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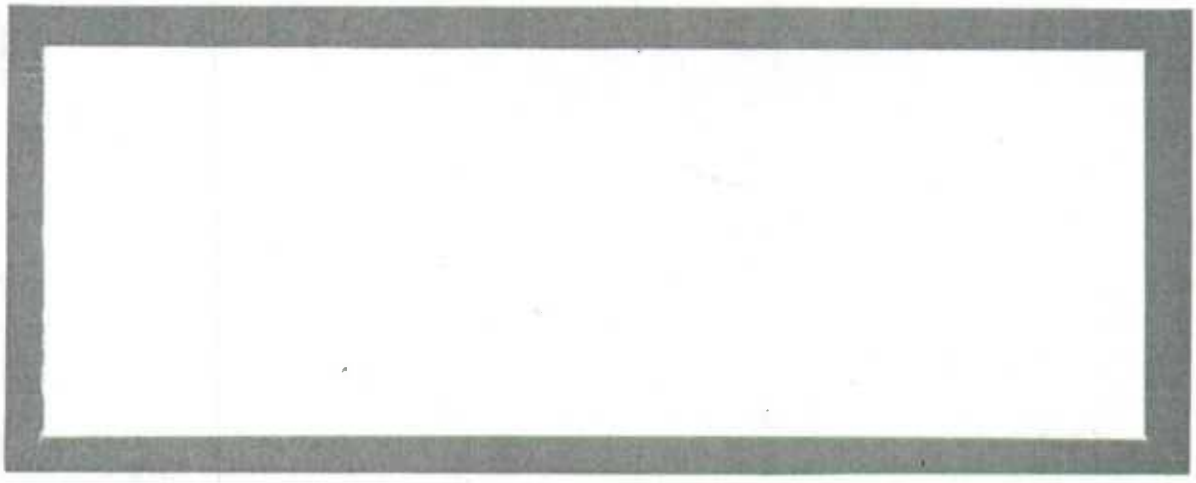

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A NOTE ON THE USE OF TREND-CYCLE ESTIMATES FOR THE HELP-WANTED INDEX

by

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THE HELP-WANTED INDEX AS A TREND-CYCLE INDICATOR

The Help-wanted Index measures changes in the demand for labour. It is compiled by Statistics Canada (1987) from newspapers in twenty cities. A national index and five regional indexes are compiled as well as an index for each city. The city and regional indexes give a picture of where growth in jobs has taken place.

The data are collected once a month, that is, the Saturday which corresponds to the reference week for the Labour Force Survey, usually the week which contains the 15th day of the month (Statistics Canada, 1987). These data are statistical records of the demand for labour compiled for consecutive and approximately equal periods. A direct implication is the possibility for the user to analyse the relationship of the observations from one month to the others.

However, trying to describe and explain the demand for labour using data from the original series may not always be appropriate. Seasonality and trend-cycle effects are entangled. For instance, the month-to-month changes will likely be dominated by the seasonal effect while the interest may be in the trend-cycle. Thus, economic statisticians and users of time series have found it useful to decompose the time series into trend-cycle, seasonal and irregular components for separate study.

The trend, which should be smooth, reflects long-term movements lasting many years. The cycle -- also referred to as the business cycle -- describes alternating periods of business expansion and contraction. Trend and cycle are usually combined into one component. Seasonality consists of intra-year movements which are repeated more or less regularly each year. Finally, the irregular fluctuations are those that remain after the other types are accounted for.

If the user's prime interest is in the analysis of the smooth long-term movements, the traditionally published seasonally adjusted series may not

always be a helpful indicator. It contains the irregular fluctuations which prevent the user from obtaining a clear month-to-month indication of the trend. The seasonally adjusted series would be a good proxy for the trend-cycle only when the contribution of the irregular fluctuations is small compared to that of the trend-cycle.

For the Help-wanted Index, though the irregular fluctuations are significant and valid observations, they are not relevant when the user is interested in the long-term trend.

Figure 1 shows the Help-wanted Index for Ontario, namely; the original series, the seasonal component, the trend-cycle estimate superimposed on the seasonally adjusted series, and the irregular component.

