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Seasonal adjustment of Indian Macro-economic Time-series

NIPFP Team: Ajay Shah, Ila Patnaik, Radhika Pandey, Rudrani Bhattacharya
E-mail for correspondence: ajay.shah@nipfp.org.in

Macro-economic analysis using monthly or quarterly data in India is primarily conducted using year-on-year growth rates. However, each value for the year-on-year growth of a monthly series is the sum of twelve previous month- on-month changes. Comparing June 2015 to June 2014 fails to see numerous developments which took place in the intervening year. In order to understand June 2015, we have to compare it against May 2015. However, this is not directly feasible owing to seasonality. Seasonality in macro-economic time series can obscure the movements of other components that are important for macroeconomic analysis. This motivates 'seasonal adjustment'. In most advanced countries, the Statistical System publishes seasonally adjusted data series, in addition to the raw data. In India, the growing need for seasonally adjusted data has not yet been met by the Statistical System. While there are statistical software available to seasonally adjust the series, using them blindly misses out critical elements such as the assessments of the quality of seasonal adjustment. The impact of India-specific festivals like Diwali are not taken care of. Further, the choice of direct versus indirect seasonal adjustment is not made. Bhattacharya et.al (2016) on which this one-pager is based shows the complete steps of the seasonal adjustment process for analysing four monthly time-series, the Index of Industrial Production, exports, the Consumer Price Index and the Wholesale Price Index. This involves calendar adjustment, correction for outliers, model selection and conducting diagnostic tests. Further, it involves checking for festival effects that may occur in certain series. The paper finds that Diwali has a significant effect on the IIP. In the jargon of seasonal adjustment, Diwali is referred to as a "moving holiday" since in some years it falls in the month of October and in some years in November. The paper finds a significant negative impact of Diwali on IIP.

The paper examines the importance of the choice of direct versus indirect seasonal adjustment for some composite series. If a time series is a sum of component series, each component series can be seasonally adjusted and summed to get an indirect adjustment for the aggregate series. On the other hand, application of seasonal adjustment procedure directly to the aggregate series yields direct seasonal adjustment. The paper compares the direct and indirect adjustment of IIP (following the use-based classification) and finds that direct adjustment removes noise better compared to indirect adjustment.

The paper also examines the importance of optimal span of data for seasonal adjustment. In the context of seasonal adjustment of macroeconomic series, there is a trade-off between the need for a longer time series in order to get a better estimate of the time-series model, and the necessity to avoid modeling a time series containing a structural break. A very long series will have data which will not relate to the pattern of the current series. On the other extreme, a short series may be highly unstable due to frequent revisions. The length of the series may be shortened owing to changes in methodologies, definitions, moving to new statistical classifications, the use of new sources of information. The paper shows that seasonal adjustment of a short series is unreliable. A ten year time span is appropriate to arrive at stable model parameters and reliable diagnostics as well as to retain the current pattern of the series.

The paper shows that the use of black box seasonal adjustment, e.g. by E-views yields a substantial reduction in the standard deviation of the point- on-point series. However, careful analysis of seasonality is a superior approach: it works reliably for all series and it yields improved reductions in the variance of the point-on-point series. Table shows the outcome of these improvements for IIP, exports and CPI. For the IIP, the raw series has a standard deviation of the point-on-point change of 73.26%. If E-views is used as a black box, a sharp gain is obtained, and the volatility drops to 25.73. Our procedures add value, getting the standard deviation down to 23.12. For the exports series, the raw data has a standard deviation of the point-on-point change of 132.53%. This drops to 89.4% using E-views as a black box, and improves further to 78.01% using the steps described in the paper. In the case of the CPI, the raw series has a standard deviation of point-on-point changes of 9.22%. E-views as a black box is unable to process this series. Our best procedures get the standard deviation down to 7.28%.

Table 1: Reduction in standard deviation obtained with our methods

Method	Std.dev of PoP growth rate over 2005-2015
(a) **IIP**	
Raw series	73.26
SA with e-views (1994-2015)	26.79
SA with our approach (taking an optimal span, adjusting for outliers and trading day effect	25.73
SA after adjusting for diwali effect	23.23
SA after adjusting for diwali effect and adjusting for outliers and trading day effect	23.12
(b) Exports	
Raw Series	132.53
SA with eviews (1994-2015)	89.40
SA with our approach (taking an optimal span, adjusting for outliers and trading day effect)	78.01
(c) CPI	
Raw Series	9.22
SA with eviews (1994-2015)	Failure
SA with our approach (taking an optimal span, adjusting for outliers and trading day effect)	7.28

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