

# Technical note on seasonal adjustment for Wholesale price index (Non food, non fuel)

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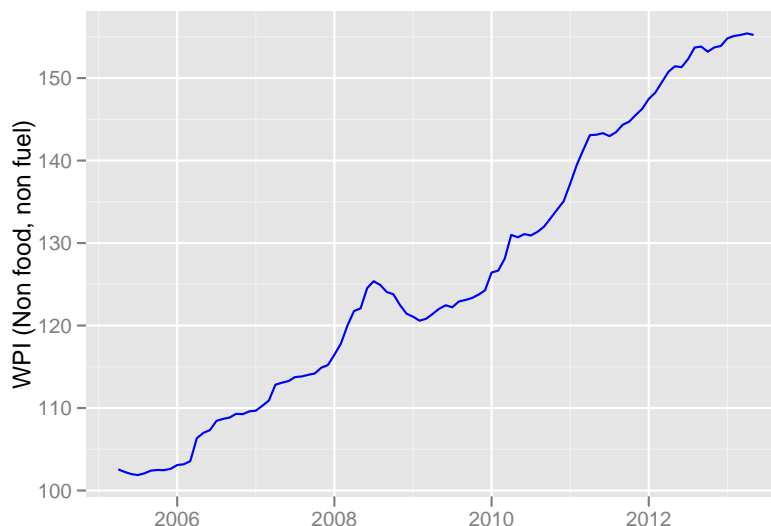
## 1 Wholesale price index (Non food, non fuel)

We construct the series for WPI (Non food, non fuel) by excluding the volatile components of food and fuel from the overall WPI. WPI inflation is divided into three broad categories- Primary articles, Fuel products and Manufacturing items. The first category includes food articles. The manufacturing category also has a component of food products, which is volatile and move in line with the primary articles. If we exclude the volatile components of food articles, food products and fuel from the headline WPI, we get a measure of non food, non fuel WPI. We analyse this series from April, 1994 onwards. Figure 1 shows the original plot of the series. The series does not show seasonal pattern.

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**Figure 1** Wholesale price index (Non food, non fuel) (Non seasonal adjusted)

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## 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 i.e 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.

Figure 2 shows growth rates in each of the months across the years. The plot shows a broadly uniform pattern across the growth rates for various months. The mean growth rates do not differ significantly across months. This shows that series does not have identifiable seasonality.

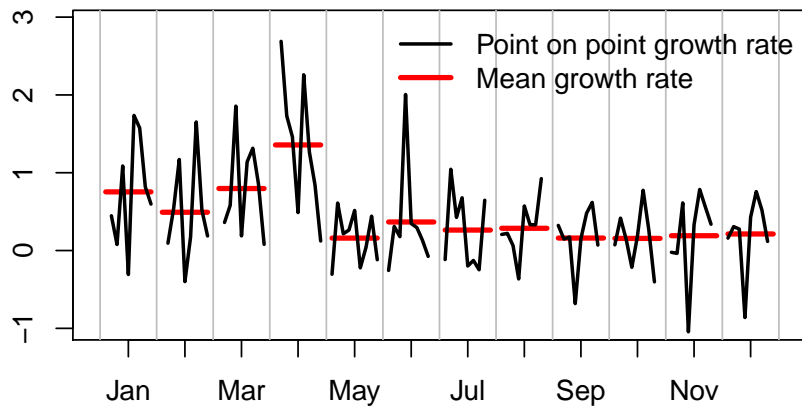
### 2.1 Seasonal adjustment of WPI (Non food, non fuel) with X-12-ARIMA

We test our inference by seasonally adjusting the series through X-12-ARIMA program.

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**Figure 2** Monthly growth rates across the years

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**Figure 3** WPI (Non food, non fuel) (NSA and SA)

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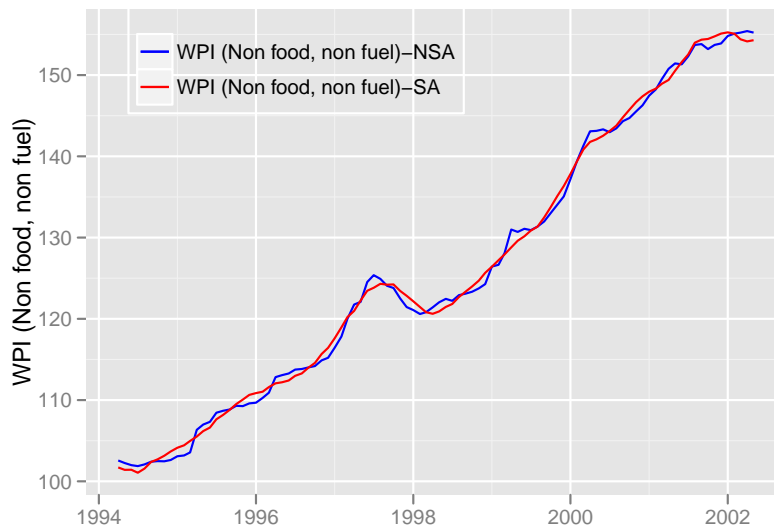


Figure 3 shows the non-seasonally and seasonally adjusted WPI (Non food, non fuel). The blue line shows the raw series and the red line shows the series after seasonal adjustment. The red line is almost superimposing the blue line. This again, is indicative of no identifiable seasonality in the series.

