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STESEG TASK FORCE ON DATA PRESENTATION AND SEASONAL ADJUSTMENT

PRESENTATION OF FILTERED SERIES

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PRESENTATION OF FILTERED SERIES

- Final paper -

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1. Introduction

It is generally assumed that the original series of the economic time series data consists of four components such as trend, cyclical, seasonal and irregular fluctuations. To see the underlying movement of an economic time series systematically, it is necessary to analyze only the trend-cycle component extracted from the original series, which describes economic fluctuations. In order to extract this trend-cycle component, it is necessary that the seasonal adjustment precede it. The seasonal component is extracted from the original series by the moving-average method and the regression method. The seasonally adjusted series can be obtained by removing this seasonal component from the original series. In Korea, the X-12-ARIMA model is used for seasonally adjusted, working day adjusted and lunar holiday adjusted data[1]. The lunar holidays mean Korean moving holidays such as Seol (Lunar New Year's Day) and Chuseok (Thanksgiving Day).

This seasonally adjusted series may still contain the distorted movement because it includes irregular fluctuations in addition to the trend-cycle (TC) component. For this reason, some countries like Australia have released the seasonally adjusted data whose irregular component was filtered. The Germany is posting the TC component, the irregular component and the related graphs of the industrial production index on the Internet homepage of the Federal Statistical Office (http://www.destatis.de/indicators/e/tkpi112.htm). In case of Italy, ISTAT is adding three-terms moving averages to the graphs in some press releases. In Korea, the Korea National Statistical Office (KNSO) has filtered the seasonally adjusted data for all the components at the compilation of the Composite Indexes (CI) of the Business Indicators and has also released these filtered series that are limited to the CI components. However, these individual trend-cycle series in Korea serves only as reference materials of the CI rather than official statistics.

The KNSO has not released the filtered series of the economic indicators except for the CI components and has left their filtering to users. It is because the economic time series cannot be completely decomposed into the aforementioned component factors and there is a possibility that the trend or cyclical component can also be removed in addition to the irregular component during the filtering of irregularity. However, different filtering techniques among different users may disturb reasonable decision-making. Therefore, intensive studies on filtering are required for a stable analysis of business situation and policy decision-making.

In this paper, I tried to suggest a proper idea on filtering based upon the experimental analysis of Korean economic statistics. Section 2 will treat the effects of filtering and Section 3 will show experimental analysis using the Industrial Production Index.

[1] See Baek-Geun Jeon (2002), *A Study of Seasonal Adjustment Method for Industrial Production Statistics* (http://www.nso.go.kr/oracms/upload_file/upload/book/7-1/산업 생산 통계.hwp).

2. Why should we filter the data?

The KNSO uses the end-point three-month moving average method for filtering at the compilation of the CI. The centered moving average method is theoretically better than the end-point moving average method. Nevertheless, the KNSO uses the end-point moving average method. This is because the centered moving average method causes the missing value on the final month. The fact that we cannot have data for the final month means that there is problem in the timeliness of the data.

The three-month moving average method has some problems in that it is not possible to completely eliminate irregularities by using this method. To solve this problem, the MCD (Months for Cyclical Dominance), five or seven month end-point moving average method can be used, but in this case the turning points of the business cycle are severely distorted. That is why we cannot but choose the end-point three-month moving average method.

Since we used the three-month moving average method, we had a problem that on the one hand the indicators with strong irregularities may still contain irregular components even after being smoothed, and on the other hand filtering even stable indicators in its movements may be distorted in their real movements after filtering. Due to these both-sided characteristics of the moving average method, most of the countries compiling the Composite Indexes do not take steps to remove the irregular component of the seasonally adjusted data. In Korea, however, since most of the indicators are influenced by the irregular factors, it is necessary to smooth the individual indicators even though the movements of some indicators are stable.

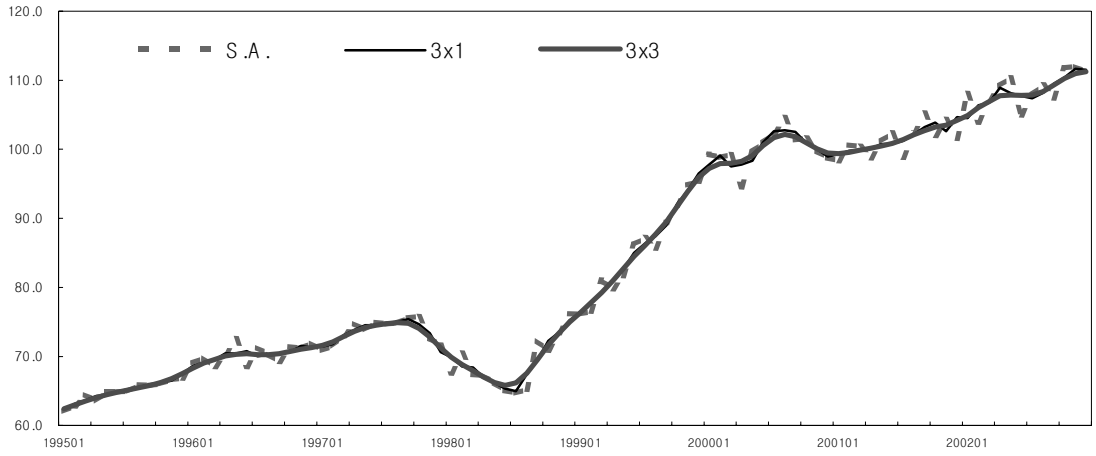
For example, if we compare the numbers of the run groups which are successions of identical symbols among the Seasonally Adjusted (S.A.) series, the 3×1, 3×3 and the 3 term end-point moving averaged series of the S.A. series in the Industrial Production Index (Time Series Term: from Jan. 1980 to Dec. 2002), we can know that the 3×3 moving averaged series showed the least number of the run (See Table 1).

