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Seasonal Adjustment of Labour Force Series during Recession and Non-Recession Periods

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ABSTRACT

This paper analyzes the revisions of eight seasonally adjusted labour force series during recession and non-recession periods. The four seasonal adjustment methods applied are X-11 and X-11-ARIMA using either concurrent or forecast seasonal factors. The series are seasonally adjusted with these four methodologies according to both a multiplicative and an additive decomposition model. The results indicate that the X-11-ARIMA concurrent adjustment yields the smallest revisions both during recession and non-recession periods regardless of the decomposition model used.

KEY WORDS: Survey; X-11; X-11-ARIMA; Concurrent adjustment; Recession/non-recession.

1. INTRODUCTION

Seasonality in some of the labour force series may be subject to abrupt changes due to dramatic variations in their composition during the various stages of the business cycle. An important example is total unemployment. In relatively prosperous years, it consists mainly of persons shifting jobs, new entrants to the labour market, workers from the primary sector (agriculture, forestry, fishing, trapping, etc.) and construction (in the winter), and students seeking jobs (in the summer). On the other hand, during recessions, the number of unemployed increases quickly and the newly unemployed are mainly regular workers from heavy industries and related activities characterized by seasonal variations of smaller amplitudes and seasonal patterns different from those in 'normal' years. This kind of shift was observed in Canada in 1981-1982, where the total unadjusted unemployment rose from 790,000 in August 1981 to 1,494,000 in December 1982; the newly unemployed coming mainly from the manufacturing and service industries.

The rapid changes in the size and composition of total unemployment during the depressed phase of the business-cycle raises the question as to whether the procedure followed to estimate seasonal factors based on data for years of low, mainly frictional and 'outdoor' unemployment, is applicable to data for years of high unemployment with a large number of the jobless added from the secondary and tertiary sectors.

Empirical research at Statistics Canada in 1974 led to current seasonal adjustment of labour force series by the X-11-ARIMA method using concurrent seasonal factors. This method of adjustment will be referred to as the 'official' procedure in the sections to follow. The U.S. Bureau of Labor Statistics officially adopted the X-11-ARIMA method in 1980 using six-month-ahead projected seasonal factors. This agency also releases monthly the unemployment rate calculated with X-11-ARIMA and concurrent seasonal factors. Concurrent seasonal factors are obtained by seasonally adjusting, each month, all the data available up to and including that month whereas projected seasonal factors are generated from data that ended usually one year before (in the case of the Bureau of Labor Statistics, six-months before).

In Section 2, the mean absolute error (MAE) of concurrent and year-ahead projected seasonal factors is given for eight Canadian labour force series obtained from X-11-ARIMA

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and X-11 using the multiplicative seasonal adjustment option. Year-ahead instead of six-months-ahead projected factors are analyzed because they are applied by several government statistical agencies. Furthermore, the MAE's of six-months-ahead factors fall between those of concurrent and year-ahead projected factors.

The main purpose of this study is to assess whether the use of X-11-ARIMA with concurrent seasonal factors still produces the smallest revisions during recession years when compared to three feasible alternative procedures.

In Section 3, the mean absolute revisions of the additive current seasonal adjustment are calculated for the four alternative procedures and MAE's of the additive are compareed to the multiplicative options.

Finally, the conclusions of this study are presented in Section 4.

2. REVISIONS OF CURRENT SEASONALLY ADJUSTED LABOUR FORCE SERIES DURING RECESSION AND NON-RECESSION PERIODS

The majority of the seasonal adjustment methods applied by government statistical agencies are based on linear smoothing filters, usually known as moving averages. It is inherent to these methods that the estimates from the observations of the most recent years are less accurate than those corresponding to central data because of the asymmetry of the end point filters. Among these methods, the Method II-X-11 variant developed by Shiskin, Young, and Musgrave (1967) and X-11-ARIMA developed by Dagum (1980) are the most widely applied. The X-11-ARIMA method is a modified version of the X-11 variant that basically consists of two steps. First, the original series are extended with extrapolation values from ARIMA (autoregressive integrated moving averages) models of the type developed by Box and Jenkins (1970), and then the extended series are seasonally adjusted with a set of moving averages that result from the combination of the X-11 seasonal filters with the extrapolation ARIMA filters. Therefore, the seasonal adjustment filters of X-11-ARIMA and X-11 differ for the data of the most recent year. For both procedures the same symmetric filter is applied to central observations. If the ARIMA option is not used, then the X-11-ARIMA reduces to the X-11 method.

