Technical note on seasonal adjustment for Gross domestic product (Agriculture)

July 1, 2013

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1 GDP (Agriculture)

We analyse the framework of seasonal adjustment for GDP (Agriculture), an important source of seasonality in GDP.

Figure 1 GDP Agriculture (Non seasonally adusted)

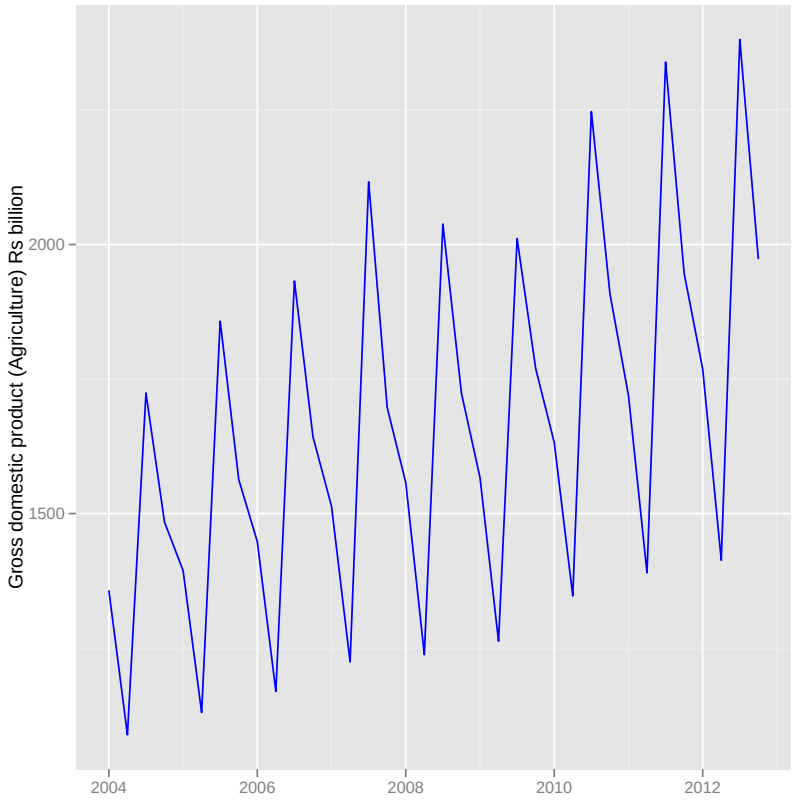


Figure 1 shows the original plot of GDP (Agriculture) from the first quarter of the fiscal year 1999-2000. The plot shows seasonal peaks.

1.1 Seasonal Dummy Model

We rely on the seasonal dummy model to detect whether a series is additive or multiplicative. We use a simple approach and include a set of dummy variables to control for stable seasonality. This approach helps us assess the presence seasonal variations in a series. We can estimate:

$$y_t = \beta_0 + \beta_1 \text{Q1}_t + \beta_2 \text{Q2}_t + \beta_3 \text{Q3}_t + \epsilon_t$$

where Q1_t, Q2_t , Q3_t are dummy variables.

In this formulation, Q4 is the base. The residual of the regression gives the seasonally adjusted series. We compare the standard deviation of the growth rate for the additive and

log transformed regression and choose the one that is lower. For this series, the standard deviation of the growth rate is lower for the log transformed series.

1.2 Slidingspans Diagnostic

X-12-Arima allows to check for the performance of additive and multiplicative seasonal adjustment through the slidingspans diagnostic. The slidingspans diagnostic is a measure of stability of the seasonally adjusted estimates. It applies the seasonal adjustment procedure to overlapping spans, with each span being adjusted as if it were a new series. If a month in a series belongs to more than two overslpping spans, the difference in the seasonally adjusted estimates in the different spans should not exceed 3%. If the difference is more than 3%, the month is flagged as unstable. We compare the number of months flagged as unstable through applying applying additive and multiplicative seasonal adjustment decomposition and find more unstable months through additive seasonal adjustment.

Since seasonal peaks are increasing with the level of the series, a multiplicative model for seasonal adjustment is appropriate.

