

A study of the seasonal adjustment method for time series data: The case of Vietnam

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1. Introduction

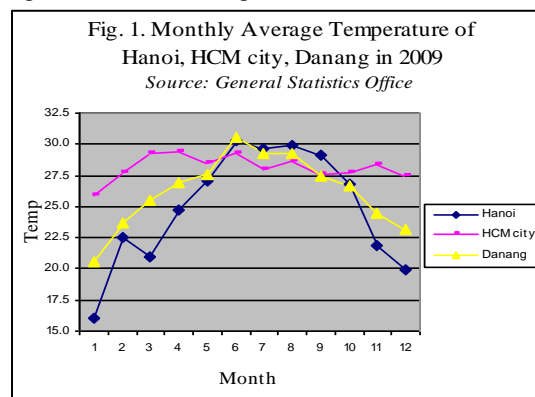
In order to find the underlying pattern of macroeconomics, seasonal adjustment methods have been applied by many countries other than Vietnam. Perhaps it is assumed that seasonality has an unclear influence on Vietnam economic and social activities. Authors, however, discovered that there is an evidence of seasonal influence in several economic and social indicators of Vietnam. This paper presents several findings of our preliminary study on this subject.

The use of the term seasonality comes from fact that the seasons exert an unquestionable influence on economic and social activity [1]. Seasonality is caused by climatic and institutional factors. The climatic factor is a concept covering all normal weather-related conditions. The institutional factor is a concept covering all calendar-related conventions to which society is adapted to [2]. Climatic variations cause changes in consumption behavior, means of production and construction activities. In addition to climatic variations, occasions such as Christmas, the end of the fiscal year, the arrival of holidays for school and others also produce recurring movements in certain data series, particularly those relating to consumption.

Seasonal fluctuations in data make it difficult to analyze whether changes in data for a given period reflect important increases and decreases in the level of data or are due to regularly occurring variation [3]. Therefore, it is necessary to perform seasonal adjustment, which means to use mathematical techniques to compensate for seasonal changes in the original data, in order to identify real economic movements.

Various seasonal adjustment methods have been adopted by many countries other than Vietnam. The statistics in Vietnam is simply carried out. The compilation of statistics in Vietnam will be much improved if seasonal adjustment is applied. That is the reason why authors selected this topic for study. Vietnam has three regions (North, South and Centre) which have quite different climate. In particular, only the North has four seasons defined by differences in temperature and climate. The South has only two season (rainy and dry). The Centre is divided into two areas, one affected by the climate of the North and the other influenced by the climate of the South. In particular, the change in monthly average

temperature in 2009 of three cities in the three regions is shown in Figure 1:



The purpose of this study is to identify the seasonal components specific to each region and help statistics offices (of the Government) to apply appropriate seasonal adjustment measures to economic, industrial and social indicators.

As mentioned above, seasonal adjustment is performed in order to eliminate the regular seasonal fluctuations from a data series. Therefore, before seasonal adjustment, the regular seasonal variations of Vietnam should be determined. This can be considered as a pre-adjustment step. The pre-adjusted series then is used as input series in the seasonal adjustment program. The X-12 ARIMA seasonal adjustment program, which was set up by the United States Bureau of the Census, is the most well-known algorithm and is used by many countries in the world.

2. Methodology

In our preliminary study, we decided to employ a simple algorithm based on the following simple assumption:

$$O = T \times S \times R$$

- O: original time series
- T: trend factor
- S: seasonal factor
- R: random factor

Then, we used a simple 12-month moving average to remove S and R from original time series to get T (Figure 2)

$$T = MA_{12}(O)$$

and $SR = O/T$

MA_{12} : moving average of 12-month

As symmetric moving averages are calculated, it is impossible to determine T for the six prior and the six last months.

