Technical note on seasonal adjustment for bank credit to the commercial sector

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1 Bank credit to the commercial sector

We analyse the monthly data for bank credit to the commercial sector from April, 1994 onwards. This series is the sum total of the RBI's credit to the commercial sector and Other banks' credit to the commercial sector. Figure 1 shows the original plot of the series. The plot does not have visible seasonal fluctuations, however if we look at the more recent data, we do find some fluctuations. Fig 2 shows a recent plot of the series, starting from April, 2005.

Figure 1 Bank credit to the commercial sector (Non seasonally adjusted)

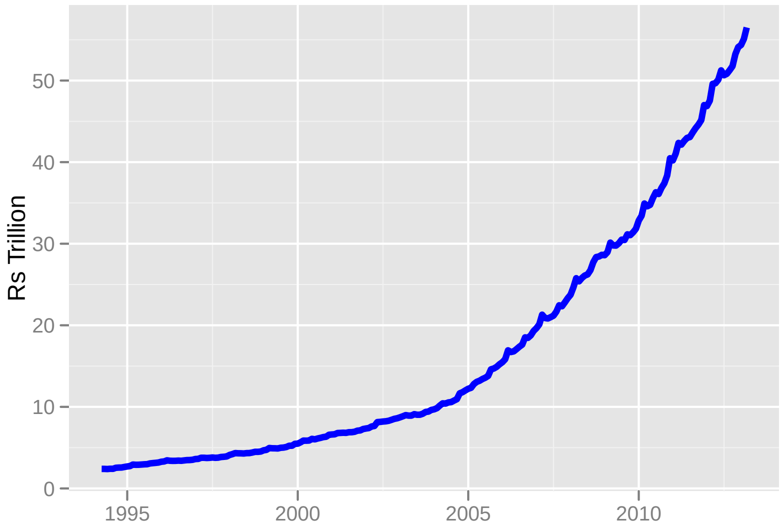
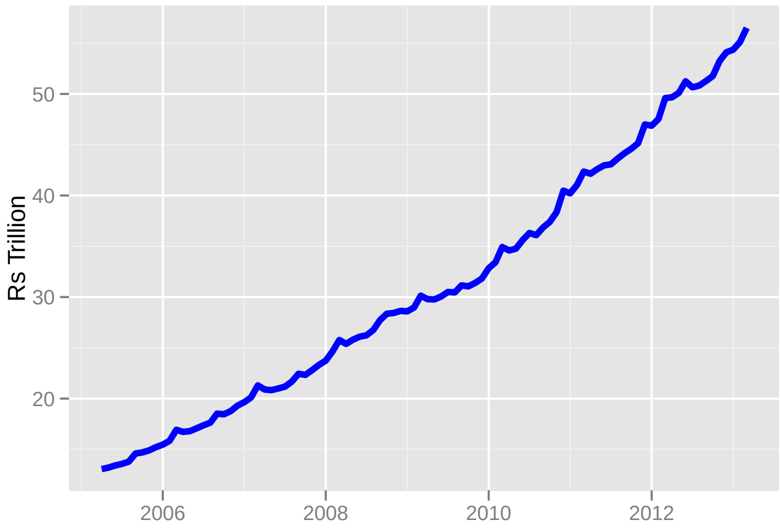


Figure 2 Bank credit to the commercial sector (Non seasonally adjusted- recent data)



On the basis of these plots, we examine the presence and magnitude of seasonal fluctuations in the series.

2 Steps in the seasonal adjustment procedure

A visually appealing way of looking at the raw data is to plot the growth rates in each of the months across the years, for instance, the growth of April over March in each of the years from 1994 onwards. This gives us some idea of the presence of seasonal peaks, if any in the series. The nature of seasonality can also be inferred intutively from the plot before the application of the testing procedures.