As more data become available, the seasonally adjusted estimate pertaining to a time point keeps getting revised until the data point in question is three years away from the end of the series and the symmetric filters apply, at which point the estimate becomes virtually fixed and is referred to as the final seasonally adjusted estimate. The difference between the very first and the final seasonally adjusted estimate is called the total revision. The revisions of current seasonally adjusted values by the X-11-ARIMA and X-11 methods are due to: (1) Differences in the smoothing linear filters applied to the same observations as more data become available; and, (2) the innovations that enter into the series with new observations. One would like to see the revisions of the first kind reduced to a minimum or completely eliminated.

Theoretical studies by one of the authors (Dagum 1982a and 1982b) have shown that the revisions of current seasonally adjusted values due to filter changes can be reduced substantially if: (1) the original series is extended with ARIMA extrapolated values i.e., the X-11-ARIMA is applied; and (2) concurrent seasonal factors are used instead of year-ahead seasonal factors. The conclusion drawn from these two theoretical studies conforms to the results given in several empirical and theoretical works (see e.g. Dagum 1978, Dagum and Morry 1982, Kuiper 1978, 1981; Pierce 1980; Kenny and Durbin 1982; McKenzie 1982; Wallis 1982; Pierce and McKenzie 1985; Otto 1985).

Next, we examine the performance of X-11-ARIMA with concurrent seasonal factors compared to three other feasible alternatives for recession and non-recession periods. The better seasonal adjustment procedure will be the one that yields smaller revisions.

2.1 Comparisons of Four Alternative Procedures for Current Seasonal Adjustment of Labour Force Series

There are four seasonal adjustment procedures commonly applied to obtain current seasonally adjusted values, namely:

(1) X-11-ARIMA with concurrent seasonal factors;

(2) X-11 with concurrent seasonal factors;

(3) X-11-ARIMA with year-ahead projected seasonal factors; and

(4) X-11 with year-ahead projected seasonal factors.

The revision measure used here for the evaluation of the four alternative procedures is the mean absolute error (MAE) of the seasonal factors for current seasonal adjustment defined by:

$$MAE(N) = \sum_{t=1}^{N} \left| \hat{S}_t^c - \hat{S}_t^F \right| / N \tag{1}$$

In this expression, N is the number of datapoints included in the mean, denotes the current seasonal factor value which can be either a concurrent or a year-ahead projected seasonal factor from X-11 or X-11-ARIMA. denotes the 'final' seasonal factor in the sense that it will not change significantly when the series is augmented with new data. For X-11 and X-11-ARIMA, a current seasonal factor becomes final when at least three years of data are added to the series (Young 1968; Wallis 1974). This study analyzes the revisions in the seasonal factors (or implicit seasonal factors in the additive case) rather than in the seasonally adjusted estimates for several reasons. First, using seasonal factors provides a feel for the size of revisions relative to the level of the series (it is in the form of a percentage); second, it standardizes the revision size within series subject to substantial jumps in level (such as the unemployment series); third, it allows for cross-series comparisons.

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Unlike in a previous paper by the authors (Dagum and Morry 1982), the revisions in the month-to-month movement of the seasonally adjusted data were not included in the analysis since these revisions are not of primary interest when dealing with labour force data (for example, Statistics Canada does not publish yearly revisions of the growth-rate for these series). Consequently, this paper focuses on the revisions in the level rather than on revisions in the change in level.

The eight Canadian series of employment and unemployment analyzed here start in January 1966 and end in October 1982. To use the ARIMA extrapolation option of X-11-ARIMA a period of at least five years is necessary to produce a seasonally adjusted series. Consequently, the first year for which total revision measures can be calculated is 1971. Taking into account the need for at least three and a half more years for a current estimate to become final, the last full year for which MAE can be obtained is 1977. Within this seven-year span of revisions, we distinguished two years of recession and five years of non-recession. The recession period includes data from August 1974 until July 1975 and June 1976 until May 1977. These two years were considered recessionary because they showed high increases (greater than 25%) in the annual levels of total unemployment due mainly to large inflows of job losers.

