Effects of calendar seasonality in Indian calendar system

Effects of calendar seasonality on economic output

Calendar have enormous effect on economic, social and cultural behaviors but nowhere it is profound than a country or region's economic output indicators such as industrial output, CPI, stock-market transaction, import-exports but in a globalized world, all of the economic time-series modelling is modeled around Gregorian calendar system. In a country like India with multiple regions and festivals from multiple religion as well, a single calendar will not be sufficient to model various seasonal component. For example, during the festival month of Diwali, consumer consumption rate is usually higher and during the month, industrial output is generally lower.

Previous Work

There have been significant work published already to identify and remove multiple lagged seasonality from time-series (De Livera, Hyndman, and Snyder 2011) considering technical papers published from The US Bureau of Census[1]. There also have been significant work done to identify and remove seasonality, especially concerning religious festival based on Gregorian calendar by the Bank of Spain(Maravall and Sánchez 2000). Similar work is present for lunar[2] and luni-solar[3] based calendar system as well. Similar work in the context of Indian seasonality effect is also present[4][5][6].

A comparative Analysis on calendar seasonality with Indian calendar system

A comparative study was performed to understand calendar seasonality creeping in while modelling seasonal decomposition on time-series objects. especially on econometric data-sets. To understand if any methodologies can be obtained and to provide a better, quantitative understanding of the seasonality, India's Industrial output after the year 2000 and modelling holiday seasonality with Diwali dates corresponding to that. To understand calendar seasonality, dates of the festival of Diwali were obtained from Sax and Eddelbuettel (2018) package and the dates were converted to Vedic calendar dates. Two different time-series were modeled, one with Gregorian calendar dates and another with Vedic calendar dates. A corresponding time-series object of India's industrial output from Sax and Eddelbuettel (2018) package was also converted to Vedic calendar based time-series and scale. In the both the cases, a seasonal decomposition was observed visible along the red line and `X-13 ARIMA SEATS` was used for seasonality decomposition. Due to change in type of calendar, missing values were omitted to keep the frequency of the time-series same for both calendar systems. Bokde et al. (2022) was used for the all the date conversio and conversion of time-series objects in the comparative study.

Future Work

Since, there is no comprehensive work done on understanding various seasonal component of the Indian calendar system and its effect on economic output metrics, it would be pertinent to pursue work on identifying various monthly and quarterly seasonal component.

[1] https://www.google.co.in/books/edition/The_X_11_Variant_of_the_Census_Method_II/BFIfiGmatUoC?hl=en&gbpv=0&kptab=overview

[2] https://www.census.gov/library/working-papers/2002/adrm/lin-01.html

[3] https://assets.cambridge.org/97811070/57623/frontmatter/9781107057623_frontmatter.pdf

[4] https://www.nipfp.org.in/media/medialibrary/2016/01/WP_2016_160.pdf

[5] https://www.census.gov/content/dam/Census/library/working-papers/2017/adrm/rrs2017-04.pdf

[6] https://journals.indexcopernicus.com/api/file/viewByFileId/690045.pdf

Moreover, the existing developed package `VedicDateTime`, needs to be updated with dates of significant festivals of the Vedic calendars which drives economic activities.

Bokde, Neeraj Dhanraj, Prajwal Kailasnath Patil, Saradindu Sengupta, and Andrés Elías Feijóo Lorenzo. 2022. "VedicDateTime: Vedic Calendar System." https://CRAN.R-project.org/package=VedicDateTime.

De Livera, Alysha M., Rob J. Hyndman, and Ralph D. Snyder. 2011. "Forecasting Time Series With Complex Seasonal Patterns Using Exponential Smoothing." *Journal of the American Statistical Association* 106 (496): 1513–27. https://doi.org/10.1198/jasa.2011.tm09771.

Maravall, Agustín, and Fernando J. Sánchez. 2000. "An Application of TRAMO-SEATS; Model Selection and Out-of-Sample Performance. The Swiss CPI Series." In, 121–30. Physica-Verlag HD. https://doi.org/10.1007/978-3-642-57678-2_11.

Sax, Christoph, and Dirk Eddelbuettel. 2018. "Seasonal Adjustment by {x-13ARIMA-SEATS} in {r}" 87. https://doi.org/10.18637/jss.v087.i11.