Figure 3 Monthly growth rates across the years

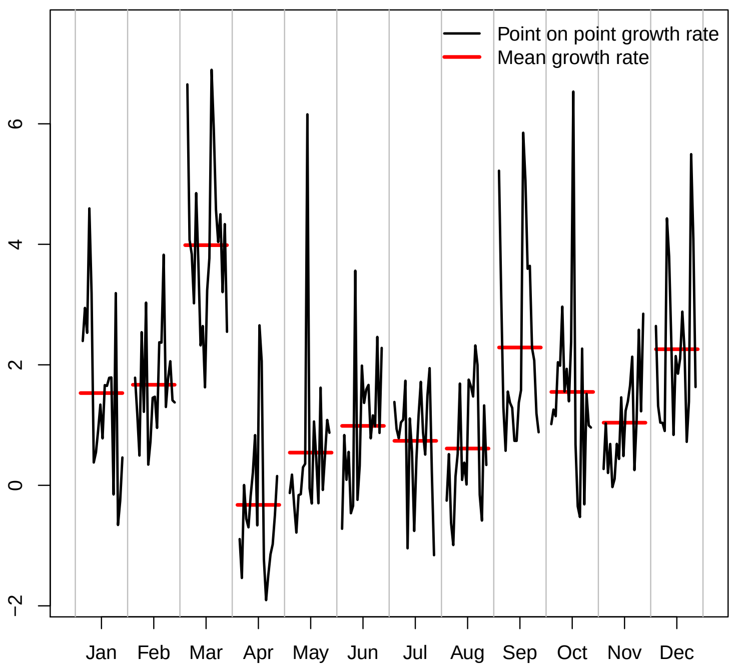


Figure 3 shows peaks in the month of March. The mean growth rate of March over February is greater than the growth rates in other months across the years. We now look at the various steps involved in the seasonal adjustment of the series.

2.1 Pre-adjustment analysis

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

$$y_t = \beta_0 + \beta_1 trend + \beta_2 \text{Jan}_t + \beta_3 \text{Feb}_t + \beta_4 \text{Apr}_t + \beta_5 \text{May}_t + \beta_6 \text{Jun}_t$$
$$+\beta_7 \text{Jul}_t + \beta_8 \text{Aug}_t + \beta_9 \text{Sep}_t + \beta_{10} \text{Oct}_t + \beta_{11} \text{Nov}_t + \beta_{12} \text{Dec}_t + \epsilon_t$$

where y_t is the raw series if the model under consideration is additive, whereas y_t is the log of the series when the model under consideration is multiplicative. Jan_t, Feb_t .... Nov_t are dummy variables. In this formulation, March is the base month. Subtracting the seasonal factors from the raw series and from the log of the raw series gives the seasonally adjusted series for additive and multiplicative models respectively. We compare the standard deviation of the growth rate for the additive and log transformed regression and choose the one that is lower. *In the case of bank credit to the commercial sector, the seasonal dummies are not significant, hence this approach is not relied upon to detect the presence of additive or multiplicative seasonality.*

We compare the performance of the additive and multiplicative models by looking at the standard deviation of the growth rate of the adjusted series obtained through additive and multiplicative models in the X-12-ARIMA program. In case of bank credit to the commercial sector, the additive models fails to converge. Hence multiplicative model is chosen for the series.

2.2 Seasonal adjustment

Seasonal adjustment is done with X-12-ARIMA method. Since the model selection criteria point towards multiplicative seasonality, log transformation of the series is performed.

Figure 4 Bank credit to the commercial sector (NSA and SA)

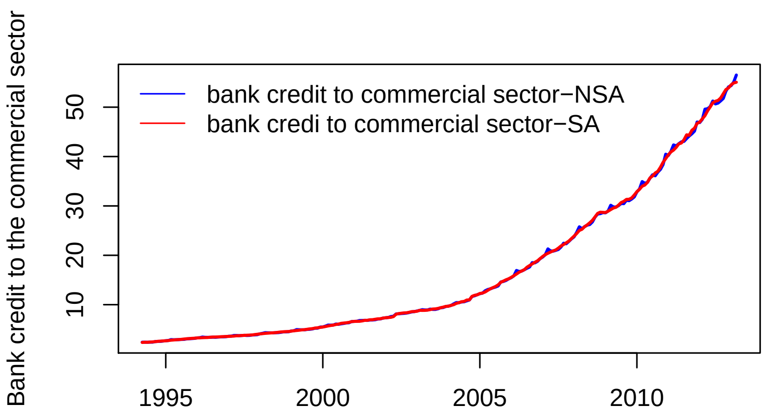


Figure 4 shows the non-seasonally and seasonally adjusted series. There is not much difference in the two plots except for moderate peaks visible in the recent data. We look at the plots of the growth rates to see the extent of noise reduction after adjustment.

Figure 5 Bank credit to the commercial sector (NSA and SA- point on point growth rates)