Figure 2 Quarterly growth rates across the years

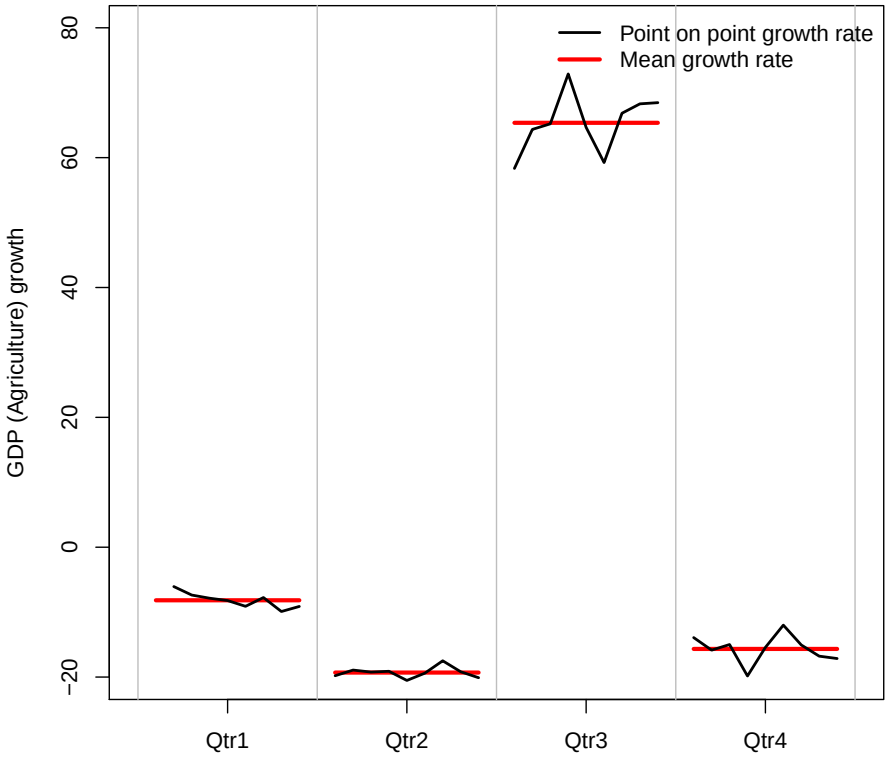


Figure 2 shows the quarter on quarter growth rate for all quarters across the years i.e. the growth rate of Q4 over Q3 for all years. This gives some idea of the nature of seasonality period wise across the different years. Figure 2 shows that mean growth rate in quarter 3 (October-December) is higher than the growth rate in other quarters.

Figure 3 shows the non seasonally and seasonally adjusted GDP Agriculture. Figure shows that seasonal peaks are dampened after seasonal adjustment.