Table 1: Number of runs by moving average method

	S.A.	3×1	3×3	3 term end-point
Number of Runs	149	51	24	50

Also, as we can see from Graph 1, the moving averaged series is much smoother than the seasonally adjusted series.

Graph 1: Movements of the S.A. series, 3×1, 3×3 moving averaged series in the Industrial Production Index



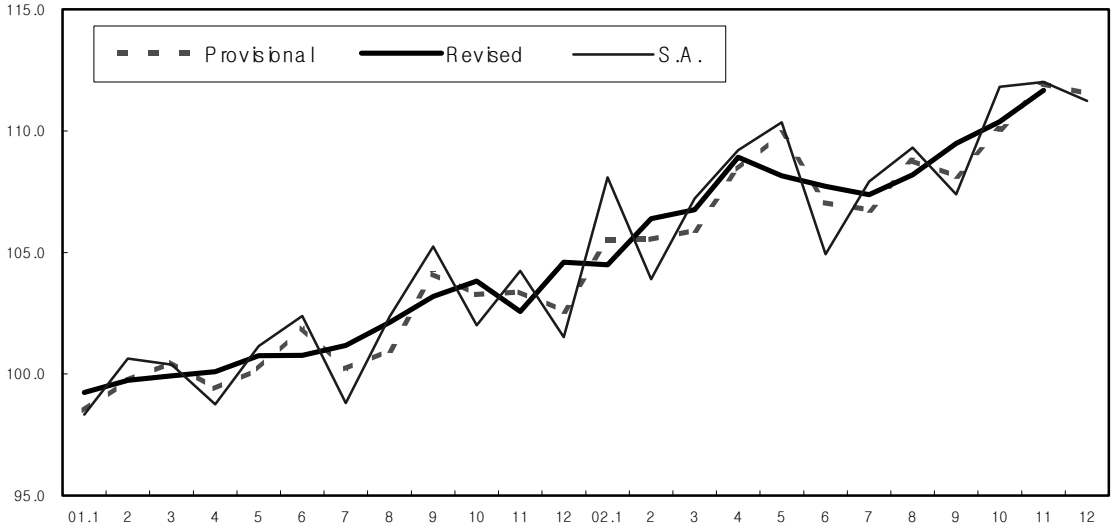
3. Experimental analysis

Regarding the moving average (henceforth to be known as MA) method, the end-point three-month MA method and the centered MA method were used for simulation. The 3×1 and 3×3 MA methods were also used among asymmetric MA methods. The end-point three-month moving average method is lagging by one month or so, compared to the centered moving average method at the time of the turning point of the business cycle (See Graph 2 and Graph 3).

However, the 3×1 and 3×3 moving average methods have a defect in that the figures in the latest month change sharply when the provisional data are replaced with the revised ones (See Table 2). Even the direction like a positive or a negative of the data can be frequently reversed. Therefore, the KNSO has opted to use the end-point three-month MA method even though it is slightly lagging in relation to the business cycle. The method can be far more preferable to having greater discrepancies between the provisional and revised indexes, given the circumstances that the Composite Indexes should be released monthly.

Graph 2: Comparison of Provisional and Revised data in the 3×1 moving averaged series

Figure 1.



Graph 3: Comparison of Provisional and Revised data in the 3×3 moving averaged series