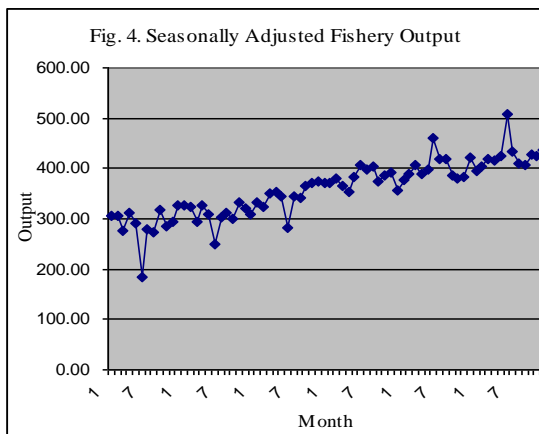
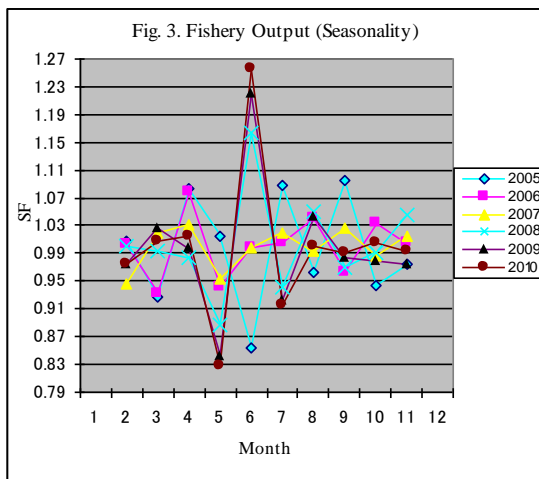
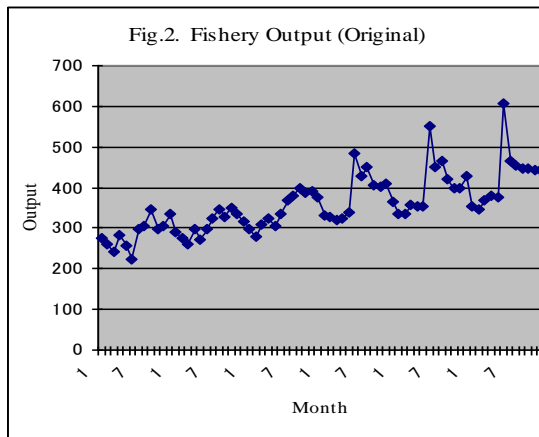
In the next step, S and R need to be extracted from SR. As SR factors present/minor

fluctuations over years, we simply assume S as an average of SR of the same month. Finally seasonal adjustment is performed by dividing the original series (O) by the seasonal factors (S).

3. Experiment Results

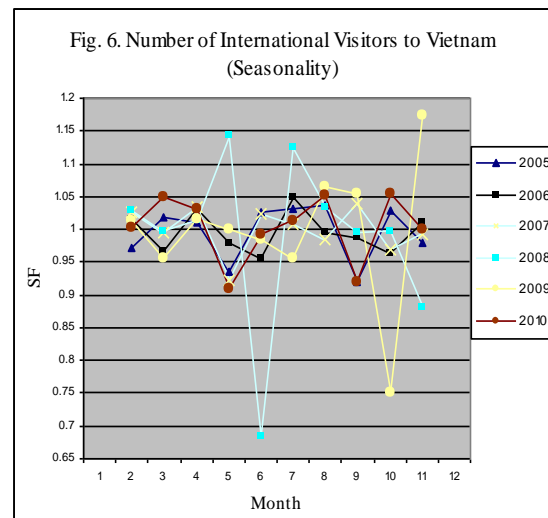
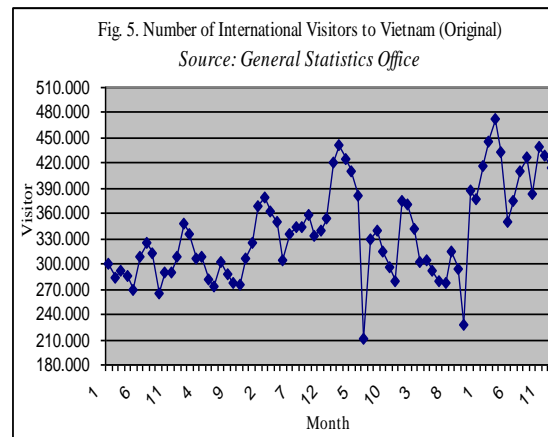
In this study, we applied the above algorithm to three monthly data of Vietnam (fishery output, export output and number of international visitors to Vietnam for the period from 2005-2010). For these series, the original data and seasonality are presented.

3.1 Fishery Output



The result from the seasonal adjustment procedure reflects that the series is suitable for seasonal adjustment. The graph above reflects the repetitive decrease in fishery output in January, February and March. This seasonality is considered to be brought by climate factors.

3.2 Number of International Visitors to Vietnam



Another economic indicator for the same time period (2005-2010) was studied whether it shows seasonality. The movement of number of international visitors to Vietnam also shows some seasonal patterns (Fig. 5), which are not only climatic but also institutional factors like the Tet holiday in Vietnamese calendar. The result shows some seasonal patterns (Fig. 6) but not so clear than the case of fishery output where seasonal factors change over the year very much.

3.3 Export Output

Finally, we investigated monthly data of export output. In this case, we couldn't find any stable seasonal factors in it.

4. Conclusion

A simple seasonal adjustment algorithm is applied to three economic and social time series data of Vietnam. The study shows that there is an evidence of seasonality in several time series data of Vietnam. Authors will continue this study to explore an effectiveness of seasonal adjustment method for a wider range of economic and social indicators of Vietnam.

References

- [1] Danielle Bilodeau, "Seasonal Adjustment: why, when, how?", *L'EcoStart*, December 1997, page 1
- [2] Denmark Statistics, "Seasonal Adjustment", page 7
- [3] Central Bank of the Republic of Turkey, "Seasonal Adjustment Methods", page 1