Another important aspect taken into consideration is the kind of decomposition model used for the seasonal adjustment of each series. The X-11 and the X-11-ARIMA methods provide both additive and multiplicative decomposition models. There are no theoretical reasons for one model to be preferable to the other. They are based on different assumptions concerning the generating mechanism of the seasonal component.

In an additive model, the components of a time series (trend-cycle, seasonal variations and irregular fluctuations) are assumed to be independent and, therefore, the seasonal effect is not affected by the level of the economic activity conditioned by the stages of the business cycle.

On the other hand, in a multiplicative model, the seasonal effect is proportional to the trend-cycle. If the seasonal factors are constant, it means the higher the level of the seasonally adjusted series, the higher the seasonal effect.

The selection of the decomposition model is not crucial for the estimation of 'final' seasonally adjusted values since for most cases the corresponding figures are similar. The problem of model selection, however, becomes very important when approached from the viewpoint of the estimation of the seasonal component of the end years of a series, particularly, of series with a rapidly growing trend-cycle. The asymmetric filters used for the end points estimation, particularly those of the X-11 method, introduce large systematic errors if the seasonal estimates change fast (Dagum 1978). In fact, if the underlying decomposition model is that of a rather stable multiplicative seasonality, an additive seasonal adjustment will produce seasonal estimates that appear to vary with the trend-cycle. Reciprocally, if stable additive seasonality is the norm, a multiplicative adjustment will produce seasonal factors that look unstable or fast moving.

From the viewpoint of seasonal adjustment, it is then preferable to choose the decomposition model that yields the most stable seasonal estimates. The tests developed by Morry (1975) and Higginson (1977) have been applied to the eight series to determine the preferred decomposition models.

The results of these tests indicated that only two series, unemployment of adult and young women, follow an additive model; the remaining series are of the multiplicative type.

In this study, however, the mean absolute revisions have been analyzed under both assumptions, that is, the components of each series are either multiplicatively or additively related. We are using additive and multiplicative decomposition models for data spanning both recessionary and non-recessionary periods in order to determine which of these two decomposition models is more sensitive to sudden changes of level from the viewpoint of revision.

The calculations shown in the following tables were obtained from multiplicative seasonal adjustment. The results from additive adjustment are discussed in Section 3.

Table 1 shows the mean absolute error (MAE) of the seasonal factors of X-11-ARIMA and X-11 applied for current seasonal adjustment during recession years. It is apparent that X-11- ARIMA with concurrent seasonal factors yields the smallest revisions. This result is consistent with the theoretical findings discussed above which determined that the use of the ARIMA extrapolation option with concurrent seasonal factors significantly reduces filter revisions.

For six out of the eight series analyzed, X-11 with concurrent seasonal factors ranks second. For the other two series (unemployed and employed adult men) X-11/concurrent shows the same MAE results as does X-11-ARIMA with year-ahead projected seasonal factors. Finally, the least accurate estimates are obtained from X-11 with year-ahead projected seasonal factors.

Table 2 shows the relative size of the revisions from each alternative procedure with respect to X-11-ARIMA with concurrent seasonal factors during recession years. All the values are greater than 1.0 indicating that none of the alternative options gives revisions smaller than X-11-ARIMA/concurrent.

Table 1

Mean Absolute Errors (MAE(N)) of Seasonal Factors of X-11-ARIMA and X-11 during Recession Years[a] (N = 24)

Series	Concurrent Seasonal Factors		Year-ahead Projected Seasonal Factors	
	X-11-ARIMA (1)	X-11 (2)	X-11-ARIMA (3)	X-11 (4)
Unemployment				
Men 25+	1.95	2.75	2.74	3.35
Women 25+	1.94	2.94	3.43	4.70
Men 15-24	2.16	3.02	3.49	4.33
Women 15-24	1.25	1.73	2.48	3.44
Employment				
Men 25+	0.08	0.12	0.12	0.16
Women 25+	0.23	0.29	0.33	0.42
Men 15-24	0.41	0.53	0.66	0.76
Women 15-24	0.50	0.70	0.81	0.97

[a] August 1974 - July 1975 and June 1976 - May 1977.