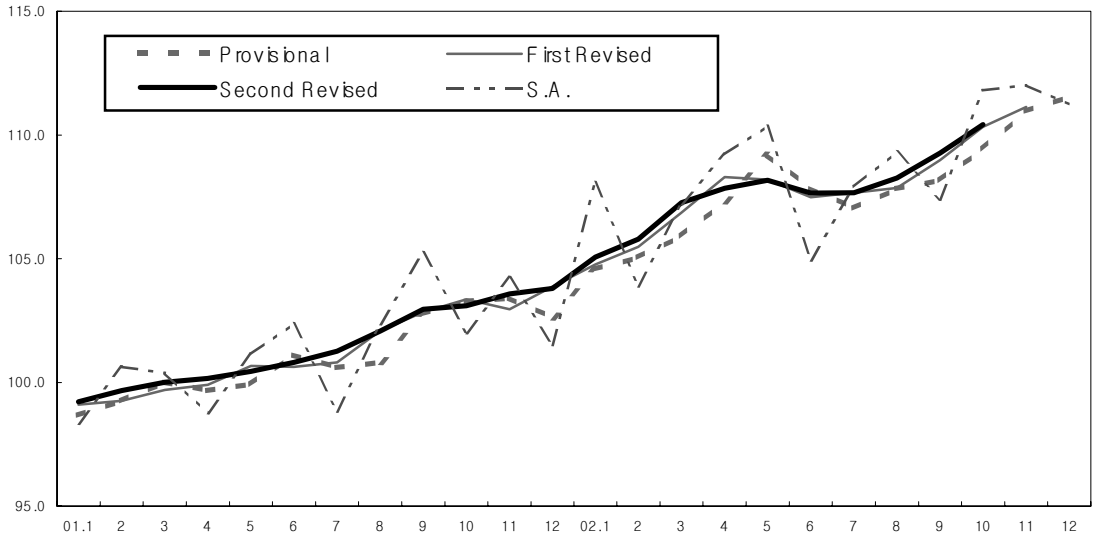


Table 2: Difference between Provisional and Revised data in the Moving Averaged Series

	3×1			3×3				
	Provisional	Revised		Provisional	First Revised	Second Revised		
	A	b	a - b	A	B	C	A - B	B – C
01.1	-0.4	0.3	-0.7	-0.4	-0.2	-0.1	-0.2	-0.1
2	0.5	0.5	0.0	0.2	0.4	0.3	-0.2	0.1
3	0.7	0.1	0.6	0.3	0.1	0.3	0.2	-0.2
4	-0.5	0.2	-0.7	0.0	0.1	0.3	-0.1	-0.3
5	0.1	0.7	-0.5	0.0	0.5	0.3	-0.5	0.2
6	1.1	0.0	1.1	0.4	0.2	0.4	0.3	-0.2
7	-0.6	0.4	-1.0	0.0	0.0	0.5	0.0	-0.4
8	-0.2	0.9	-1.1	0.0	0.8	0.8	-0.8	0.0
9	1.9	1.0	0.9	0.7	0.7	0.9	-0.1	-0.1
10	0.1	0.6	-0.5	0.4	0.4	0.1	0.0	0.3
11	-0.4	-1.2	0.8	0.1	-0.1	0.5	0.2	-0.6
12	0.0	2.0	-2.0	-0.3	0.3	0.2	-0.6	0.1
02.1	0.9	-0.1	1.0	0.7	0.9	1.2	-0.2	-0.3
2	1.0	1.8	-0.8	0.3	0.4	0.7	-0.1	-0.3
3	-0.4	0.4	-0.8	0.4	1.0	1.4	-0.6	-0.4
4	1.6	2.0	-0.5	0.4	1.0	0.5	-0.5	0.4
5	0.9	-0.7	1.6	0.8	0.3	0.3	0.5	0.0
6	-1.0	-0.4	-0.6	-0.3	-0.6	-0.5	0.3	-0.2
7	-0.9	-0.3	-0.6	-0.4	0.0	0.0	-0.4	0.0
8	1.3	0.8	0.5	0.1	0.2	0.5	0.0	-0.4
9	-0.1	1.2	-1.2	0.3	0.7	0.9	-0.4	-0.3
10	0.5	0.8	-0.3	0.4	1.0	1.1	-0.6	-0.1
11	1.4	1.2	0.2	0.6	0.6	-	-	-
12	-0.1	-	-	0.4	-	-	-	-

4. Conclusion

It was determined that filtering the seasonally adjusted series would make the series smoother than before filtering. However, filtering has a defect in that the real information of the original data may be lost. Personally, if users have to make a filtered series for a certain economic indicator, I would like to recommend they use the short-term (less than five months) filter if possible. I think that this is because releasing the data close to the original data seems to help users understand the property of data and conduct decision-making accordingly. In Korea, as an example, the decreased portion of the industrial production index caused by temporary stoppages or reduction of operation by labor strike, flood, equipment repair, etc is often compensated in the next month. Without filtering, in this case, there may be some misunderstanding that the month-to-month change represents a genuine rise or fall of the business situation. But, if we use the long-term filters (for example, D12 by X-12-ARIMA) in this case, I think that the factor(s) caused by the temporary stoppage of the production may have influence on the estimates of the Trend Cycle for too long a period.

Even though statistical organizations do not provide users with the filtered series, users can recently analyze economic indicators for themselves because computer technology has developed to the point where methods and tools for analyzing data are more accessible to users. Personally, if statistical organizations have to release the filtered series for the services of users, I would like to recommend that the filtered series be used only as a reference material for the original and seasonally adjusted series.

REFERENCES

Bureau of the Census (2002), *X-12-ARIMA Reference Manual*

Shiskin, J. Young, A. and Musgrave, J.C.(1967), *The X-11 Variant of The Census Method Seasonal Adjustment Program*, Technical Paper 15, Bureau of the Census