

METHODOLOGICAL NOTE

Seasonal Adjustment of Retail Trade Sales Series
March 2011 to February 2012



**Statistics
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Methodological note for the seasonal adjustment of series for Retail Trade Sales

Monthly and quarterly time series are often characterised by considerable seasonal variations, which might complicate their interpretation. Such time series are therefore subjected to a process of seasonal adjustment in order to remove the effects of these seasonal fluctuations.

Statistics South Africa (Stats SA) uses the X-12-ARIMA to estimate the trend, seasonal and irregular components, as well as Trading day and Easter effects. The X-12-ARIMA is a seasonal adjustment program developed at the United States Bureau of the Census. The program is based on the Bureau's X11 algorithm. It incorporates regression techniques and ARIMA modeling to improve estimation of the different time series components. The span of the Retail trade sales time series (at current and constant prices) used in identifying the parameters is from January 2002 to February 2011. The identified seasonal adjustment parameters will be fixed for a period of one year and revised on an annual basis.

Stats SA has adopted the direct seasonal adjustment approach (i.e. aggregates at current and constant prices are seasonally adjusted, as apposed to adjustment of components).

Table 1: Retail Trade Sales series metadata

Definitions:

	Decomposition scheme	ARIMA model	Outliers (AO, LS, TC)	Presence of seasonality	Presence of Easter effect	Presence of Trading day effect
Retail trade sales (at current prices)	Multiplicative	(3, 1, 1)(0, 1, 1)	None	Significant	Significant	Significant
Retail trade sales (at constant prices)	Multiplicative	(3, 1, 1)(0, 1, 1)	None	Significant	Significant	Significant

Additive decomposition – An additive decomposition is appropriate if the magnitude of the seasonal fluctuations does not vary with the level of the series. Under the additive decomposition scheme, the original series (Y) is expressed as $Y = T + (K + S) + I$, where T = trend, K = Calendar effects i.e. Trading day and Easter effects, S = seasonal component and I = irregular component.

Multiplicative decomposition – The multiplicative decomposition is usually appropriate for series of positive values where the size of the seasonal oscillations increases with the level of the series. The original series (Y) is expressed as $Y = T * (K * S) * I$.

Additive Outlier (AO) – This refers to unusually high or low singular values in the time series.

Level Shift (LS) – This refers to an abrupt, but sustained change in the level of the time series.

Transitory Change (TC) – This refers to a series of outliers with transitory effects on the level of the series.

Easter effect – Effects from Easter holidays, that are not always on the same day of a month. The most important fluctuating holiday in the South African calendar is Easter, not only because it fluctuates between days, but it can also fluctuate between months – since it can occur either in March or April. These factors may consequently result in an increase in the shopping activities of consumers in weeks prior to or following Easter, which furthermore can give rise to monthly variations that may not reflect a true growth or fall in economic activity, but instead indicate a shift.

Trading day effect (TD) – An effect associated with the composition of the calendar. For example, different months have different numbers of working days. Days of the week can have different levels of activity.

Direct seasonal adjustment approach – In seasonal adjustment, the direct approach refers to combining the component series first and then adjusts the totals.

Trend component (T) – An estimate of the local level of the series derived from the surrounding recent observations (which could be a year or two). The trend is generally fairly smooth and includes movements and cycles that are longer than a year.

Seasonal component (S) – An estimate of effects that are reasonably stable in terms of annual timing, direction and magnitude. Possible causes include natural factors (the weather), administrative measures (starting and ending dates of the school year), and social/cultural/religious traditions (fixed holidays such as Christmas day).

Irregular component (I) – An estimate of any effect not included in the trend-cycle or the seasonal effects (or in estimated trading day or holiday effects). Its values are unpredictable with regards to timing, impact, and duration. It can arise from sampling error, non-sampling error, unseasonable weather, natural disasters, strikes, etc.

Seasonal adjustment parameters – This refers to the decomposition scheme, ARIMA model, moving average filters and outliers.