Table 2

Comparison of MAE(N)'s from Three Alternative Procedures Versus X-11-ARIMA/Concurrent for Multiplicative Seasonal Adjustment of Employment and Unemployment Series in Recession Years (N = 24)

Series	X-11 Concurrent vs. X-11-ARIMA Concurrent (1)[a]	X-11-ARIMA Projected Factors vs. X-11-ARIMA Concurrent (2)[b]	X-11 Projected Factors vs. X-11-ARIMA Concurrent (3)[c]
Unemployment			
Men 25+	1.41	1.40	1.72
Women 25+	1.52	1.77	2.41
Men 15-24	1.40	1.61	2.00
Women 15-24	1.38	1.98	2.75
Employment			
Men 25+	1.50	1.50	1.50
Women 25+	1.26	1.43	1.83
Men 15-24	1.29	1.61	1.85
Women 15-24	1.40	1.62	1.94

[a] (1) equals column (2) ÷ column (1) of Table 1.
[b] (2) equals column (3) ÷ column (1) of Table 1.
[c] (3) equals column (4) ÷ column (1) of Table 1.

The non-recession period covers from January 1971 to December 1977 excluding the recession years. Table 3 shows the MAE of the current seasonally adjusted series for the four procedures during these years. Similarly to Table 1, X-11-ARIMA with concurrent seasonal factors yields the smallest revisions for all the series due to minimal filter revisions as pointed out before. For seven out of the eight series X-11/concurrent ranks second with values relatively close to those shown for X-11-ARIMA with year-ahead projected factors. Finally, the most unreliable procedure in terms of the magnitude of the revision is X-11 with year-ahead seasonal factors.

The relative size of the revisions of the three alternative procedures with respect to the X-11-ARIMA/concurrent procedure during non-recession years are shown in Table 4. The figures in column (1) with the exception of one entry, however, are smaller than those shown in column (1) of Table 2 which would indicate that during recession years the percentage gains achieved by using ARIMA extrapolation are even higher than during non-recession years.

Finally, Table 5 compares the size of the revisions during recession versus non-recession years for the two best procedures. The results show that X-11-ARIMA/concurrent which is Statistics Canada official procedure gives smaller MAE values compared to those of the second best alternative, X-11/concurrent. Most of the ratios in the first column are very close to 1.0, indicating that the revisions in times of recession are similar in size to those in non-recession years when using the ARIMA extrapolation option. If X-11 with concurrent seasonal factors is applied, the size of revision is substantially higher in most series during recession than in 'normal' times. This is due to the fact that the rapid change in the level of the series, introduced by the new observations of the recession years, is not estimated as well by the end filters. In fact, gradual movements and some of the level increase are passed to the seasonal component.

Table 3

Mean Absolute Errors (MAE(N)) of Seasonal Factors of X-11-ARIMA and X-11 during Recession Years[a] (N = 60)

Series	Concurrent Seasonal Factors		Year-ahead Projected Seasonal Factors	
	X-11-ARIMA (1)	X-11 (2)	X-11-ARIMA (3)	X-11 (4)
Unemployment				
Men 25+	1.37	1.73	2.22	2.73
Women 25+	1.84	2.41	2.92	3.55
Men 15-24	1.97	2.66	3.17	3.96
Women 15-24	1.93	2.87	2.59	3.18
Employment				
Men 25+	0.08	0.10	0.12	0.13
Women 25+	0.23	0.27	0.33	0.34
Men 15-24	0.39	0.46	0.58	0.69
Women 15-24	0.43	0.49	0.68	0.80

[a] From January 1971 until December 1977 excluding recession periods defined in Table 1 footnote (*a*)

Table 4

Comparison of MAE(N)'s from Three Alternative Procedures Versus X-11-ARIMA/Concurrent for Multiplicative Seasonal Adjustment of Employment and Unemployment Series in Recession Years (N = 60)

Series	X-11 Concurrent vs. X-11-ARIMA Concurrent (1)[a]	X-11-ARIMA Projected Factors vs. X-11-ARIMA Concurrent (2)[b]	X-11 Projected Factors vs. X-11-ARIMA Concurrent (3)[c]
Unemployment			
Men 25+	1.26	1.62	1.99
Women 25+	1.31	1.59	1.93
Men 15-24	1.35	1.61	2.01
Women 15-24	1.49	1.34	1.65
Employment			
Men 25+	1.25	1.50	1.62
Women 25+	1.17	1.43	1.48
Men 15-24	1.18	1.49	1.77
Women 15-24	1.14	1.58	1.86

[a] (1) equals column (2) ÷ column (1) of Table 3.
[b] (2) equals column (3) ÷ column (1) of Table 3.
[c] (3) equals column (4) ÷ column (1) of Table 3.

