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METHODOLOGICAL NOTE:

Seasonal adjustment of selected building statistics of the private sector as reported by local government institutions

Methodological note on the seasonal adjustment of selected building statistics of the private sector as reported by local government institutions ('building statistics')

This document provides a brief explanation of the seasonal adjustment of building statistics, at both current and constant prices.

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 X-12-ARIMA to estimate trend, seasonal and irregular components as well as length-of-month or length-of-quarter, trading day, leap year and Easter effects.

X-12-ARIMA is a seasonal adjustment program developed at the United States Census Bureau. It incorporates regression techniques and also ARIMA modelling to improve estimation of the different time series components. Further information is available at the following link: <https://www.census.gov/topics/research/seasonal-adjustment.html>.

Indirect seasonal adjustment was applied for total building statistics while the direct approach was adopted for the three main components. The period from January 1981 to March 2021 was used to identify the parameters.

The parameters will be revised every one year to two years, or as necessary.

Table 1 below shows metadata for the individual components for building statistics at both constant and current prices. For each component the following are given in the table below: decomposition scheme, ARIMA model, presence of seasonality, Easter, length-of-month and trading effects, Henderson and seasonal moving average filters, and outliers.

Table 1: Metadata for building statistics for the period January 1981 to March 2021

Variable	Description	Decomposition scheme	ARIMA model	Presence of seasonality	Presence of Easter effect	Presence of length-of-month and trading day effects	Henderson filter	Seasonal movement average filter	Outliers (AO, LS, TC)
Building plans passed (current prices)									
G0010003	Residential buildings	Multiplicative	(0,1,1)(0,1,1)	Present	Easter(1)	TDNOLPYEAR	13	3x9	AO01APR2020 O01MAY2020 AO01JUN2020 AO01JUL2020 AO01AUG2020 O01SEP2020 AO01OCT2020 O01NOV2020 AO01DEC2020 AO01JAN2021 AO01FEB2021 O01MAR2021
G0020003	Non-residential buildings	Multiplicative	(0,1,1)(0,1,1)	Not Present	Not Present	Not Present	23	3x9	
G0030003	Additions and alterations	Multiplicative	(0,1,1)(0,1,1)	Present	Easter(1)	TDNOLPYEAR	13	3x5	
Building plans passed (constant prices)									
G0110003	Residential buildings	Multiplicative	(0,1,1)(0,1,1)	Present	Easter(1)	TDNOLPYEAR	13	3x5	AO01APR2020 O01MAY2020 AO01JUN2020 AO01JUL2020 AO01AUG2020 O01SEP2020 AO01OCT2020 O01NOV2020 AO01DEC2020 AO01JAN2021 AO01FEB2021 O01MAR2021
G0120003	Non-residential buildings	Multiplicative	(0,1,1)(0,1,1)	Not Present	Not Present	Not Present	23	3x9	
G0130003	Additions and alterations	Multiplicative	(0,1,1)(0,1,1)	Present	Easter(1)	TDNOLPYEAR	23	3x5	
Buildings completed (current prices)									
V0010003	Residential buildings	Multiplicative	(0,1,2)(0,1,1)	Present	Easter(1)	Not present	23	3x5	AO01APR2020 O01MAY2020 AO01JUN2020 AO01JUL2020 AO01AUG2020 O01SEP2020 AO01OCT2020 O01NOV2020 AO01DEC2020 AO01JAN2021 AO01FEB2021 O01MAR2021
V0020003	Non-residential buildings	Multiplicative	(2,1,1)(0,1,1)	Not Present	Not present	Not Present	23	3x5	
V0030003	Additions and alterations	Multiplicative	(0,1,1)(0,1,1)	Present	Easter(1)	TDNOLPYEAR	23	3x5	

Variable	Description	Decomposition scheme	ARIMA model	Presence of seasonality	Presence of Easter effect	Presence of length-of-month and trading day effects	Henderson filter	Seasonal movement average filter	Outliers (AO, LS, TC)
Buildings completed (constant prices)									
V0110003	Residential buildings	Multiplicative	(0,1,2)(0,1,1)	Present	Easter(1)	Not Present	23	3x5	AO01APR2020 O01MAY2020 AO01JUN2020 AO01JUL2020 AO01AUG2020 O01SEP2020 AO01OCT2020 O01NOV2020 AO01DEC2020 AO01JAN2021 AO01FEB2021 O01MAR2021
V0120003	Non-residential buildings	Multiplicative	(0,1,1)(0,0,1)	Not Present	Not Present	Not Present	23	3x5	
V0130003	Additions and alterations	Multiplicative	(0,1,1)(0,1,1)	Present	Easter(8)	TDNOLPYEAR	23	3x5	

Definitions:

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 $Y = T + (TD + S) + I$, where T = trend, TD = trading day effect, S=seasonal component and I=irregular component.

Multiplicative decomposition – A 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 $Y = T * (TD * S) * I$.

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

Easter effect – The Easter holidays may regularly affect economic activity before, during or after the holiday period. Unlike other public holidays which occur on the same date each year, the dates for Easter are not fixed and may occur in March or April. Such an effect, if it is present, is known as the Easter effect.

Trading day effect (TD) – An effect associated with the composition of the calendar. For example, different months have different numbers of working days and also the number of specific days of the week can occur in differing frequency in the same month over different years. Days of the week can have different levels of activity.

Length-of-month effect (LOM) – An effect arising from the fact that some months are longer than others e.g. 28, 29, 30 or 31 days.

Seasonal adjustment approaches – In seasonal adjustment, the direct approach refers to the adjustment of a total (aggregate of unadjusted components), and the indirect approach is the aggregation of seasonally adjusted components to obtain a total.

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

Seasonal component – 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).

Irregular component – 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 regard to timing, impact and duration. It can arise from sampling error, non-sampling error, unseasonal weather patterns, natural disasters, strikes, etc.

Parameters – This refers to the decomposition scheme, ARIMA model, seasonal moving average and Henderson filters, outliers and trading day, Easter and length-of-month regressors.