of adjustment for these sectors: given the level of customer interest, some component series are too small to adjust. Generally, series are adjusted at the component level that is published in *Monetary and Financial Statistics*.

When the Bank introduced X-12-ARIMA, it was important to know how all the series fitted together to form total and subtotal aggregates, in order to determine the appropriate level of seasonal adjustment. Diagrams, such as that shown in Figure 1, were used in this process.

Moving from the outside towards the centre of Figure 1, the Bank examined the direct and indirect adjustment of each subtotal in turn. For instance, un-shaded series are the component series and shaded series are totals.

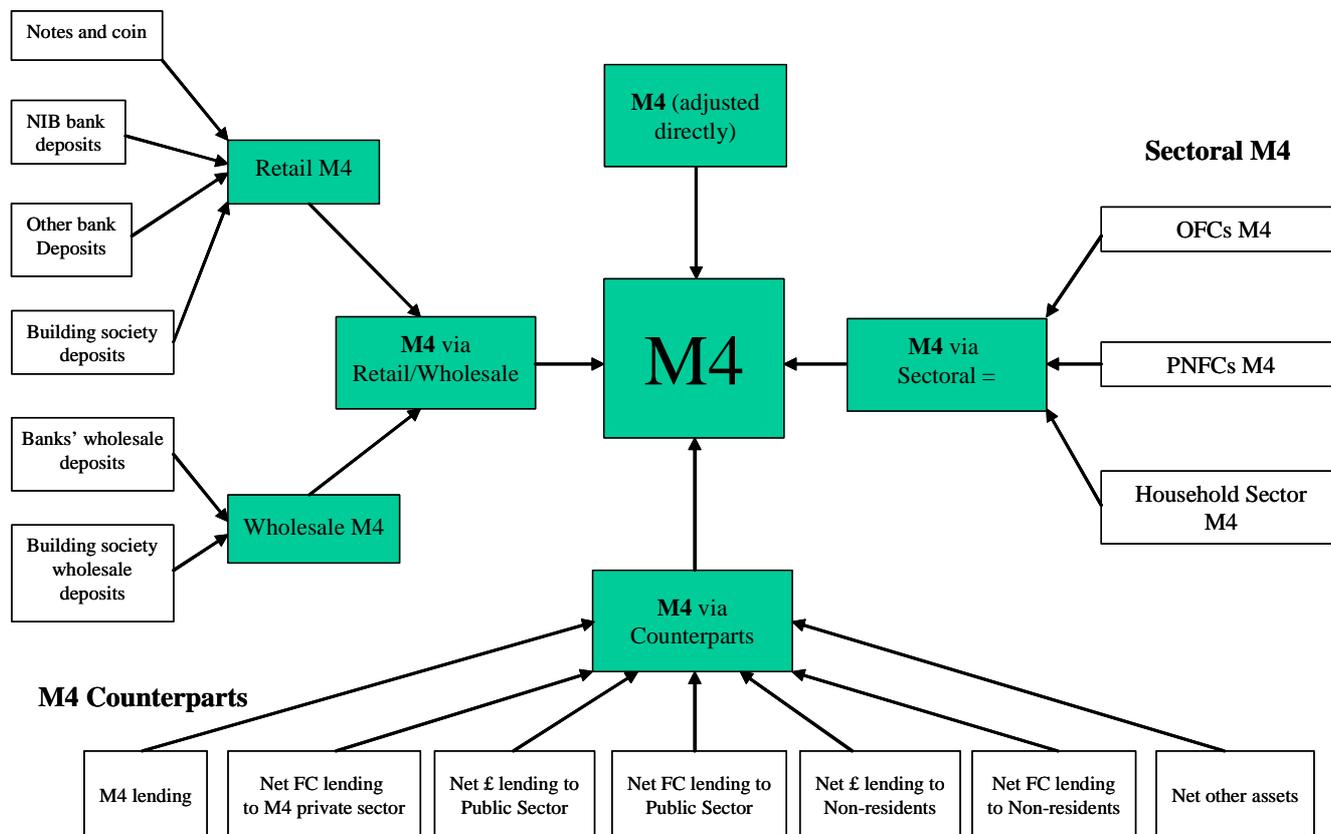
First, each un-shaded series was analysed in X-12-ARIMA to decide if it was seasonal and should be adjusted. Series that were not seasonal were included as unadjusted series in indirectly adjusted totals series. Second, the shaded series were adjusted both directly and indirectly to allow comparison of the results.

² Another option is to spread the residual between the components. This can be performed by X-12-ARIMA but tends to reduce the quality of adjustment of the component series. While other institutions generally do not force the components of indirectly adjusted totals to equal the total there are some series where additivity is deemed too important for it to be lost.

¹ See <http://www.bankofengland.co.uk/statistics/ms/articles/artdec03.pdf> for details on the new method.

Figure 1: Routes to total M4

Retail/Wholesale M4



It was the Bank’s view that, in cases where the X-12-ARIMA diagnostics indicated a clear difference between the quality of direct and indirect adjustment, the higher quality adjustment should be used. Where the diagnostics were similar, economic or operational considerations determined which adjustment was used.

The Bank decided not to constrain components to sum to a total if the aggregate was adjusted directly, as individual series may be interesting in their own right and should be adjusted optimally, even at the expense of a loss of additivity. The resulting residual series are available to users on the Bank’s Statistical Interactive Database³.

The construction of aggregate M4

There are 3 main ways to aggregate M4: by adding up the sectors’ (household sector, PNFCs and OFCs) holdings of M4, by summing the broad instruments of M4 (retail and wholesale deposits) and by adding up the counterparts of M4 (summing the asset elements from the balance sheet and subtracting the liability elements with the exception of M4). So including direct adjustment of

M4 there are at least 4 different ways to calculate seasonally adjusted data for aggregate M4.

Policy use of the monetary data focuses on the sectoral breakdown, so ideally aggregate M4 would be calculated indirectly (if the diagnostics allowed) from the seasonally adjusted sectoral components. But the sectoral component data are not available in time for the provisional estimates of broad money and credit statistical release.

As all routes to seasonally adjusted M4 produced acceptable adjustments, the solution chosen was to adjust M4 directly for both releases, using all the information available at the time of each release. This has the advantage that M4 and its components are all adjusted optimally. The disadvantage is that no single breakdown of seasonally adjusted M4 components adds up to aggregate M4. This can result in the flow of M4 being of opposite sign to the component flows.

³ See <http://www.bankofengland.co.uk/mfsd/iadb/>.

Chart A shows that the seasonally adjusted aggregate M4 flows derived from different routes have consistently produced similar results over the last 3 years.

Chart A: Seasonally adjusted aggregate M4 flows derived from different routes