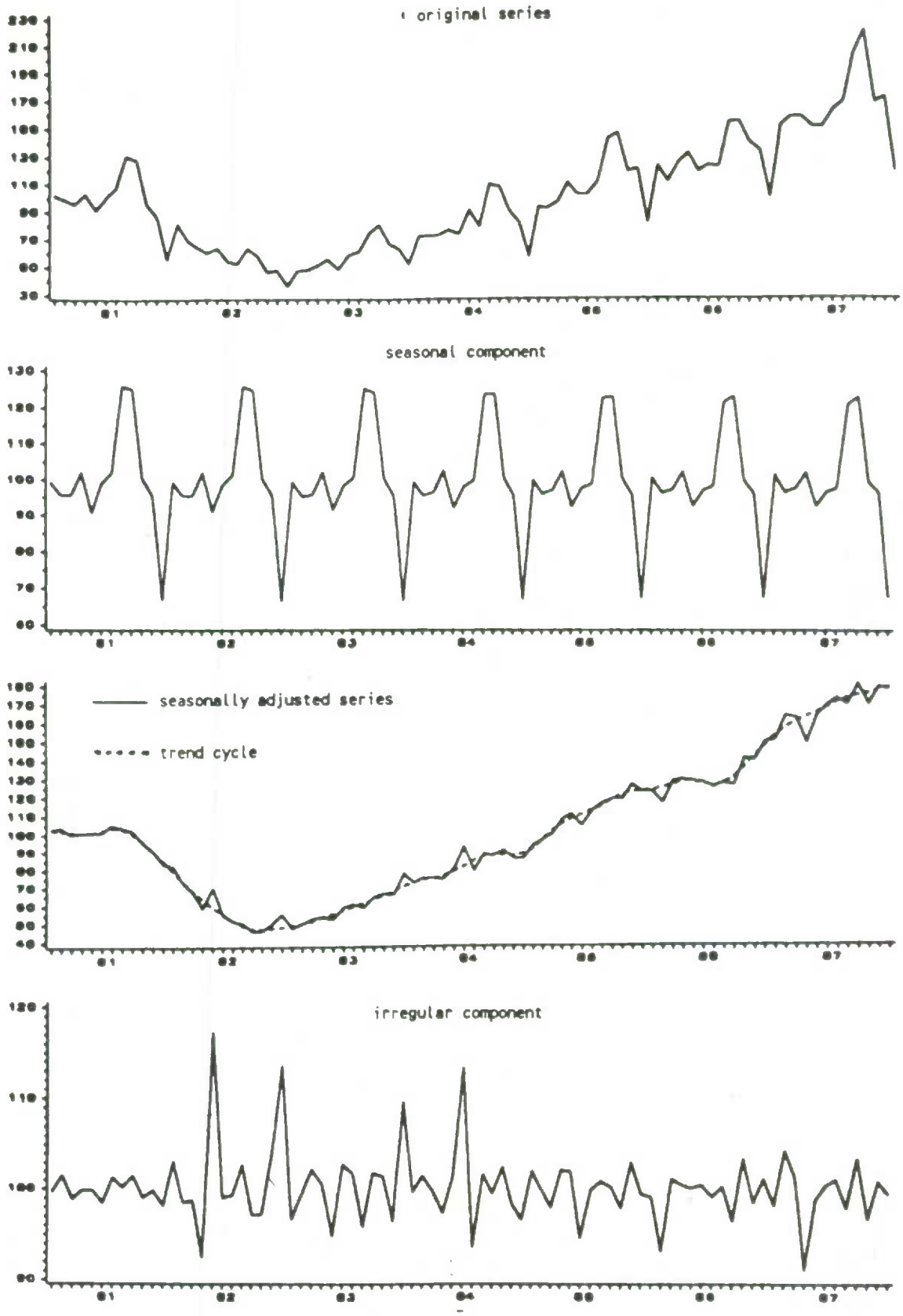
TREND-CYCLE ESTIMATION

The trend-cycle estimation procedure presently used by Statistics Canada is based on the Henderson moving averages in the X-11-ARIMA seasonal adjusment program (Dagum, 1980). These moving averages are trend-cycle estimators designed to smooth out as much as possible the irregulars from the seasonally adjusted series, without affecting the trend-cycle component.

In any moving average procedure, symmetric and asymmetric moving averages are used. The former gives equal weight to the recent past and recent future information about a time point. By taking into account full information about a time point, the symmetric moving average has optimal smoothing properties. However, it is not possible to apply a symmetric moving average to the current time point at the end of the series (i.e. January 1989), since there is no future information available. An asymmetric moving average is then used. When the observation for February becomes available, January is then re-estimated using partial future information and a different asymmetric moving average. In fact, a different asymmetric moving average is applied to each end point until the

Figure 1

HELP-WANTED INDEX FOR ONTARIO



symmetric one can be used. Thus the end-point trend-cycle estimates are revised due to the new observations and the changes in the moving averages.

The ARIMA extension of the series allows for the use of past and acceptable forecasted future values when adjusting the current observation. The symmetric Henderson moving average can be used to obtain the current trend-cycle estimate. The revisions are then related to the forecast error and the changes in the seasonal moving averages.