## 2.2 Diagnostic checks

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

### 2.2.1 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 value lesser than 1 is desirable to show identifiable seasonality in the series. The value of M7 for WPI (Non food, non fuel) is 0.489 .

*WPI (Non food, non fuel) does not show identifiable seasonality on the basis of the M7 statistic.*

## 3 Spectral representation

Figure 4 shows the spectral plot of the growth rate of the unadjusted and seasonally adjusted series. The spectral plot, an important tool of the frequency domain analysis shows the portion of variance contributed by cycles of different frequencies.

The x-axis represent frequency from 0 to  $\pi$  (3.14). The seasonal frequencies are  $\pi/6$  (0.52 on the x-axis),  $\pi/3$  (1.04 on the x-axis) ,  $\pi/2$  (1.57 on the x-axis),  $2\pi/3$  (2.09 on the x-axis) and  $5\pi/6$  (2.6 on the x-axis). In terms of periods (months); they are 12 months, 6 months, 4 months, 3 months and 2.4 months.

Figure 4 does not show explicit peaks at the seasonal frequencies in the upper panel. This again, is a reflection of low seasonal variability in the series. A major component of seasonality is moving in nature for the series.

## 4 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.

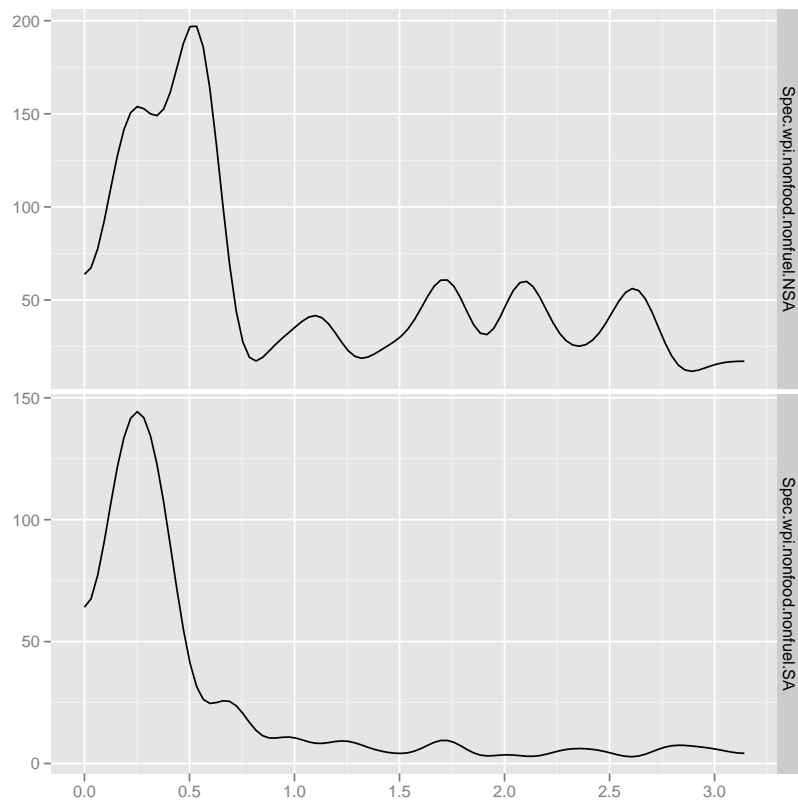
It is based on the idea that for a month common to more than one overlapping spans, the percent change of its adjusted value from the different spans should not exceed the threshold value and for a month common to more than one span, the difference between the month on month change from the different 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.

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**Figure 4** WPI (Non food, non fuel) Spectral plot (NSA and SA)

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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 WPI (Non food, non fuel), the programme gives the warning that the range of the means of seasonal factors is too low for sliding span measures to be reliable. Hence this diagnostic measure is not relied for this series.

**WARNING: The sliding span diagnostics is not reliable when the range of the seasonal factors in a particular span is low.**

With the latest data, the M7 statistic and the spectral plots do not show identifiable seasonality in the series. We do not perform seasonal adjustment of the series and report non-seasonally adjusted annualised month-on-month growth rates (NSAAR) for non food, non fuel WPI.