Table 5

Comparison of MAE(N)'s of Concurrent Seasonal Factors of X-11-ARIMA and X-11 for Recession Versus Non-Recession Years Using the Multiplicative Option

Series	X-11-ARIMA Concurrent Recession Years (N = 24) vs. Non-Recession Years (N = 60) (1)[a]	X-11 Concurrent Recession Years (N = 24) vs. Non-Recession Years (N = 60) (2)[b]
Unemployment		
Men 25+	1.42	1.59
Women 25+	1.05	1.22
Men 15-24	1.09	1,35
Women 15-24	0.67	0.60
Employment		
Men 25+	1.00	1.20
Women 25+	1.00	1.07
Men 15-24	1.05	1.27
Women 15-24	1.16	1.54

[a] (1) equal to column (1) of Table 1 ÷ column (1) of Table 3.
[b] (2) equal to column (2) of Table 1 ÷ column (2) of Table 3.

The only exception is the series unemployed women 15 to 24 where revisions with both methods are smaller during economic hardship. This can be explained by the special behaviour of this series during the period analyzed, which is characterized by large annual increases of about 15% for 1966-73 and 8.5% for 1973-80 and an additive seasonal component, independent of the business-cycle (i.e., the change in level reflected more the changing behaviour of young women than the effect of the business-cycle).

Another special case is the series unemployed men 25 years and over. Here recession years were characterized by much larger revisions than non-recession periods even with ARIMA extrapolations as indicated by a ratio of 1.42. This large discrepancy between the two periods is a result of the drastic composition changes in seasonality that this series undergoes during times of recession as discussed before. Without ARIMA extrapolation, the revision sizes deviate even more (the ratio is 1.59), since apart from the changes in composition the unreliable seasonal estimates produced during recession introduce added discrepancies.

3. COMPARISON OF ADDITIVE VERSUS MULTIPLICATIVE CURRENT SEASONAL ADJUSTMENT DURING RECESSION AND NON-RECESSION PERIODS

It is often argued that during recession periods the use of an additive instead of a multiplicative decomposition model is to be preferred from the viewpoint of the minimization of revisions. The main reasons given for this are: (1) in an additive model, the time series components are assumed to be independent and, therefore, the seasonal effect is not affected by the level of the trend-cycle contrary to what occurs with a multiplicative model; and (2) the inflexibility of the end-point filters to estimate adequately fast-moving seasonality.

The eight labour force series analyzed in the previous section was additively seasonally adjusted in order to assess this new alternative. The results obtained confirm the ranking given by the multiplicative option. Namely, X-11- ARIMA/concurrent yields the smallest revisions followed by X- 11/concurrent and X-11-ARIMA/year-ahead projected, in that order. The least accurate estimates are obtained with X-11/year-ahead projected. It is important to note that *factors* of additive seasonal adjustment mean *implicit* factors in the sense that they result from the quotient between the original series and the seasonally adjusted series.

Tables 6 and 7 show the relative size of the revisions by each alternative procedure with respect to X-11-ARIMA/concurrent, for the recession and non-recession periods, respectively. All the values are greater than one indicating that none of the alternative procedures gives smaller revisions than X-11- ARIMA/concurrent. Since the latter ranks first for both additive and multiplicative seasonal adjustment options, we compare for each series which of the two decomposition models gives the smallest revisions.

In Table 8 the data show that for the two series that affect the unemployment rate the most, i.e., the unemployment and employment of adult men, the multiplicative option is to be preferred during recession as well as non-recession years. For the most part, these data confirm the decomposition models chosen by Statistics Canada according to the model tests (Morry 1975; Higginson 1977). The only apparent exception is the series Employed Men 15-24 which would do better with an additive model. However, given the fact that the size of the revisions is already very small, this improvement is of no consequence. The MAE's from the multiplicative adjustment are 0.41 (recession period) and 0.39 (non-recession period) and are reduced by the additive options to 0.33 and 0.31 respectively.

Finally, we observe that the unemployment of adult women would have smaller revisions with a multiplicative instead of an additive seasonal adjustment during recession years.

