

# Insolvency Statistics Seasonal Adjustment Review – April 2014

## Overview

Seasonal adjustment is the estimation and removal of effects on a time series that are a result of the time of year, such as the calendar month or Easter. Accounting for these effects makes it possible to analyse the underlying trend in the data.

A common example is retail sales, which peak as a result of the Christmas shopping period. However, this rapid increase in sales does not indicate a sustained upwards trend. Seasonal adjustment removes the effect estimated to be as a result only of Christmas, leaving the actual story in the data to be assessed.

If a data series is seasonal but is not adjusted to account for this, it is not valid to compare the current time period to the previous one.

The purpose of this annual review was to determine which of the data series included in the Insolvency Service's National Statistics publication, *Insolvency Statistics*, should be adjusted to account for seasonality. This is part of the on-going commitment to improve the quality and relevance of the statistics produced by the Insolvency Service.

Prior to this review, four series were seasonally adjusted:

- Compulsory liquidations (Table 1 of *Insolvency Statistics*)
- Creditors' voluntary liquidations (Table 1)
- Total bankruptcy orders (Table 2)
- Individual voluntary arrangements (IVAs) (Table 2)

These series have been reviewed to determine whether it was still appropriate to apply seasonal adjustment and, if so, whether the model being used was still applicable.

The following series were also considered for seasonal adjustment:

- Administrations (Table 3)
- Receiverships (Table 3)
- Company voluntary arrangements (CVAs) (Table 3)
- Bankruptcy orders – debtor petitions (Table 2a)
- Bankruptcy orders – creditor petitions (Table 2a)
- Consumer bankruptcy orders (Table 2b)
- Sole trader/self employed bankruptcy orders (Table 2b)

These series were analysed to see if seasonality was present and if so, to develop an appropriate seasonal adjustment model.

Data series for Scotland and Northern Ireland were outside the scope of this review. Additionally, the time series for Debt Relief Orders (DROs) was not long enough to consider for formal seasonal adjustment. DROs will be considered in the next annual seasonal adjustment review.

The data used in this review can be found on the Insolvency Service website:

<https://www.gov.uk/government/publications/insolvency-statistics-october-to-december-2013>

## Background

All the data series published by the Insolvency Service contain quarterly flow data. They are series of differing lengths. Compulsory and creditors' voluntary liquidations exist as far back as Q1 1960, compared to IVAs from 1987 and Administrations from 1993. For the purposes of seasonal adjustment, data since Q1 2003 has been used, that is 11 full years of data at the time of this review.

The Insolvency Service currently constrains the seasonally adjusted series to match the annual totals in the original data. It has previously been advised that this may distort the seasonally adjusted totals but it is felt that doing so aids interpretation of the data.

The revisions policy for seasonally adjusted series is as follows:

For compulsory liquidations and bankruptcies:

- Q1 edition – revise previous three years' data
- Q2 edition – revise previous five quarters (to account for revisions in original data)
- Q3 edition – revise the previous quarter's figure
- Q4 edition – revise current calendar year

For creditors' voluntary liquidations and IVAs:

- Q1 edition – revise previous three years' data
- Q2 edition – revise the previous quarter's figure
- Q3 edition – revise the previous quarter's figure
- Q4 edition – revise current calendar year

Changes to the revisions policy were not considered as part of this review, but the Statistics Team would welcome comments and feedback on this approach.

## Analysis

For each series, the following have been reviewed:

- Tests for the presence of seasonality
- regARIMA model, which considers the ARIMA model, as well as features (prior adjustments) such as outliers, level shifts, seasonal breaks as well as Easter and trading day effects
- The optimal choice of filters for the seasonal moving average and trend moving averages

The analysis was carried out using X13-ARIMA-SEATS, the recommended programme for seasonal adjustment for National Statistics.

Detailed comments on each series are given in the following sections.

## Summary of outcomes

Series	Decomposition	Model	Priors	Seasonal moving average	Trend moving average
Compulsory Liquidations <sup>1</sup>	<i>No seasonality present – seasonal adjustment discontinued</i>				
Creditors' Voluntary Liquidations <sup>1</sup>	Multiplicative	Log(0,1,2)(0,1,1)	-	3x5	5-term
Individual Voluntary Arrangements <sup>1</sup>	Multiplicative	Log(2,1,0)(0,1,1)	-	3x5	5-term
Bankruptcy Orders (total) <sup>1</sup>	Multiplicative	Log(0,1,1)(0,1,1) <i>and constant regression term</i>	Easter[1]	3x5	5-term
Administrations	Multiplicative	Log(0,1,1)(0,1,1)	TD	3x9	5-term
Receiverships	No seasonality present				
Company Voluntary Arrangements	No seasonality present				
Bankruptcy - Creditor petition	Multiplicative	Log(0,1,1)(0,1,1)	TD1Coeff, Easter[1]	3x5	5-term
Bankruptcy - Debtor petition	Multiplicative	Log(0,1,1)(0,1,1)	Easter[1]	3x5	5-term
Consumer bankruptcy	Multiplicative	Log(0,1,1)(0,1,1)	Easter[1]	3x3	5-term
Trader bankruptcy	Multiplicative	Log(0,1,1)(0,1,1)	LS2006.4	3x3	5-term

<sup>1</sup> Series subject to seasonal adjustment prior to this review  
Changes made following this review are in italics

### Compulsory Liquidations

Tests showed no identifiable seasonality present in the compulsory liquidation series. This was also the case in the previous review. Therefore, these data will no longer be adjusted, and the seasonally adjusted series will be removed from the publication.