TREND-CYCLE VERSUS SEASONALLY ADJUSTED CURRENT ESTIMATES

How do the seasonally adjusted and trend-cycle end-point estimates compare? In order to answer this question, a comparison period of 18 months in the historical part of the Help-wanted Index series for Ontario has been selected, i.e. October 1983 to March 1985. The period covered by the series was October 1977 to August 1988. The root mean square percentage error (RMSPE) has been used as a measure of performance. "Error" means initial or recent estimate minus final estimate. The comparison is based on the two different criteria of smoothness and revision.

The smoothest component that can be obtained, using the X-11-ARIMA program, is the final trend-cycle. Smoothness refers here to a series which is corrected for seasonality and does not fluctuate in an irregular manner in any small interval of time. Thus, a clear month-to-month indication of the trend-cycle can be obtained. From this point of view, are current and recent trend-cycle estimates doing better than the seasonally adjusted ones?

Figure 2 presents the RMSPE calculated for the trend-cycle and seasonally adjusted estimates averaged over the 18-month comparison period. The error is measured as the deviation of the trend-cycle and seasonally adjusted end-points from the corresponding final trend-cycle estimates. The lags on

the x-axis are defined as the period between the latest observation and the date of the estimate. Thus, the estimate for October 1983 based on data up to October 1983 is an estimate at lag 0. Lag 0 refers to current estimates. The estimate for October 1983 with data to November 1983 is an estimate at lag 1, and so on. The final estimates for October 1983 to March 1985 are based on data up to August 1988.

As expected, Figure 2 shows that the seasonally adjusted estimates of the Help-wanted Index for Ontario at lags 0 to 11 are more irregular, that is, not as smooth as the trend-cycle estimates. It is also evident that the trend-cycle estimates at lags 0 and 1 are subjected to estimation error. This error is related to the use of seasonal asymmetric moving averages and the presence of forecast errors. Nevertheless, the end-point trend-cycle estimates, by being closer to the final trend-cycle, improve on the seasonally adjusted estimates. The improvement amounts to 27%, 57%, 73% and 81% at lags 0, 1, 2 and 3. Similar results were obtained with the other Help-wanted Index series.

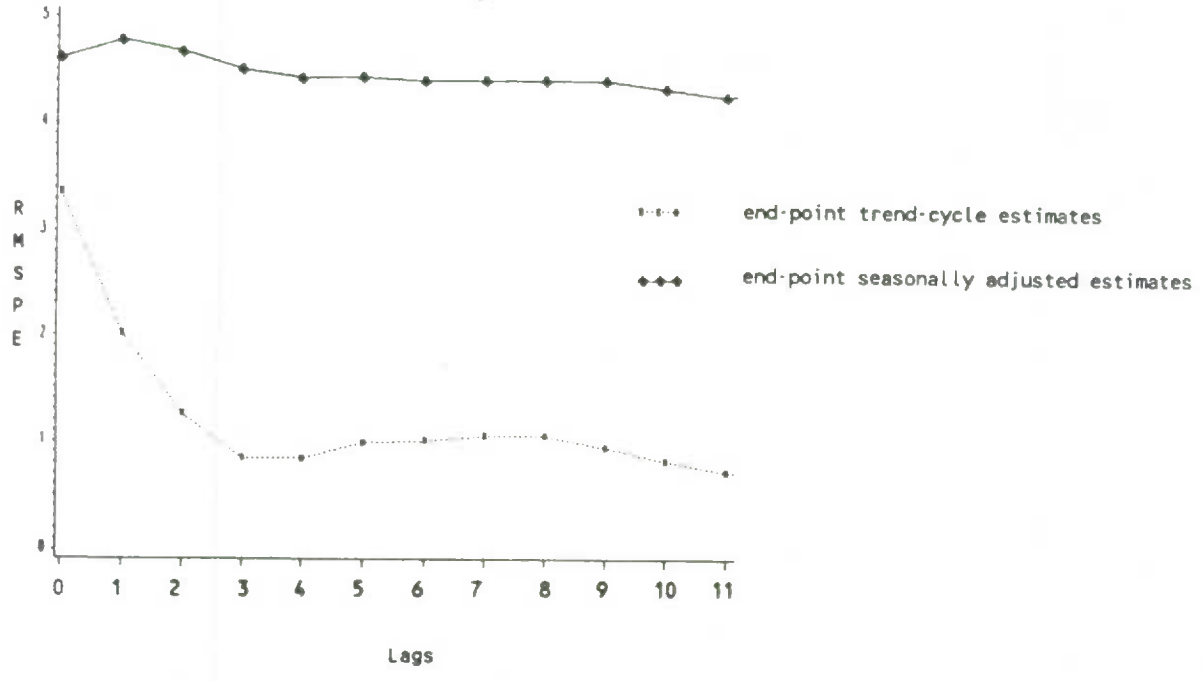


Figure 2. DEVIATION FROM THE FINAL TREND-CYCLE ESTIMATES

Every time a new observation is added to the original series, revisions are made to the trend-cycle and seasonally adjusted end-point estimates. An important consideration is the time path and speed of convergence of the end-point estimates to their final estimates. The revision is measured as the deviation of the trend-cycle and seasonally adjusted end points from their respective final estimates. Figure 3 shows that the trend-cycle estimates at lag 0 and 1 require more revision than the seasonally adjusted estimates. The advantage is that, the trend-cycle revisions converge to 0 faster than those of the seasonally adjusted estimates. Nevertheless, one has to be cautious about the use of both the seasonally adjusted and trend-cycle end-point estimates since they are subjected to revision.