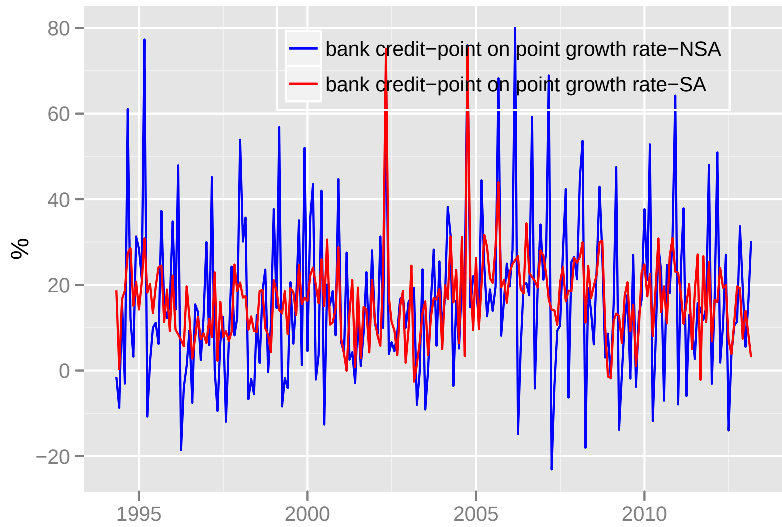


Figure 5 shows the point on point growth of the raw and seasonally adjusted series. Figure shows that noise is reduced after adjustment. This is also evident through the standard deviation of the growth rate of the raw and adjusted series. The standard deviation of the growth rate of the raw series is 18.97 and that of the adjusted series is 9.87.

2.3 Diagnostic checks

After seasonal adjustment, a series of diagnostic checks are performed through relevant tests and quality assessment statistics.

2.3.1 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 value lesser than 1 is desirable to show identifiable seasonality in the series. The value of M7 for bank credit to commercial sector is 0.3.

2.3.2 Sliding span diagnostics

Sliding span diagnostics are descriptive statistics of how the seasonal adjustments and their month-to-month changes vary when the span of data used to calculate them is altered in a systematic way. It is based on the idea that for a month common to more than one overlapping spans, the percent change of its adjusted value from the different spans should not exceed the threshold value and for a month common to more than one span, the difference between the month on month change from the different spans should not exceed the threshold value (the threshold value being 0.03).

Sliding span gives the percentage of months (A%) for which the seasonal adjustment is unstable (the difference in the seasonally adjusted values for a particular month from more than one span should not exceed 0.03). It also gives the percentage of months (MM%) for

which the month on month changes of the seasonally adjusted values is unstable i.e exceeding the threshold value.
The seasonal adjustment produced by the procedure chosen should not be used if A% > 25.0 (> 15.0 is considered problematic) or if M M % > 40.0.

For bank credit to the commercial sector, the programme gives the warning that the range of the seasonal factors is too low for sliding span measures to be reliable. Hence this diagnostic measure is not relied for this series. **The sliding span diagnostics is not reliable when the range of the seasonal factors in a particular span is low. (less than 5)**

3 Year on year growth versus seasonally adjusted point on point growth

Growth rates can be computed either year on year or point on point. The year on year growth rate is computed as the percentage change with respect to the corresponding month (or quarter) in the preceding year, while the point on point growth rate is computed as the percentage change with respect to the preceding period (month or quarter).

Table 1 shows the year on year growth and seasonally adjusted annualized rate in percent, point on point.

Table 1 Year on year and point on point growth rates

	year.on.year.growth	point.on.point.growth
2008 Jan	20.81	25.20
2008 Feb	22.54	26.50
2008 Mar	20.99	29.93
2008 Apr	21.50	11.20
2008 May	23.84	24.44
2008 Jun	24.30	16.92
2008 Jul	23.85	19.72
2008 Aug	23.46	22.42
2008 Sep	23.52	29.99
2008 Oct	26.99	30.33
2008 Nov	24.65	10.37
2008 Dec	22.80	-1.41
2009 Jan	20.46	-1.71
2009 Feb	17.53	11.61
2009 Mar	16.93	13.30
2009 Apr	17.34	12.69
2009 May	15.38	6.47
2009 Jun	15.17	17.49
2009 Jul	16.28	20.61
2009 Aug	13.83	9.20
2009 Sep	12.33	15.38
2009 Oct	9.49	1.11
2009 Nov	10.40	9.73
2009 Dec	11.14	22.80
2010 Jan	14.86	24.77
2010 Feb	15.40	17.31
2010 Mar	15.91	22.52
2010 Apr	16.11	8.00
2010 May	16.78	18.83
2010 Jun	18.49	30.84
2010 Jul	19.03	13.60
2010 Aug	18.52	19.67
2010 Sep	18.28	11.00
2010 Oct	20.46	26.55
2010 Nov	22.24	30.94
2010 Dec	27.19	23.08
2011 Jan	22.44	22.85
2011 Feb	22.78	17.61
2011 Mar	21.26	10.92
2011 Apr	21.85	15.65
2011 May	22.56	20.24
2011 Jun	20.66	5.01
2011 Jul	18.62	18.51
2011 Aug	20.90	27.11
2011 Sep	19.86	-2.17
2011 Oct	19.25	26.70
2011 Nov	17.67	11.27
2011 Dec	16.10	25.39
2012 Jan	16.57	6.91
2012 Feb	15.83	16.51
2012 Mar	17.09	15.99
2012 Apr	17.86	23.96