As one of the headline measures in the publication, the presence of seasonality will be tested at each annual review.

### Creditors' Voluntary Liquidations

Contrary to previous reviews, the series demonstrated significant seasonality. This seasonality is multiplicative, therefore a log transformation will be applied to the data.

Using the pick model function, the ARIMA model (0,1,2)(0,1,1) was selected, along with a 3x5 seasonal moving average and a 5-term Henderson moving average to account for the trend. This is identical to the outcome of the previous annual review.

Both Easter and trading day effects were found to be significant, however the inclusion of these only marginally improved the diagnostics. As this data series has been historically volatile, these effects will not be included following this year's review, but will be considered again at the next.

## Total Bankruptcy Orders

The time series for total bankruptcy orders demonstrated significant seasonality. This seasonality is multiplicative, therefore a log transformation will be applied to the data.

Using the pick model function, the ARIMA model  $(1,1,0)(1,0,1)$  was identified. However, the preference is to use a  $(1,1,0)(1,1,0)$  ARIMA model with the addition of a constant term in the regression. This represents the least change to the previous model – a  $(1,1,0)(1,1,0)$  ARIMA model – and has little effect on the final seasonally adjusted series.

A 3x5 seasonal moving average and a 5-term Henderson moving average to account for the trend have been selected.

A lagged effect of Easter (Easter[1]) was found to be significant and has been included in the model.

## Individual Voluntary Arrangements

The time series for IVAs demonstrated significant seasonality. This seasonality is multiplicative, therefore a log transformation will be applied to the data.

Using the pick model function, the ARIMA model  $(0,1,2)(0,1,1)$  was selected, along with a 3x5 seasonal moving average and a 5-term Henderson moving average to account for the trend. The previous model was identical other than the seasonal moving average, which was 3x9.

No prior adjustments were found to be significant.

## Administrations

The time series for administrations demonstrated significant seasonality. This seasonality is multiplicative, therefore a log transformation will be applied to the data.

Using the auto model function, the ARIMA model  $(0,1,1)(0,1,1)$  was selected, along with a 3x9 seasonal moving average and a 5-term Henderson moving average to account for the trend. It should be noted that the pick model function could not identify a suitable model and reverted to using ARIMA  $(0,1,1)(0,1,1)$  as per the default operation.

A trading day effect was found to be significant and has been included in the model.

## Receiverships

Tests showed no identifiable seasonality present in the receiverships series. Therefore, these data will not be adjusted.

## Company Voluntary Arrangements

Tests showed no identifiable seasonality present in the CVA series. Therefore, these data will not be adjusted.

## Bankruptcy Orders – Debtor Petitions

The time series for debtor petitions demonstrated highly significant seasonality. This seasonality is multiplicative, therefore a log transformation will be applied to the data.

Using the pick model function, the ARIMA model  $(0,1,1)(0,1,1)$  was selected, along with a 3x5 seasonal moving average and a 5-term Henderson moving average to account for the trend.

A lagged effect of Easter (Easter[1]) was found to be significant and has been included in the model.

## Bankruptcy Orders – Creditor Petitions

The time series for creditor petitions demonstrated marginally significant seasonality. As the corresponding data series (debtor petitions) is seasonal, creditor petitions will also be adjusted. This will be considered at the next review. This seasonality is multiplicative, therefore a log transformation will be applied to the data.

Using the pick model function, the ARIMA model  $(0,1,1)(0,1,1)$  was selected, along with a 3x5 seasonal moving average and a 5-term Henderson moving average to account for the trend.

Both a lagged effect of Easter (Easter[1]) and a trading day effect were found to be significant and have been included in the model.

## Consumer Bankruptcy Orders

The time series for consumer bankruptcy orders demonstrated significant seasonality. This seasonality is multiplicative, therefore a log transformation will be applied to the data.

Using the pick model function, the ARIMA model  $(0,1,1)(0,1,1)$  was selected, along with a 3x3 seasonal moving average and a 5-term Henderson moving average to account for the trend.

Some autocorrelation was present at lags 3 and 4, although this did not significantly affect the other diagnostics. Additionally, the corresponding data series (sole trader bankruptcy orders) is seasonal, therefore the consumer bankruptcy series will also be adjusted.

A lagged effect of Easter (Easter[1]) is significant and has been included in the model.

## Sole Trader Bankruptcy Orders

The time series for consumer bankruptcy orders demonstrated significant seasonality. This seasonality is multiplicative, therefore a log transformation will be applied to the data.

Using the pick model function, the ARIMA model (0,1,1)(0,1,1) was selected, along with a 3x3 seasonal moving average and a 5-term Henderson moving average to account for the trend.

A level shift in Q4 2006 was found to be significant. This corresponds to a change in the way the data were recorded, and has therefore been included in the model.

A second level shift was detected in Q4 2010. However, there is no particular reason for this and therefore has been excluded from the model. This will be considered in future reviews and could be found to be an outlier.

## Contact

For more information about this review, please contact a member of the Insolvency Service Statistics Team:

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