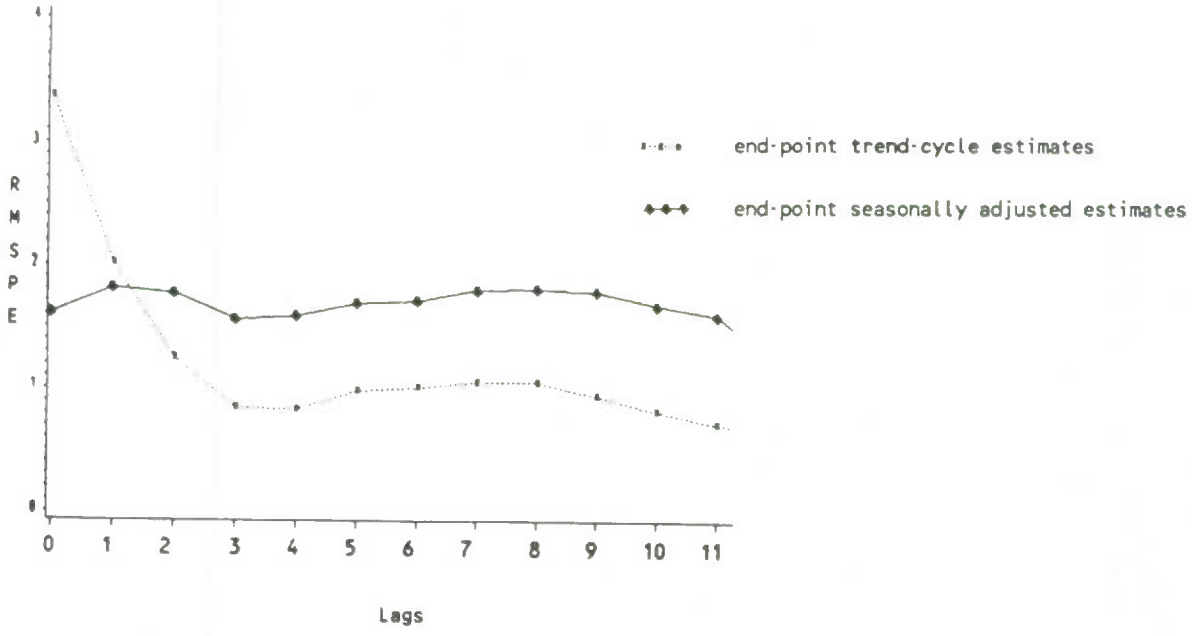


Figure 3. REVISIONS OF THE TREND-CYCLE AND SEASONALLY ADJUSTED ESTIMATES

THE USE OF TREND-CYCLE ESTIMATES

The use of the trend-cycle estimates to complement or to replace the seasonally adjusted series have been discussed by several authors, among them; Dagum, Huot and Morry (1988), Castles (1987), Kenny and Durbin (1982), and Moore, Box, Kaitz, Stephenson, and Zellner (1981). The conclusions drawn here conform to those obtained by Dagum and Laniel (1987)

in a theoretical study about the trend-cycle moving averages in the X-11-ARIMA program.

1. The historical trend-cycle estimates provide a clear month-to-month indication of the long-term trend. However, there is an error of trend-cycle estimation at the end points of the series. The seasonally adjusted estimates are also subjected to estimation errors.

2. A trade-off has to be considered when choosing between the use of the trend-cycle and the use of the seasonally adjusted estimates at lags 0 and 1. The trend-cycle estimates are smoother but undergo a larger revision than the seasonally adjusted estimates.

3. The trend-cycle revision decreases substantially when moving away from lag 0. From lag 2 and on, the trend-cycle estimates are smoother and are undergoing smaller revisions than the seasonally adjusted estimates. That is, the errors of trend-cycle estimation tend to be corrected right away, while the error of the seasonally adjusted estimation are carried over a longer period.

4. The trend-cycle estimates at lags 0 and 1 are considered as preliminary estimates. The same is true for the seasonally adjusted estimates.

5. The trend-cycle estimates at lags 0, 1 and on are smoother or less irregualar than the seasonally adjusted estimates.

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