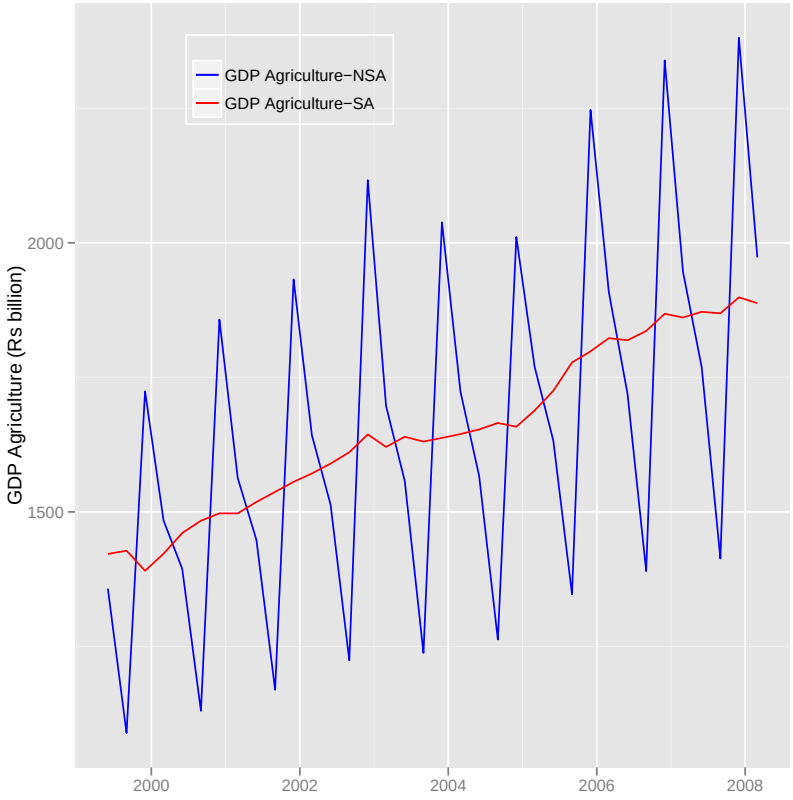
2 Diagnostic checks

After seasonal adjustment a series of diagnostic checks are preformed to check the quality of seasonal adjustment procedure.

2.1 Presence of identifiable seasonality

The statistic M7 shows the amount of moving seasonality present relative to stable seasonality. It shows the combined result for the test of stable and moving seasonality in the series. A

Figure 3 GDP Agriculture (NSA and SA)



value lesser than 0.7 is desirable to show identifiable seasonality in the series. The value of M7 statistic for GDP(agriculture) is 0.064.

GDP agriculture shows identifiable seasonality on the basis of the M7 statistic.

2.2 Spectral representation

Figure 4 GDP (Agriculture) Spectral plot (NSA and SA)

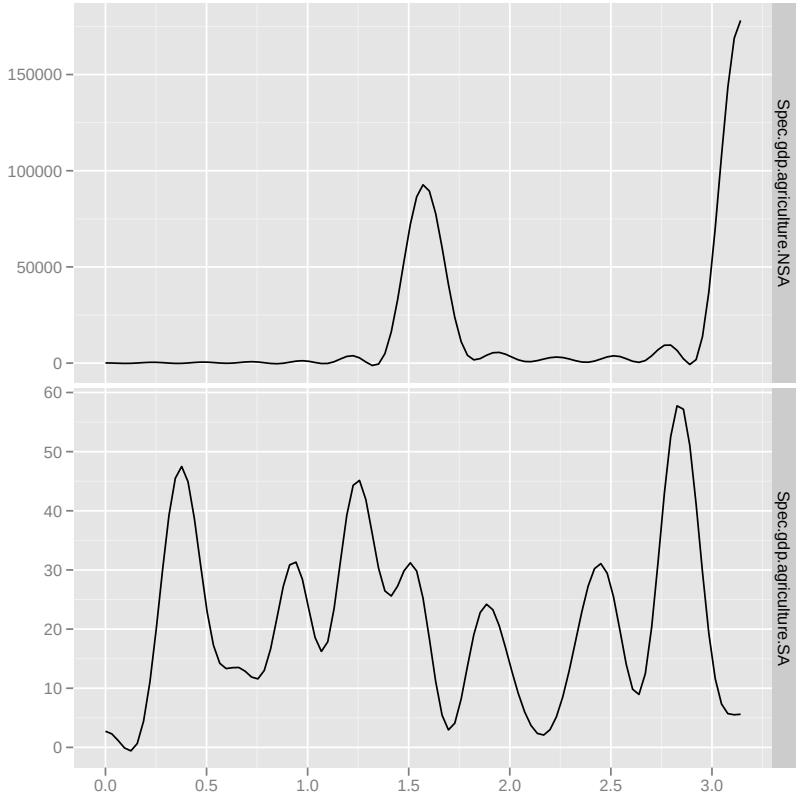


Figure 4 shows the spectral plot of the growth rate of the unadjusted and seasonally adjusted series. Spectral plot, an important tool of the frequency domain analysis shows the portion of variance of the series contributed by cycles of different frequencies. In case of quarterly series, the seasonal frequencies are pi/2 (1.57 on the X-axis) and pi (3.14 on the X-axis) which correspond to periods of 4 quarters and 2 quarters. Figure shows that seasonal adjustment removes the peaks at seasonal frequencies.