Table 6

Comparison of MAE(N)'s from Three Alternative Procedures Versus X-11-ARIMA/Cncurrent for Additive Seasonal Adjustment of Employment and Unemployment Series in Recession Years (N = 24)

Series	X-11 Concurrent / X-11-ARIMA Concurrent	X-11-ARIMA Projected Implicit Factors / X-11-ARIMA Concurrent	X-11 Projected Implicit Factors / X-11-ARIMA Concurrent
Unemployment			
Men 25+	1.18	1.29	1.38
Women 25+	1.16	1.49	1.75
Men 15-24	1.21	1.48	1.70
Women 15-24	1.33	1.74	1.84
Employment			
Men 25+	1.44	1.69	2.08
Women 25+	1.26	1.33	1.65
Men 15-24	1.02	1.05	1.34
Women 15-24	1.50	1.50	2.05

Table 7

Comparison of MAE(N)'s from Three Alternative Procedures Versus X-11-ARIMA/Concurrent for Additive Seasonal Adjustment of Employment and Unemployment Series in Recession Years (N = 60)

Series	X-11 Concurrent / X-11-ARIMA Concurrent	X-11-ARIMA Projected Implicit Factors / X-11-ARIMA Concurrent	X-11 Projected Implicit Factors / X-11-ARIMA Concurrent
Unemployment			
Men 25+	1.31	1.65	1.88
Women 25+	1.20	1.59	1.71
Men 15-24	1.22	1.57	1.89
Women 15-24	1.05	1.20	1.26
Employment			
Men 25+	1.16	1.24	1.54
Women 25+	1.10	1.27	1.30
Men 15-24	1.22	1.31	1.55
Women 15-24	1.41	1.68	2.16

Table 8

Comparison of MAE(N)'s of Seasonal Factors from Additive Versus Multiplicative X-11-ARIMA (Concurrent) Seasonal Adjustment during Recession and Non-Recession Periods

Series	(N = 24) Recession Period: Additive X-11-ARIMA Concurrent / Multiplicative X-11-ARIMA Concurrent	(N = 60) Non-recession Period: Additive X-11-ARIMA Concurrent / Multiplicative X-11-ARIMA Concurrent
Unemployment		
Men 25+	1.25	1.15
Women 25+	1.14	0.88
Men 15-24	1.23	1.05
Women 15-24	0.93	0.85
Employment		
Men 25+	1.25	1.25
Women 25+	1.00	1.00
Men 15-24	0.80	0.80
Women 15-24	1.14	1.17

4. CONCLUSIONS

The results of Sections 2 and 3 can be summarized as follows:

(1) The X-11-ARIMA method with concurrent seasonal factors gives the smallest revisions for each series, whether an additive or a multiplicative seasonal adjustment is made, during both recession and non-recession years.

(2) The comparisons of the magnitude of the revision from additive versus multiplicative seasonal adjustment with X-II-ARIMA/concurrent indicate clearly that the two series that affect the unemployment rate most, unemployment and employment of adult men, are of the multiplicative type during times of recession as well as non-recession.

(3) During recession years, the use of X-11-ARIMA with year- ahead factors and of X-11/concurrent yields equal MAE's for employment and unemployment adult men. For the six remaining series, however, X-11/concurrent is the second best alternative.

(4) The least accurate current seasonal adjustment estimates for all series in all the situations discussed are obtained with X-11 with year-ahead projected seasonal factors.

(5) The comparisons of the revisions during recession versus non-recession periods from X-11-ARIMA/concurrent show that they are of relatively similar magnitude with the important exception being Unemployed Men 25 years and over, where revisions are much higher in recession years. This concurs with the fact that this series undergoes abrupt seasonal changes because of drastic variations in its composition. The larger revisions are mainly due to these new innovations.

On the other hand, the use of concurrent seasonal factors with X-11 shows, for most series, large discrepancies in the size of the revisions of these two periods. This is an indication that revisions result mainly from the inadequacy of the end filters to estimate well the rapidly changing levels of recession periods.

For only one series, Unemployed Women 15-24 years, the two best procedures yield revisions substantially larger in non-recessions compared to recessions. This can be explained by the special behaviour of this series during the analyzed period which is characterized by large annual increases of about 15% for 1966-73 and 8.5% for 1973-80, obscuring the effect of the business-cycle; and, a seasonal component independent of the business-cycle.

Given the above observations, we can feel confident that the official seasonal adjustment procedure at Statistics Canada will give best estimates among the alternatives considered during recession.

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